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WISC-R Patterns for the Learning Disabled: A Study of the Recategorizations of Bannatyne and Kaufman

Dianne A. Johnston
Western Michigan University

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WISC-R PATTERNS
FOR THE LEARNING DISABLED:
A STUDY OF THE RECATEGORIZATIONS
OF BANNATYNE AND KAUFMAN

by

Dianne A. Johnston

A Project Report
Submitted to the
Faculty of The Graduate College
of the
Degree of Specialist in Education

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December 1979
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My adviser for this project, Alonzo Hannaford, not only advised and encouraged during the course of this project, but also helped me avoid procedural roadblocks and detours that could have delayed the completion of the work. Many thanks to him. Thanks, too, to Joseph J. Eisenbach, Head of the Department of Special Education, for his advice, concern, and assistance.

Dianne A. Johnston
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STUDY OF THE RECLASSIFICATIONS OF BANNATYNE
AND KAUFMAN.
WESTERN MICHIGAN UNIVERSITY, ED. S., 1979
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CHAPTER I

Introduction

Emergence of the special education category "Learning Disabled" generated a great interest in and necessity for systematic and valid identification of this group of learners. Such identification is necessary to enable appropriate educational and related services to be made available. Toward this end, a diverse array of procedures and instruments have emerged. In addition to new procedures and instruments has come renewed interest in the potential for using existing instruments typically used for other, though frequently related, purposes. Such has been the case with the Wechsler Intelligence Scale for Children (WISC) and its revision, the WISC-R. Both instruments lend themselves well to investigation of "patterns" of performance, as they yield Verbal, Performance, and Full Scale IQs that are derived from 12 subtest scores, six each in the Verbal and Performance areas.

Evidence is mounting that there may indeed be characteristic subtest patterns or profiles for the mentally retarded (Kaufman & Van Hagen, 1977; Silverstein, 1968), the reading disabled (McManis, Figley, Richert & Fabre, 1978; Rugel, 1974), as well as for the learning disabled (Ackerman, Dykman & Peters, 1976; Kaufman, 1979).

The most basic pattern or profile, that of Verbal and Performance subtest scores, has not been found sensitive enough to distinguish certain populations. Factor-analytic studies have led researchers to look beyond the Verbal-Performance dichotomy for alternate groupings or patterns of subtests which may be used in identification of the learning disabled. Most popular of such attempts has been the system suggested by Bannatyne (1968, 1974). With this system, which consists of a recategorization
of the WISC and the WISC-R, reading disabled and learning disabled children score highest in Spatial Ability (Picture Completion, Object Assembly, Block Design subtests), have intermediate Conceptual Ability (Similarities, Vocabulary, and Comprehension subtests), are weak in Sequencing Ability (Arithmetic, Digit Span, and Coding subtests), and score lowest in Acquired Knowledge (Information, Arithmetic, and Vocabulary subtests) (Rugel, 1974; Smith, Coleman, Dokecki & Davis, 1977a, 1977b).

The Bannatyne recategorization is, however, not the only such attempt. As a result of Kaufman's (1975) factor analysis of the WISC-R standardization data (100 males and 100 females for each of 11 age groups, 6 1/2 to 16 1/2 years), three factors emerged that suggest a slightly different recategorization for profile analysis. These consisted of Perceptual Organization (Picture Completion, Picture Arrangement, Block Design, and Object Assembly subtests), Verbal Comprehension (Information, Similarities, Vocabulary, and Comprehension subtests), and Freedom from Distractibility (Arithmetic, Digit Span, and Coding subtests).

Research conducted on the characteristic profiles of the learning disabled led Kaufman (1979) to postulate a pattern of Perceptual Organization > Verbal Comprehension > a third factor, for reading and learning disabled children.

