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DISCRIMINANT AND PREDICTIVE VALIDITY OF THE WISC-III ACID PROFILE AMONG CHILDREN WITH LEARNING DISABILITIES

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Clinical interpretation of subtest score profiles on intelligence tests is a common practice. The ACID profile found on Wechsler's scales has been widely accepted as a clinical indicator which has both diagnostic and treatment implications. However, this practice has been based on clinical rather than empirical evidence. This study examines the discriminant and predictive validity of the Wechsler Intelligence Scale for Children-Third Edition (WISC-III) ACID profile among 612 students with learning disabilities. Analyses included diagnostic utility statistics (sensitivity, selectivity, etc.) and ROC methods as well as correlational and descriptive statistics. Results indicated that the ACID profile does not efficiently separate children with disabilities from those without disabilities, and further, there is no ACID cutting score which significantly exceeds chance discriminatory power. Likewise, the ACID profile did not robustly predict academic achievement among children with learning disabilities. © 1997 John Wiley & Sons, Inc.

The practice of interpreting patterns of test score elevations and depressions across an individual's performance on tests of personality and intelligence has gained considerable popularity among psychologists. Within the domain of cognitive assessment, the assumption that large discrepancies between Verbal and Performance IQs are indicative of some pathognomonic state has lead many psychologists to extend this belief to interpretations of individual subtest patterns or profiles.

Wechsler (1958) himself initiated the process of interpreting children's subtest profiles when he advanced the hypothesis that childhood schizophrenia could be diagnosed with the WISC by high scores on Picture Completion and Object Assembly and low scores on Picture Arrangement and Digit Symbol. Bannatyne (1968) continued the practice of profile analysis, suggesting that WISC subtest scores could be recategorized to identify children with learning disabilities. Based on factor analytic studies, Bannatyne suggested that rather than relying on the traditional WISC Verbal and Performance IQs, subtest scores could be redistributed into three "new" composite scores which could identify children with genetic dyslexia. Subsequently, Rugel (1974) reviewed 25 studies involving disabled children which reported WISC scores and found support for Bannatyne's classification system. This research lead to Bannatyne's later decision (1974) to add a fourth category. Researchers and practitioners extended Bannatyne's recategorization system to the WISC-R (Wechsler, 1974) following its release.

Kaufman's (1975) factor analysis of the WISC-R standardization sample produced a Freedom from Distractibility (FD) factor (Arithmetic, Coding, and Digit Span) which again sparked much excitement among psychologists who continued to hope for extended utility of the instrument. Originally identified by Cohen (1957) as measuring short-term and auditory memory, the FD factor has generated considerable disagreement among psychologists as to exactly what it measures. More importantly, while some support for the discriminative validity of the FD Index has been shown (Traver & Hallahan, 1974), most subsequent research has shown that the FD Index was unable to distinguish between learning disabled and nonhandicapped populations (Barkley, DuPaul, & McMurray, 1990; Gussin & Javorsky, 1995; Kavale & Forness, 1984; McDermott, Fantuzzo, & Glutting, 1990).

Perhaps in an attempt to enhance the differential predictive power of the FD factor, researchers added the Information subtest to the FD triad to create the ACID profile. Similar to research with the FD factor, investigators began to recognize the ACID profile to be common in learning disabled and reading-disabled children (Greenblatt, Mattis, & Trad, 1991; Petrauskas & Rourke, 1979; Reynolds & Kaufman, 1990), such that their WISC-R profiles were characterized by low scores on Arithmetic, Coding, Information and Digit Span. Similar evidence of the ACID profile was found in samples of adolescents with learning disabilities using the WAIS-R (Sandoval, Sassenrath, & Penaloza, 1988) and for children identified as having Attention Deficit Hyperactivity Disorder (ADHD; Dykman, Ackerman, & Oglesby, 1980). Unfortunately, ACID interpretations were limited by many of the same cautions that were made against FD interpretations, namely limited diagnostic validity.

Despite the widespread popularity of subtest or profile analysis with the Wechsler scales, most support for the practice is based on clinical impressions or personal testimonials, and there currently exists little empirical support for interpreting hypotheses derived from subtest profiles (McDermott, Fantuzzo, & Glutting, 1990; McDermott, Fantuzzo, Glutting, Watkins, & Baggaley, 1992; McDermott, Glutting, Jones, Watkins, & Kush, 1989; Watkins & Kush, 1994). Analyses of the WISC-R have shown these patterns to add little predictive power beyond Full Scale IQ (Hale & Raymond, 1981), offering only about an 8% increase in the prediction of academic achievement (Hale & Saxe, 1983). Perhaps the greatest limitation of profile analysis is that the patterns of Wechsler scores found in clinical samples have rarely been compared to the general population of children. This limitation makes it impossible to know whether the profiles "discovered" are truly uncommon and therefore provide educationally and clinically meaningful information or are common patterns with no discriminative or treatment utility.