A survey of the literature reveals that, to date, there is no research to test Kaufman's hypothesis of a characteristic pattern for reading disabled and learning disabled children. This study was therefore undertaken to help fill this research gap. Furthermore, because the recategorization of the WISC-R suggested by Kaufman
is similar to the recategorization suggested by Bannatyne (1968, 1974), the study was broadened to include a replication of the study of Bannatyne's recategorization conducted by Smith et al. (1977b).

The research tested the following hypotheses:

WISC-R subtest scores of school-verified learning disabled children exhibit a statistically significant pattern of Spatial Ability > Conceptual Ability > Sequential Ability.

WISC-R subtest scores of school-verified learning disabled children exhibit a statistically significant pattern of Perceptual Organization > Verbal Comprehension > Freedom from Distractibility.

Bannatyne's and Kaufman's recategorizations yield comparable patterns of WISC-R subtest scores for school-verified learning disabled students.

The following definitions may be useful to the readers of this study; the first three are important to Bannatyne's suggested recategorization, the next three, to Kaufman's.

Spatial Ability--those abilities tapped by the WISC-R subtests Picture Completion, Object Assembly, and Block Design.

Conceptual Ability--those abilities sampled by Similarities, Vocabulary, and Comprehension subtests.

Sequencing Ability--those abilities probed in the Arithmetic and Coding subtests.

Perceptual Organization--those abilities tapped by Picture Completion, Picture Arrangement, Block Design, and Object Assembly subtests.
Verbal Comprehension--the abilities assessed by Information, Similarities, Vocabulary, and Comprehension subtests.

Freedom from Distractibility--the abilities evaluated by Arithmetic, Digit Span, and Coding subtests.
CHAPTER 2

Review of the Literature

The Wechsler Intelligence Scale for Children (WISC) and the Wechsler Intelligence Scale for Children-Revised (WISC-R) have been the focus of an impressive number and variety of studies, ranging from correlational studies involving these tests and other instruments such as the Stanford-Binet (Bloom, Raskin & Reese, 1977) to studies of test specificity—"...the proportion of a subtest's variance that is both reliable and unique to that particular task..." (Kaufman, 1979, p.12), studies comparing the WISC and WISC-R (e.g., Doppelt & Kaufman, 1977), studies of assessment of minorities such as those by Reschly (1978) and Richmond and Long (1977), factor-analytic investigations (Kaufman, 1975), and the search for characteristic profiles (e.g., Kaufman & Van Hagen, 1977; McManis et al., 1978; Rugel, 1974). The latter two groups of studies, the factor-analytic investigations and the investigations of characteristic profiles, provide support for the present study of learning disabled students' WISC-R scores recategorized according to the suggestions of Bannatyne and Kaufman.

Factor-analytic Studies

Most of the factor-analytic studies of the WISC (e.g., Cohen, 1959) yielded verbal and nonverbal factors that fragmented when several factors were rotated. As a result, the construct validity of the old WISC was suspect; especially suspect was that the Verbal and Performance IQ's represented unitary abilities. Therefore, test interpretation of the WISC, particularly interpretation of Verbal-Performance IQ discrepancies, was done without support of scientific research.

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Factor analysis of the WISC-R has produced far more positive results. All the factor-analytic studies have yielded the same finding: the WISC-R factors of Verbal Comprehension and Perceptual Organization emerge consistently and recurrently; these findings have resulted regardless of the factor-analytic method used, the age and ethnic background of the children in the sample, or the nature of the population (normal or exceptional) (Kaufman, 1979). The verbal factor includes significant loadings of five subtests--Information, Similarities, Arithmetic (often a distant fifth), Vocabulary, and Comprehension, the five Verbal subtests regularly administered by examiners. All Performance subtests except Coding yield significant loadings of the non-verbal dimension. A general intelligence factor emerges, preceding the verbal and perceptual factors, when a hierarchial factor solution is utilized (Vance & Wallbrown, 1978; Wallbrown, Blaha, Wallbrown & Engin, 1975); Verbal Comprehension and Perceptual Organization emerge first, followed by a distractibility factor, when principle components or principle factor analysis is performed (e.g., DeHorn & Klinge, 1978; Kaufman, 1975; Reschy, 1978). Even when four or five factors are rotated, the WISC-R factors do not split apart as they do on the WISC, but retain their integrity (Kaufman, 1975).

The composition of the two major WISC-R factors is similar across the 11 age groups between 6 1/2 and 16 1/2 in the standardization sample of 2200 (Kaufman, 1975); "...it also characterizes the variety of samples that have been factor analyzed by numerous investigators..." (Kaufman, 1979, p.6).
The emergence of robust factors that closely resemble the Verbal and Performance Scales of the WISC-R was also found with a variety of populations: black students (Reschly, 1978; Vance & Wallbrown, 1978) Spanish-speaking students (Reschly, 1978; Stedman, Lawlis, Cortner & Achterberg, 1978); native Americans (Rechly, 1978); the mentally retarded (Van Hagen & Kaufman, 1975), psychiatric populations (DeHorn & Klinge, 1978); and referrals to school and clinical psychologists (Lombard & Ridel, 1978; Stedman et al., 1978; Swerdlik & Schweitzer, 1978).

The third factor, which Kaufman (1975, 1979) calls Freedom from Distractibility, was identified for the old WISC, but its composition varied from age group to age group. For example, when Cohen (1959) factor analyzed the WISC standardization sample, Digit Span loaded on the distractibility factor for three age groups, Arithmetic loaded for only age 12 1/2, Digit Span and Object Assembly loaded at age 10 1/2. Silverstein (1969) found that the distractibility factor did not emerge at all when an objective criterion was used to decide which number of factors to rotate.

The factor analyses of the WISC-R have produced noticeably different results. When Kaufman (1975) analyzed the WISC-R standardization data, each age group between 6 1/2 and 16 1/2 produced a distractibility factor. At all age levels, Digit Span and Arithmetic loaded substantially; and across the age range, Coding was closely associated with this factor. In his 1979 article, Kaufman reviews 10 other studies of normal and exceptional groups in which the distractibility factor emerged eight times, usually with the subtests Arithmetic,
Digit Span, and Coding; and he concludes, "Thus, unlike its WISC counterpart, the WISC-R distractibility factor is sufficiently large and stable from age to age to constitute an important force to be reckoned with in profile analysis" (p.10).

**Characteristic Profiles**

Studies of the 1949 WISC revealed that groups of mentally retarded children generally performed well on Picture Completion, Object Assembly, and Block Design, and performed poorly on Information, Arithmetic, and Vocabulary (Silverstein, 1968). Children with reading problems also did well on Picture Completion, Object Assembly, and Block Design, and poorly on Information, Arithmetic, Digit Span, and Coding, according to Rugel's (1974) review of 25 studies. Ackerman, Dykman, and Peters (1976) found that various groups of learning disabled children had difficulties with these latter four subtests.

A study using the WISC-R with the mentally retarded revealed a pattern of subtest scores similar to the pattern found with the old WISC (Kaufman & Van Hagen, 1977). McManis et al., (1978) found that a reading disabled population evidenced a characteristic profile found in many WISC studies. Kaufman (1979) rank ordered the mean subtest scores according to subtest difficulty for four groups of learning disabled students studied previously by Anderson, Kaufman, and Kaufman (1976), Smith et al. (1977b), Vance, Gaynor, and Coleman (1976), and Zingale and Smith (1978). He found considerable consistency in the rank orderings from group to group. Object Assembly, Picture Completion, Picture Arrangement, and Block Design were the easiest...
for the four samples; and Coding, Arithmetic, and Information were the most difficult subtests (Digit Span and Mazes were generally not given in the studies and were not included in Kaufman's analysis). This analysis and the trends in the subtest scores for the mentally retarded and the reading disabled led Kaufman (1979) to suggest that a three-factor solution rather than the traditional Verbal-Performance distinction is more effective in explaining these persistent profiles. He cited in particular the difficulty children had on Coding, in comparison to the remainder of the Performance Scale subtests; furthermore, when Digit Span is administered (Ackerman et al., 1976; Rugel, 1974), it joins Coding and Arithmetic as the most difficult subtests. He therefore postulated that reading and learning disabled children will have "...a strong ability... in Perceptual Organization, medium ability in Verbal Comprehension, and weak ability in whatever is measured by the third factor" (p. 17). This hypothesis was tested in the present study.