With the development of the most recent revision of the Wechsler Scale for Children (WISC-III; Wechsler, 1991), diagnostic utility of the ACID profile has again been advanced (Groth–Marnat, 1997). Prifitera and Dersh (1993) compared percentages of children with the WISC-III ACID profiles from learning disabled and ADHD samples to the percentages in the standardization sample. Their results showed a greater incidence of ACID profiles in the clinical samples with approximately 5% of the LD and 12% of the ADHD children evidencing such a profile, while the ACID profile occurred in only 1% of the cases from the standardization sample. Based upon this data, Prifitera and Dersh (1993) concluded that ACID profiles "are useful for diagnostic purposes" since "the presence of a pattern or patterns would suggest strongly that the disorder is present" (p. 50–51). Ward et al. (1995) investigated the prevalence of the WISC-III ACID profile among a sample of 382 children with learning disabilities and found a prevalence rate of 4.7%. Finding similar WISC-III ACID pattern prevalence results for a sample of 165 children with learning disabilities, Daley and Nagle (1996) suggested that when practitioners encounter an ACID profile that they "investigate the possibility of a learning disability" (p. 330).

Although the ACID profile has been of limited diagnostic utility with previous versions of the WISC, recent investigations have suggested its applicability to the WISC-III. As noted by Prifitera and Dersh (1993), however, additional research is necessary to determine the prevalence and distinctiveness of the WISC-III ACID profile across groups of exceptional and nonexceptional students. Like its predecessors, the WISC-III is the most popular intellectual measure used by school psychologists to determine eligibility for special education services (Wilson & Reschly, 1996). Given the profound influence which these diagnostic decisions play in childrens' lives (Dahlstrom, 1993), it is important to fully delineate the discriminative and predictive power of any tool or diagnostic indicator used to classify or program for children. Consequently, the present study investigates the discriminant and predictive validity of the WISC-III ACID subtest profile among a large group of children previously diagnosed as having learning disabilities.

Method

Participants

Learning disabilities sample. All students who received comprehensive psychoeducational evaluations in three southwestern, suburban school districts during one school year were initially eligible. Participants were selected from special education records based upon two criteria: cognitive assessment including 11 subtests of the WISC-III and placement in a learning disability (LD) program.

Students' special education eligibility and placement was determined by multidisciplinary evaluation teams following assessment by a school psychologist. Teams followed state special education regulations which were similar to federal guidelines in that a learning disability was defined as a significant ability–achievement discrepancy.

These selection criteria identified 612 students who were enrolled in grades kindergarten through eleven. Median grade placement was fifth grade with 74% of the participants placed in grades kindergarten through six. Mean age was 10.6 years ($SD = 2.65$). Males comprised 72.5% and females 27.5% of the participants. Ethnic identity, as reported by parents on school records, was 65% White, 15% Native American, 12% Hispanic, and 8% African American.

Academic achievement levels in reading, math, and written expression for 94% of the participants were measured with the Woodcock Johnson Tests of Achievement-Revised (Woodcock & Mather, 1989). Academic achievement of the remaining students was assessed with six other achievement tests. Table 1 presents intellectual and academic achievement scores for participating students. Although lower than average, cognitive and academic achievement levels are consistent

Table 1
Intellectual and Academic Achievement Standard Scores of Students With Learning Disabilities

	All LD[a]	Reading disabled[b]
WISC-III FSIQ		
M	91.9	99.9
SD	12.2	8.5
WISC-III VIQ		
M	91.1	97.4
SD	11.8	9.2
WISC-III PIQ		
M	94.4	103.1
SD	14.1	10.3
Reading		
M	81.2	76.1
SD	13.3	9.6
Math		
M	85.2	96.9
SD	14.4	10.8
Written expression		
M	76.4	78.8
SD	11.2	10.5

Note. FISQ is Full Scale IQ, VIQ is Verbal IQ, and PIQ is Performance IQ.
[a]$n = 612$.
[b]$n = 129$.

with other compilations of data from children enrolled in special education programs (Kavale & Nye, 1985).