Bannatyne (1968) also suggested a three-factor re-categorization of the WISC, to identify children with genetic dyslexia, rather than employing the traditional Verbal-Performance dichotomy. He suggested deriving a Spatial score from Object Assembly, Block Design, and Picture Completion; a Conceptual score from Comprehension, Similarities, and Vocabulary; and a Sequential score from Digit Span, Coding, and Picture Arrangement. Rugel (1974) reviewed 25 studies on reading disabled children, recategorizing the reported WISC subtest scales scores in Bannatyne's Spatial, Conceptual, and Sequential categories, and rank ordered the scores. The results supported Bannatyne's predicted
ordering; furthermore, this order was not found when WISC scores of normal readers were recategorized and rank ordered. Rugel's study is also important because the factor analytic work he cited and his comparisons of normal and disabled readers led Bannatyne (1974) to substitute the Arithmetic subtest for Picture Arrangement in the Sequential category. Smith, Coleman, Dokecki, and Davis's (1977b) important study applied Bannatyne's recategorization to the WISC-R scores of 208 school-verified learning disabled children; they again found the unique and statistically significant pattern of Spatial > Conceptual > Sequential. Replication of this study was an additional purpose of the current investigation.

Relationship of the Literature to this Study

A considerable body of literature supports the hypothesized patterns of WISC-R subtest scores as grouped according to the suggestions of Bannatyne and Kaufman; especially important are the factor-analytic studies and the investigation of characteristic profiles.

The factor analytic-studies of the WISC-R support the three categories in each recategorization, as the research consistently yields three factors--verbal, performance, and what Kaufman calls the third factor and/or distractibility.

The verbal factor is represented by Bannatyne's Conceptual Ability category (the Verbal Scale subtests Similarities, Vocabulary, and Comprehension), and by Kaufman's Verbal Comprehension (the same three subtests plus Information, another subtest of the Verbal Scale). The performance factor is represented by Bannatyne's Spatial Ability category (Performance Scale subtests...
Picture Completion, Object Assembly, and Block Design) and by Kaufman's Perceptual Organization (the same three subtests plus Picture Arrangement, another Performance Scale subtest). The third factor is represented by Bannatyne's Sequential Ability category and Kaufman's Freedom from Distractibility group, both of which include the Arithmetic, Digit Span, and Coding subtests.

The research relating to characteristic profiles for learning disabled students supports the hypothesized pattern of the categories; Spatial > Conceptual > Sequential, and Perceptual Organization > Verbal Comprehension > Freedom from Distractibility. The studies revealed that the reading disabled and learning disabled scored highest on the WISC-R subtests that loaded on the performance factor (Bannatyne's Spatial Ability category and Kaufman's Perceptual Organization), had intermediate scores on the subtests that loaded on the verbal factor (Bannatyne's Conceptual Ability and Kaufman's Verbal Comprehension), and scored lowest on the subtests that loaded on the third factor (Bannatyne's Sequential Ability and Kaufman's Freedom from Distractibility).

Furthermore, because the recategorizations by Bannatyne and Kaufman differ only to the extent that Kaufman includes two more WISC-R subtests in his regroupings—Information and Picture Completion—one would also expect comparable patterns of scores for the two recategorizations.
CHAPTER III

Methods and Procedures

Sample

The sample comprised 103 students who had received or were receiving service in the learning disabilities program in a rural county and who had been tested with the WISC-R. The sample constituted approximately 59% of the total population of children in the learning disabilities program. Students not included were those who had not been administered the WISC-R or those who did not have the necessary 10 subtest scores for testing the hypotheses. The school system initially identified the population by the following criteria: (a) the child demonstrated he/she had a specific learning disability; the county system uses the following definition:

"Specific Learning Disability" means a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell or to do mathematical calculations. The term includes such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia and developmental aphasia. The term does not include children who have learning problems which are primarily the result of visual, hearing or motor handicaps, of mental retardation, of emotional disturbance or of environmental, cultural or economic disadvantage;

(b) the student was evaluated by a qualified psychological examiner, who used both formal and informal measures; and (c) based on the results of the required assessments, the child demonstrated a severe discrepancy between ability and achievement.

The children ranged in age from 6 years 3 months to 15 years 8 months; the mean age was 10 years 1 month.
The mean Full Scale IQ on the WISC-R for the sample was 93.06, with a range from 66 to 118; the mean Verbal IQ was 93.17; the mean Performance IQ was 94.29. There were 76 males and 27 females. All were Caucasian.

**Instrumentation**

The Wechsler Intelligence Scale for Children-Revised (WISC-R), the revised version of the Wechsler Intelligence Scale for Children (WISC) was used to test the hypotheses. The WISC-R is an individually administered test for children 6 to 16 years old; it is designed to evaluate a child's ability to understand and cope with the world. The WISC yields Verbal, Performance, and Full Scale IQs. The 12 subtests of the WISC-R are organized into two separate scales; each subtest yields a scaled score. The Verbal Scale assesses a child's understanding of verbal concepts and ability to respond orally through the subtests Information, Similarities, Arithmetic, Vocabulary, Comprehension, and Digit Span. The Performance Scale assesses ability to solve problems involving manipulation of objects or other manual responses through the subtests Picture Completion, Picture Arrangement, Block Design, Object Assembly, Coding, and Mazes. The subtests Digit Span and Mazes are administered at the examiner's option.

The WISC-R tests used in this study were administered by qualified examiners; a large percentage were given by the school system's psychometrist.

**Data Organization**

WISC-R subtest scores were grouped according to Bannatyne's suggestion, with one exception; Digit Span subtest scores were not included in the Sequential cate-
gory because the scores were not included in the study by Smith et al. (1977b) (the subtest was not administered), and this facet of the present study was a replication of that previous study. The mean of each child's Picture Completion, Block Design, and Object Assembly subtest scores was computed for the Spatial score. The mean of Comprehension, Similarities, and Vocabulary was computed for the Conceptual score. The recategorized Sequential score consisted of the mean of the subtest scaled scores for Arithmetic and Coding.

WISC-R subtest scaled scores for the same students were grouped according to Kaufman's recategorization. The mean of each child's Picture Completion, Picture Arrangement, Object Assembly, and Block Design scaled scores was computed for the Perceptual Organization score. The mean of the Information, Similarities, Vocabulary, and Comprehension scaled scores was computed for the Verbal Comprehension score. The recategorized Freedom from Distractibility score consisted of the mean of the Arithmetic, Digit Span, and Coding subtests.

Statistics

Because the study of Bannatyne's recategorization was a replication of the study by Smith et al. (1977b), the statistical procedures used in that study were repeated here. Specifically, they consisted of single classification repeated measures analysis of variance (Winer, 1962) and the Neuman-Keuls test. The .01 level of significance was used for all analyses. These procedures were used to test both Kaufman's and Bannatyne's recategorizations.

The third hypothesis, that of comparability between the two recategorizations, was assessed by determining the percent of agreement between students identified by each.
CHAPTER IV
Results

The null hypothesis, that there would be no difference between the means of the Spatial, Conceptual, and Sequential scores (Bannatyne's recategorization) was tested by a single classification, repeated measures analysis of variance (Winer, 1962). The null hypothesis was rejected, as there was a difference between the means of the subtests. The results are shown in Table 1.