Specific reading disabilities subsample. A subsample of participants was identified to allow specialized analyses for students with unambiguous, specific reading disabilities. Selection criteria included: (a) identification as learning disabled in reading by a local multidisciplinary evaluation team; (b) WISC-III Full Scale IQ (FSIQ) greater than 84; (c) FSIQ-reading achievement discrepancy greater than 15 points; (d) FSIQ-math achievement discrepancy less than 14 points; and (e) not identified as learning disabled in math by a local multidisciplinary evaluation team. These criteria identified 129 students. Their mean cognitive and achievement scores are provided in Table 1. Whereas the learning disabilities group was marked by FSIQ-reading and FSIQ-math discrepancies of 10.7 and 6.7 points, respectively, the specific reading disabilities subsample had discrepancies in reading and math of 23.8 and 3.0 points, respectively. Distributions of age, grade placement, gender, and ethnic identity were very similar to the total sample of students with learning disabilities (M age $= 9.5$; Md grade $= 4$; 74% male; 72.9% White, 12.4% Native American, 11.6% Hispanic, 3.1% African American).

Instrument

The WISC-III is an individually administered test of intellectual ability which was normed on a representative sample of 2,200 children aged six years to sixteen years eleven months. It consists of 12 subtests ($M = 10$; $SD = 3$) which combine to yield Verbal (VIQ), Performance (PIQ) and Full Scale (FSIQ) IQs ($M = 100$; $SD = 15$). Full details of the instrument and its standardization are available in Wechsler (1991).

Procedure

As per Prifitera and Dersh (1993), scaled scores on the WISC-III Arithmetic, Coding, Information, and Digit Span subtests were identified as the four components of the ACID profile. Each participant's four WISC-III ACID subtests scores were compared to the remaining seven WISC-III subtests, excluding Mazes and Symbol Search. If all four ACID subtests were equal to or lower than the seven non-ACID subtests, then that participant was considered to have met the four-subtest ACID profile criteria. If three of the four ACID subtests were equal to or lower than the remaining WISC-III subtests, then that participant met the three-subtest ACID profile standard. This comparison of ACID to non-ACID subtests was continued until none of the ACID subtests was equal to or lower than the seven non-ACID subtests.

The percentage of participants who exhibited each ACID profile level was calculated in this manner and compared to those reported for the normative sample (Prifitera & Dersh, 1993) via diagnostic utility statistics at each of the four ACID profile levels.

Results

Discriminant

Table 2 presents the percentage of children in the WISC-III normative sample and the current sample of children with learning disabilities who were categorized at each ACID profile level. The current participants exhibited: (a) similar ACID profile levels as the sample of 99 children with learning disabilities analyzed by Prifitera and Dersh (1993); (b) a similar four-subtest ACID profile level as reported by Ward et al. (1995) for 382 children with learning disabilities; (c) greater frequency of ACID profile levels than reported for the 2,158 children with IQs above 70 in the WISC-III standardization sample; and (d) larger percentage of ACID profiles than reported by Daley and Nagle (1996) for 165 children with learning disabilities.

Table 2
Cumulative Percentage of the WISC-III Standardiztion Sample and the Children With Learning Disabilities Exhibiting Four ACID Profile Levels

	Sample			
Number of ACID subtests lowest	WISC-III normative[a]	All LD[b]	Reading Disabled[c]	LD[d]
4	1.1	4.1	3.9	1.0
3	5.7	16.2	18.6	12.0
2	19.5	35.6	40.3	—
1	46.9	61.9	76.7	—

[a]$n = 2{,}158$. From Prifitera and Dersh (1993).
[b]$n = 612$. From current sample.
[c]$n = 129$. From current sample.
[d]$n = 165$. From Daley and Nagle (1996).

Diagnostic utility statistics for the students with learning disabilities and with specific reading disabilities are presented in Table 3. These represent discriminative power for cumulative ACID profiles rather than for each separate subtest ACID variant. Thus, the sensitivity of having at *least* three low ACID subtests (partial profile) among all children with learning disabilities was .16, while the sensitivity of having all four low ACID subtests (full profile) was .04. Results for the total group of children with learning disabilities were very similar to those for students with specific reading disabilities.

Table 3
Diagnostic Efficiency of Cumulative ACID Profile Levels When Used to Predict Membership in Learning Disabled Groups Versus WISC-III Standardization Sample

	ACID Profile	
Diagnostic efficiency statistic	Full[c]	Partial[d]
All LD[a]		
Sensitivity (true positive)	.04	.16
Specificity (true negative)	.99	.94
False positive rate	.01	.06
False negative rate	.96	.84
Positive predictive power	.51	.45
Negative predictive power	.78	.80
Kappa	.04*	.14*
Reading Disabled[b]		
Sensitivity (true positive)	.04	.19
Specificity (true negative)	.99	.94
False positive rate	.01	.06
False negative rate	.96	.81
Positive predictive power	.17	.16
Negative predictive power	.95	.95
Kappa	.04*	.12*

[a]$n = 612$ in all learning disabled group.
[b]$n = 129$ in reading learning disabled group.
[c]All four subtests were lowest.
[d]Three or four subtests were lowest.
*$p < .01$.

Kappas of .04 to .14 reflect “slight” or “poor” diagnostic agreement between the ACID profile and the actual condition of the participants beyond that accounted for by chance alone (Kraemer, 1992). Many children were miscategorized when an ACID profile was used as a diagnostic marker for learning disabilities. For example, only 25 of the 612 children with learning disabilities (4%) were properly diagnosed by the four-subtest ACID profile, in contrast to 24 children without disabilities (1%) who were misclassified as learning disabled and 587 children with disabilities (96%) who were misclassified as nondisabled. The most rigorous ACID profile resulted in a positive predictive power of only .51. That is, only 51% of the children identified as learning disabled by the full ACID profile actually were diagnosed as learning disabled.

The results displayed in Table 3 reveal that neither the full nor partial ACID profiles efficiently separated children with learning disabilities from those without learning disabilities. However, the one-ACID or two-ACID subtest profiles might add discriminative power. Thus, the simultaneous performance of all ACID profile levels was tested with a Receiver Operating Characteristic (ROC) analysis. ROC analysis systematically sweeps across all possible sensitivity (true positive) and false positive values of a diagnostic test and graphically illustrates the test’s full range of diagnostic utility. Because it analyzes all possible cut scores, an ROC analysis is independent of decision threshold effects. By using both true and false positive values, it does not depend on the prevalence of disabilities in the population (Metz, 1978).

As illustrated in Figure 1, the ROC curve of a test with zero discriminating power is a diagonal line labeled the “random ROC.” The more accurately a test is able to discriminate between individuals with and without disabilities, the more its ROC curve will deviate toward the upper left corner of the graph. The ROC curve of Figure 1 is based on the current ACID profile data for the total group of students with learning disabilities. The ACID profile ROC curve for the students with specific reading disabilities is displayed in Figure 2.

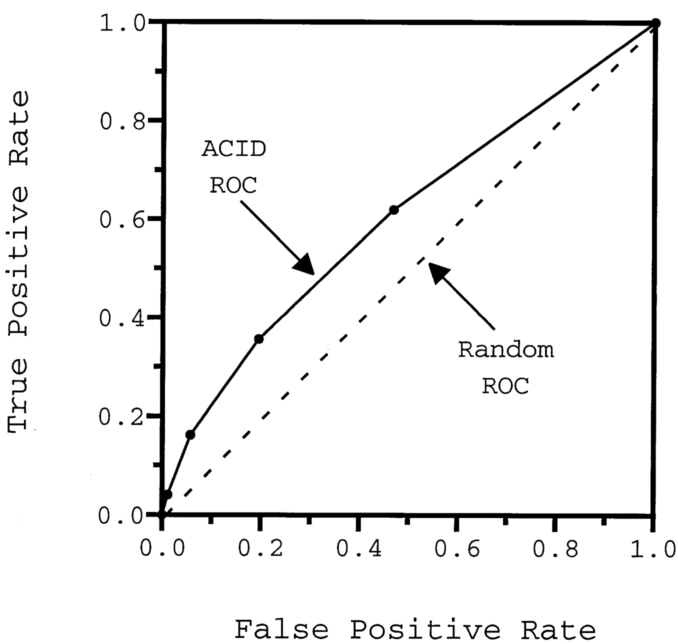

FIGURE 1. Receiver operating characteristic (ROC) of ACID profile levels used to distinguish between children with and without learning disabilities.