Table 1
Analysis of Variance for the Bannatyne Recategorization

<table>
<thead>
<tr>
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<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
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</thead>
<tbody>
<tr>
<td>Between people</td>
<td>844.70</td>
<td>102</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within people</td>
<td>869.21</td>
<td>206</td>
<td></td>
<td></td>
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<tr>
<td>Subtest groups</td>
<td>150.64</td>
<td>2</td>
<td>75.32</td>
<td>21.38**</td>
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<tr>
<td>Residual</td>
<td>718.57</td>
<td>204</td>
<td>3.52</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1713.91</td>
<td>308</td>
<td>21.38**</td>
<td></td>
</tr>
</tbody>
</table>

Critical value--**F_{99}(2,204)=4.70

The null hypothesis, that there would be no differences between the means of the Perceptual Organization, Verbal Comprehension, and Freedom from Distractibility scores (Kaufman's recategorization) was also tested by the same method. Again, the null hypothesis was rejected; there was a difference between the means. See Table 2.

The data from the Bannatyne recategorization were then analyzed to determine if the differences between the categories was significant. The results, shown in Table 3, are noticeably different from the results of the study by Smith et al. (1977b). The pattern of categories in this
Table 2

Analysis of Variance for the Kaufman Recategorization

<table>
<thead>
<tr>
<th>Source</th>
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<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between people</td>
<td>796.34</td>
<td>102</td>
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<td></td>
</tr>
<tr>
<td>Within people</td>
<td>725.17</td>
<td>206</td>
<td></td>
<td></td>
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<tr>
<td>Subtest groups</td>
<td>201.72</td>
<td>2</td>
<td>100.86</td>
<td>39.31*</td>
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<tr>
<td>Residual</td>
<td>523.46</td>
<td>204</td>
<td>2.57</td>
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<tr>
<td>Total</td>
<td>1521.51</td>
<td>308</td>
<td></td>
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</tbody>
</table>

Critical value—*F,.99(2,204)=4.70

The present study was Conceptual > Spatial > Sequential; in contrast, Smith and his colleagues found Spatial > Conceptual > Sequential. The present study found significant differences using a Neuman-Keuls test between the Conceptual score (9.64) and the Sequential score (8.12), and between the Spatial score (9.21) and the Sequential score (8.12), but not between the Conceptual score (9.64) and the Spatial score (9.21) (see Table 3). Smith et al. found that the Spatial score was

Table 3

Neuman-Keuls Test for the Bannatyne Recategorization

<table>
<thead>
<tr>
<th>Category</th>
<th>Conceptual</th>
<th>Spatial</th>
<th>Sequential</th>
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<tr>
<td>Totals</td>
<td>993.39</td>
<td>984.32</td>
<td>836.50</td>
</tr>
<tr>
<td>Conceptual</td>
<td>993.39</td>
<td>9.09</td>
<td>156.89</td>
</tr>
<tr>
<td>Spatial</td>
<td>984.32</td>
<td></td>
<td>147.82</td>
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<tr>
<td>Sequential</td>
<td>836.50</td>
<td></td>
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</tr>
<tr>
<td>r</td>
<td>2</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

\[
F_{.99} (r,204) = 3.68, 4.18
\]

\[
\sqrt{\frac{MS_{Resid.}}{MS_{Resid.}}} = 70.07, 79.59
\]

N = 103

MS_{Resid.} = 3.52
significantly greater than the Conceptual, which, in turn was significantly greater than the Sequential score. Thus, the hypothesis tested in the present study, that WISC-R subtest scores of school-verified learning disabled children exhibit a statistically significant pattern of Spatial > Conceptual > Sequential was not supported.

The data for the Kaufman recategorization were then analyzed, using the Neuman-Keuls test. The Perceptual Organization score (9.65) was significantly greater than the Verbal Comprehension score (9.03), which in turn, significantly exceeded the Freedom from Distractibility score (7.71). The results, shown in Table 4, support the hypothesis that WISC-R subtest scores of school-verified learning disabled children exhibit a statistically significant pattern of Perceptual Organization > Verbal Comprehension > Freedom from Distractibility.