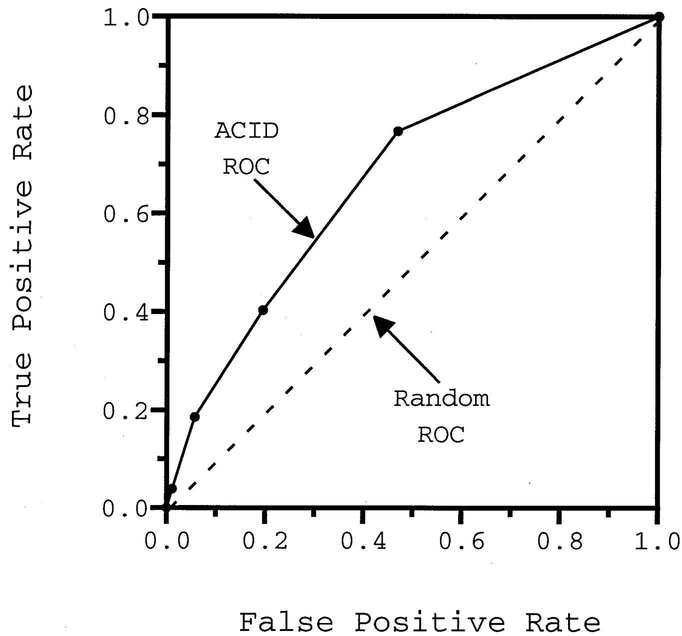

FIGURE 2. Receiver operating characteristic (ROC) of ACID profile levels used to distinguish between children with and without specific reading disabilities.

Visual inspection of these ROC curves reveals that they are not meaningfully elevated over the random ROC. This subjective visual analysis was quantified by calculating the area under the ROC curve (AUC; Hanley, 1989) to produce an overall index of the accuracy of ACID profiles in discriminating between children with and without learning disabilities. The AUC ranges from a lower limit of .50 for chance performance to 1.0 for perfect prediction. The AUC of Figure 1 summed to .60 (Hsiao, Bartko, & Potter, 1989). An AUC of .60 permits an interpretation that a randomly selected child with learning disabilities will have a more severe ACID profile than a randomly selected child without learning disabilities about 60% of the time (Ruttimann, 1994). The AUC of Figure 2 was .68. Swets (1988) provided interpretative guidelines: an AUC of .5 to .7 indicates low test accuracy, .7 to .9 moderate accuracy, and .9 to 1.0 high accuracy. Thus, both obtained AUC's reflect "low" test accuracy. This performance is disappointing when compared to ROC research in medical diagnostic imaging, which typically generates AUCs of .87 to .97 (Swets, 1988), and in diagnosis of ADHD with the Child Behavior Checklist, which produces AUCs of .84 to .90 (Chen, Faraone, Biederman, & Tsuang, 1994).

Predictive

Although a poor diagnostic indicator, the ACID profile may be related to performance on academic achievement measures and could, therefore, identify academic weaknesses. To test this hypothesis, participants' reading, math, and written expression scores were tested for differences across ACID profile levels via three separate one-way ANOVAs for each participant group. None of these comparisons were significant ($p = .05$). These academic patterns are presented in Table 4. Thus, reading, math, and written expression achievement levels were not associated with severity of the ACID profile.

Although academic achievement does not vary across ACID profile levels, ACID profiles might provide incremental predictive power beyond that provided by composite intelligence scores. This

Table 4
Mean Academic Achievement for ACID and Non-ACID Profiles by Disability Group

	4 Subtest profile	3 Subtest profile	2 Subtest profile	1 Subtest profile	Non-ACID profile
Reading					
All LD	82.6	84.4	81.1	79.7	81.1
Reading disabled	76.6	78.1	76.1	76.2	74.7
Math					
All LD	86.9	87.8	85.9	86.0	83.4
Reading disabled	100.6	98.3	96.9	97.6	94.2
Writing					
All LD	79.2	75.9	76.0	76.6	76.4
Reading disabled	82.2	75.7	77.8	79.1	80.6

Note. $n = 612$ in all learning disabled group and $n = 129$ in specific reading disabled group.

was tested with a series of multiple regression analyses where reading, math, and written expression achievement served as dependent variables and the WISC-III FSIQ was entered as the first predictor variable. The number of low ACID subtests (0−4) was then entered into each analysis to see if that variable improved prediction of academic achievement. Severity of the ACID profile was ineffective in providing incremental predictive validity beyond the FSIQ (increase in R^2 ranged from 0 to .028). Thus, at best, severity of the ACID profile contributed only 2.8% beyond the FSIQ when predicting academic achievement. Although limited by the homogeneity of the LD sample and its depressed academic scores, these results are congruent with those reported when predictive power of WISC-R subtest patterns was evaluated (Hale & Raymond, 1981; Hale & Saxe, 1983).