Table 4

<table>
<thead>
<tr>
<th>Category</th>
<th>Perceptual Organization</th>
<th>Verbal Comprehension</th>
<th>Freedom from Distractibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals</td>
<td>993.50</td>
<td>929.92</td>
<td>793.98</td>
</tr>
<tr>
<td>Perceptual Organization</td>
<td>993.50</td>
<td></td>
<td>199.52</td>
</tr>
<tr>
<td>Verbal Comprehension</td>
<td>929.92</td>
<td></td>
<td>135.94</td>
</tr>
<tr>
<td>Freedom from Distractibility</td>
<td>793.98</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$r^2$ = 0.98 (r,2(M) Resid. = 3.68 4.18

<table>
<thead>
<tr>
<th>$\sqrt{\frac{MS_{Resid.}}{N}}$</th>
<th>$\sqrt{MS_{Resid.}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.68</td>
</tr>
<tr>
<td></td>
<td>59.87</td>
</tr>
<tr>
<td></td>
<td>68.01</td>
</tr>
<tr>
<td></td>
<td>2.57</td>
</tr>
</tbody>
</table>

$N = 103$

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Data for the comparison of Bannatyne's and Kaufman's patterns were derived from the two patterns of recategorizations obtained by each student. For each student the highest, middle, and lowest scores were determined for each of the two recategorizations. This permitted tally entries to be entered in a double entry contingency table (Table 5). Within this table the agreements between the two recategorizations are found along the diagonal. For example, for the

<table>
<thead>
<tr>
<th>Kaufman</th>
<th>Perceptual Organization (High)</th>
<th>Verbal Comprehension (Middle)</th>
<th>Freedom from Distractibility (Low)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bannatyne Spatial (High)</td>
<td>75 (82%)</td>
<td>13 (14%)</td>
<td>3 (3%)</td>
</tr>
<tr>
<td>Conceptual (Middle)</td>
<td>13 (14%)</td>
<td>61 (68%)</td>
<td>17 (19%)</td>
</tr>
<tr>
<td>Sequential (Low)</td>
<td>3 (3%)</td>
<td>17 (19%)</td>
<td>71 (78%)</td>
</tr>
</tbody>
</table>

N = 91 due to ties which were dropped from the analysis.

91 students included in the analysis, 75 or 82% were found to score the highest in Kaufman's Perceptual Organization category and the highest in Bannatyne's Spatial category. There was sixty-one or 68% agreement between the two recategorizations in terms of the middle score, and 78% agreement in the lowest score. This resulted in an overall agreement of 76%. Stated another way, 76% of the time with this LD sample, the pattern of performance identified by Kaufman's
recategorization agreed with Bannatyne's pattern. This shows a moderate degree of agreement between the two recategorizations; thus the hypothesis of comparability between the two can be somewhat supported.
CHAPTER V
Discussion

The need for systematic and valid identification of the learning disabled led to the present study of recategorization of WISC-R subtest scores for this group of learners. In this study, Kaufman's suggested recategorization of WISC-R subtest scores was found to yield a statistically significant pattern of Perceptual Organization > Verbal Comprehension > Freedom from Distractibility. On the other hand, the results of an earlier study of Bannatyne's suggested recategorization by Smith et al. (1977b), which found a statistically significant pattern of Spatial Ability > Conceptual Ability > Sequential Ability, was not duplicated in the present study. Instead, the pattern was Conceptual Ability > Spatial Ability > Sequential Ability, with significant differences only between Conceptual Ability and Sequential Ability, and between Spatial Ability and Sequential Ability. The comparability of Bannatyne's and Kaufman's recategorizations was somewhat supported.