Discussion

Discriminative and predictive validity of the WISC-III ACID profile among children with learning disabilities was investigated in this study. As in previous research (Kaufman, 1994), ACID profiles were more prevalent among children with learning disabilities than among nondisabled children. However, when ACID profiles were used to classify students into disabled and nondisabled groups, they operated with considerable error. At best, only 51% of the children identified by a positive ACID profile were previously diagnosed as learning disabled. These data indicate that a randomly selected child with learning disabilities will have a more severe ACID profile than a randomly selected child without learning disabilities about 60% to 68% of the time. Although marginally better than chance, this degree of accuracy has been characterized as poor (Swets, 1988). Nor were ACID profiles a robust predictor of academic achievement among children with learning disabilities. Reading, math, and written expression scores of learning disabled children were not significantly different across ACID profile levels and severity of the ACID profile did not provide incremental predictive validity beyond the WISC-III FSIQ.

Prifitera and Dersh (1993) studied students with learning disabilities and ADHD and opined that “the presence of a[n ACID] pattern or patterns would suggest strongly that the disorder is present” (p. 51). They cautioned, however, that psychologists should consider the likelihood of false negatives and false positives when using WISC-III subtest profiles to render diagnostic judgments. The current study clearly confirms the veridicality of that warning: utilizing the ACID profile as a diagnostic indicator generated an excessive misclassification rate among these participants. This result is not surprising because any evaluation of a diagnostic test must consider all possible outcomes (i.e., true positive, true negative, false positive, and false negative). The test divides the normal population into true negative and false positive groups and the disabled population into true positive and false negative groups. These groups, in turn, allow calculation of positive (probability that a student has a learning disability given that he or she exhibited the ACID profile) and negative (probability that a student does not have a learning disability given that he or she did not exhibit the ACID profile) predictive power (Elwood, 1993). When positive predictive power for the current participants is considered (see Table 3), these results indicate that the WISC-III ACID profile has "little utility in differential diagnosis" (Ward et al., p. 275).

Peipert and Sweeney (1993) have noted that a test's diagnostic utility is often spuriously inflated due to defects in research design. Two types of design errors may be encountered: errors of spectrum and errors of bias. Spectrum errors deal with the spectrum, or range, or normal and abnormal cases used in the research. If a broad range of students with disabilities is not included, for example, the sensitivity may be erroneously elevated. This investigation included a homogeneous group of students with learning disabilities, so this threat to generalizability does not appear to be serious. If a broad range of students without disabilities, including students with disorders commonly confused with learning disabilities, are not included, then specificity estimates may be inflated. Since this investigation included only students with learning disabilities, it appears to be vulnerable to this threat. This conclusion was supported by results of a supplemental analysis which compared the 129 students with specific reading disabilities to 80 students with emotional disabilities from the same school districts. The AUC generated by this comparison was .54. Thus, there was considerable shrinkage of the AUC when a wide spectrum of controls (Peipert and Sweeney, 1993) was contrasted. Additionally, errors of bias can lead to both falsely elevated sensitivity and specificity. Errors of bias are created when the WISC-III is used to arrive at the diagnosis of learning disabilities. Errors of bias are present in the current investigation since the WISC-III was used to identify students as learning disabled, but it is impossible to identify the magnitude of this error nor the extent to which it inflated the results.

In a broader context, the current cautionary results are consonant with research on previous Wechsler scales which revealed that subtest profiles were not reliably associated with such important external variables as achievement and special education placement (Hale & Raymond, 1981; Hale & Saxe, 1983; Kramer, Henning–Stout, Ullman, & Schnellenberg, 1987; McDermott, Fantuzzo, Glutting, Watkins, & Baggaley, 1992; McDermott, Glutting, Jones, Watkins, & Kush, 1989; Watkins & Kush, 1994). A review of the subtest analysis research persuaded Kline, Snyder, and Castellanos (1996) that "we as a discipline have pursued scatter analysis . . . with little success. It is time to move on" (p. 11). McDermott, Fantuzzo, and Glutting (1990) reached similar conclusions regarding Wechsler subtest profile analysis and recommended that psychologists "just say no" (p. 299) to this practice. Recent empirical investigations have failed to provide support for several WISC-III subtest profiles (Daley & Nagle, 1996; Dumont & Willis, 1995; Gussin & Javorsky, 1995; Ward et al., 1995; Watkins, 1996; Watkins, Kush, & Glutting, to appear). This evidence, both historic and current, suggests that WISC-III subtest analysis should be abandoned.

References

Bannatyne, A. (1968). Diagnosing learning disabilities and writing remedial prescriptions. *Journal of Learning Disabilities, 1,* 242–249.

Bannatyne, A. (1974). Diagnosis: A note on recategorization of the WISC scaled scores. *Journal of Learning Disabilities, 7,* 272–273.

Barkley, R. A., DuPaul, G. J., McMurray, M. B. (1990). A comprehensive evaluation of attention deficit disorder with and without hyperactivity defined by research criteria. *Journal of Consulting and Clinical Psychology, 58,* 775–789.

Cohen, J. (1957). The factorial structure of the WISC at ages 7-6, 10-6, and 13-6. *Journal of Consulting Psychology, 23,* 285–299.

Chen, W. J., Faraone, S. V., Biederman, J., & Tsuang, M. T. (1994). Diagnostic accuracy of the Child Behavior Checklist Scales for Attention-Deficit Hyperactivity Disorder: A receiver-operating characteristic analysis. *Journal of Consulting and Clinical Psychology, 62,* 1017–1025.

Dahlstrom, W. G. (1993). Tests: Small samples, large consequences. *American Psychologist,* 48, 393–399.

Daley, C. E., & Nagle, R. J. (1996). Relevance of WISC-III indicators for assessment of learning disabilities. *Journal of Psychoeducational Assessment, 14,* 320–333.

Dumont, R., & Willis, J. O. (1995). Intrasubtest scatter on the WISC-III for various clinical samples vs. the standardization sample: An examination of WISC folklore. *Journal of Psychoeducational Assessment, 13,* 271–285.

Dykman, R. A., Ackerman, M. A., & Oglesby, B. A. (1980). Correlates of problem solving in hyperactive, learning disabled and control boys. *Journal of Learning Disabilities, 13,* 23–32.

Elwood, R. W. (1993). Psychological tests and clinical discriminations: Beginning to address the base rate problem. *Clinical Psychology Review, 13,* 409–419.

Greenblatt, E., Mattis, S., & Trad, P. V. (1991). The ACID pattern and the freedom from distractibility factor in a child psychiatric population. *Developmental Neuropsychology, 7,* 121–130.

Groth–Marnat, G. (1997). Handbook of psychological assessment (3rd ed.). New York: Wiley.

Gussin, B., & Javorsky, J. (1995). The utility of the WISC-III freedom from distractibility in the diagnosis of youth with attention deficit hyperactivity disorder in a psychiatric sample. *Diagnostique, 21,* 29–40.

Hale, R. L., & Raymond, M. R. (1981). Wechsler Intelligence Scale for Children-Revised (WISC-R) patterns of strengths and weaknesses as predictors of the intelligence–achievement relationship. *Diagnostique, 7,* 35–42.

Hale, R. L., & Saxe, J. E. (1983). Profile analysis of the Wechsler Intelligence Scale for Children-Revised. *Journal of Psychoeducational Assessment, 1,* 155–162.

Hanley, J. A. (1989). Receiver operating characteristic (ROC) methodology: The state of the art. *Critical Reviews in Diagnostic Imaging, 29,* 307–335.

Hsiao, J. K., Bartko, J. J., & Potter, W. Z. (1989). Diagnosing diagnoses. *Archives of General Psychiatry, 46,* 664–667.

Kaufman, A. S. (1975). Factor analysis of the WISC-R at eleven age levels between 6-1/2 and 16-1/2 years. *Journal of Consulting and Clinical Psychology, 43,* 135–147.

Kaufman, A. S. (1994). *Intelligent testing with the WISC-III.* New York: Wiley.

Kavale, K. A., & Forness, S. R. (1984). A meta-analysis of the validity of Wechsler scale profiles and recategorizations: Patterns or parodies? *Learning Disabilities Quarterly, 7,* 136–156.

Kavale, K. A., & Nye, C. (1985). Parameters of learning disabilities in achievement, linguistic, neuropsychological, and social/behavioral domains. *The Journal of Special Education, 19,* 443–458.

Kline, R. B., Snyder, J., & Castellanos, M. (1996). Lessons from the Kaufman Assessment Battery for Children (K-ABC): Toward a new cognitive assessment model. *Psychological Assessment, 8,* 7–17.

Kraemer, H. C. (1992). *Evaluating medical tests: Objective and quantitative guidelines.* Newbury Park, CA: Sage.