The present study raises several questions, the most obvious relating to why this study of Bannatyne's recategorization did not produce results similar to those in the study by Smith et al. (1977b). Perhaps the differences in the results are due to the differences between the two populations. However, the two studies differ noticeably only in the number of subjects (103 in the present study; 208 in the study by Smith et al.), the mean Full Scale IQs (93.06 in the present study; 87.12 in the study by Smith et al.), and the racial composition of the populations (100% Caucasian in the present study, 81% Caucasian in the earlier study). Otherwise, the two populations were quite similar.
More important questions relate to the usefulness of Bannatyne's and Kaufman's recategorizations to facilitate identification of, and educational planning for, learning disabled children. Because of the equivocal results—support for Kaufman's recategorization but not for Bannatyne's—this writer is reluctant to recommend widespread use of either recategorization for identifying the learning disabled without support of considerably more research of the recategorizations with other large populations of learning disabled students. Furthermore, research should be undertaken to determine the patterns of recategorized scores for so-called normal learners.

On the other hand, pattern analysis has the potential to aid in educational planning for the individual student—when psychologists and educators know more about the nature of the abilities and disabilities. The low scores of the present population for Kaufman's Freedom from Distractibility and Bannatyne's Sequential Ability, and the similar results reported by Smith et al. (1977b), Rugel (1974), and Kaufman (1979), suggest that whatever is tapped by the Arithmetic, Digit Span, and Coding subtests may be an area of weakness for many learning disabled students. However, writers and researchers differ in their views as to the nature of the disability. Cohen (1952) originally called the third factor Freedom from Distractibility, then changed and called it memory (Cohen, 1957), then returned to his original interpretation (Cohen, 1959). Osborne and Lindsey (1967) considered the third factor to be a measure of numerical ability; certainly there are reasons to consider the WISC-R third factor as being quantitative: Arithmetic is a numerical task, Digit Span requires the recall of
numbers, and Coding B involves associating numbers with abstract symbols.

Kaufman (1975) labels the third factor Freedom from Distractibility, citing both research and clinical lore, but says that its being a measure of numerical ability should not be discounted, and the nature of Factor C should be researched. Bannatyne (1971) wrote that the subtests in the Sequential category relate to short-term storage and retrieval of sequences of auditory and visual stimuli. Vance, Gaynor, and Coleman (1976) called it a weakness in "...attentional, enumerational, and concentrational skills" (p.481); Keogh and Hall (1974) considered it attentional; McManis et al. discussed short-term memory deficits and difficulties in using encoded information to guide sequential motor responses; Lutey (1977) focused on disruptive anxiety. From Guilford's structure of intellect model, Meeker (1967; 1975) says Arithmetic, Digit Span, and Coding B are the only subtests that are primarily measures of symbolic content.

This lack of agreement about the nature of the abilities assessed in Arithmetic, Digit Span, and Coding signals psychologists and educators to proceed cautiously in making educational plans for a child based on his or her performance on patterns of subtests alone. Interpretations cannot be made in isolation; one must find correlations in the child's behaviors in the "real world."

In summary, the recommendations leading from the present study point to the need for research in two areas. First, before characteristic patterns of recategorized WISC-R scores can be used for the identification of the learning disabled, further research is needed, using Bannatyne's and Kaufman's recategorizations with both
normal and learning disabled students. The results of this study alone do not support the widespread use of either recategorization.

Second, research must be done to discover the nature of the third WISC-R factor, Bannatyne's Sequential Ability and Kaufman's Freedom from Distractibility, which this study and others have demonstrated is a weakness for many learning disabled students. Answers to the questions about what abilities are tapped by the Arithmetic, Digit Span, and Coding subtests of the WISC-R would aid immeasurably in planning appropriate strategies for a large number of the learning disabled.
References


Smith, M.D., Coleman, J.M., Dokecki, P.R., & Davis, E.E. Recategorized WISC-R scores of learning disabled children. Exceptional Children, 1977, 43, 353-357.(a)