Kramer, J. J., Henning–Stout, M., Ullman, D. P., & Schnellenberg, R. P. (1987). The viability of scatter analysis on the WISC-R and the SBIS: Examining a vestige. *Journal of Psychoeducational Assessment, 5,* 37–48.

McDermott, P. A., Fantuzzo, J. W., & Glutting, J. J. (1990). Just say no to subtest analysis: A critique on Wechsler theory and practice. *Journal of Psychoeducational Assessment, 8,* 290–302.

McDermott, P. A., Fantuzzo, J. W., Glutting, J. J., Watkins, M. W., & Baggaley, A. R. (1992). Illusions of meaning in the ipsative assessment of children's ability. *Journal of Special Education, 25,* 504–526.

McDermott, P. A., Glutting, J. J., Jones, J. N., Watkins, M. W., & Kush, J. C. (1989). Identification and membership of core profile types in the WISC-R national standardization sample. *Psychological Assessment: A Journal of Consulting and Clinical Psychology, 1,* 292–299.

Metz, C. E. (1978). Basic principles of ROC analysis. *Seminars in Nuclear Medicine, 8,* 283–298.

Peipert, J. F., & Sweeney, P. J. (1993). Diagnostic testing in obstetrics and gynecology: A clinician's guide. *Obstetrics & Gynecology, 82,* 619–625.

Petrauskas, R. J., & Rourke, B. P. (1979). Identification of subtypes of retarded readers: A neuropsychological, multivariate approach. *Journal of Clinical Neuropsychology, 1,* 17–37.

Prifitera, A., & Dersh, J. (1993). Base rates of WISC-III diagnostic subtest patterns among normal, learning-disabled, and ADHD samples. *Journal of Psychoeducational Assessment,* WISC-III Monograph, 43–55.

Reynolds, C. R., & Kaufman, A. S. (1990). Assessment of children's intelligence with the Wechsler Intelligence Scale for Children-Revised. In C. R. Reynolds and R. W. Kamphaus (Eds.), *Handbook of psychological and educational assessment of children: Intelligence and achievement.* (pp. 127–165). New York: Guilford Press.

Rugel, R. P. (1974). WISC subtest scores of disabled readers: A review with respect to Bannatyne's recategorization. *Journal of Learning Disabilities, 7,* 57–64.

Ruttimann, U. E. (1994). Statistical approaches to development and validation of predictive instruments. *Critical Care Clinics, 10,* 19–35.

Sandoval, J., Sassenrath, J., & Penaloza, M. (1988). Similarity of WISC-R and WAIS-R scores at age 16. *Psychology in the Schools, 25,* 373–379.

Swets, J. A. (1988). Measuring the accuracy of diagnostic systems. *Science, 240,* 1285–1293.

Traver, M. A., & Hallahan, D. P. (1974). Attention deficit in children with learning disabilities: A review. *Journal of Learning Disabilities, 9,* 36–45.

Ward, S. B., Ward, T. J., Hatt, C. V., Young, D. L., & Mollner, N. R. (1995). The incidence and utility of the ACID, ACIDS, and SCAD profiles in a referred population. *Psychology in the Schools, 32,* 267–276.

Watkins, M. W. (1996). Diagnostic utility of the WISC-III developmental index as a predictor of learning disabilities. *Journal of Learning Disabilities, 29,* 305–312.

Watkins, M. W., & Kush, J. C. (1994). WISC-R subtest analysis: The right way, the wrong way, or no way? *School Psychology Review, 23,* 640–651.

Watkins, M. W., Kush, J. C., & Glutting, J. J. (to appear). Prevalence and diagnostic utility of the WISC-III SCAD profile among children with disabilities. *School Psychology Quarterly.*

Wechsler, D. (1958). *The measurement and appraisal of adult intelligence (4th ed.).* Baltimore, MD: Williams & Wilkins.

Wechsler, D. (1974). *Manual for the Wechsler Intelligence Scale for Children-Revised.* New York: Psychological Corporation.

Wechsler, D. (1991). *Manual for the Wechsler Intelligence Scale for Children-Third Edition.* San Antonio, TX: Psychological Corporation.

Wilson, M. S., & Reschly, D. J. (1996). Assessment in school psychology training and practice. *School Psychology Review, 25,* 9–23.

Woodcock, R. W., & Mather, N. (1989). WJ-R Tests of Achievement: Examiner's Manual. In R. W. Woodcock & M. B. Johnson, (Eds.), *Woodcock–Johnson Psycho-Educational Battery-Revised.* Allen, TX: DLM.