The WISC–III Freedom From Distractibility Factor: Its Utility in Identifying Children With Attention Deficit Hyperactivity Disorder

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Factor analytic studies of the Wechsler Intelligence Scale for Children—Revised (WISC–R; Wechsler, 1974) have consistently identified what is commonly known as the Freedom From Distractibility (FFD) factor, consisting of the Arithmetic, Digit Span, and Coding subtests (Kaufman, 1979). Support for the validity of this factor stems in part from studies that found significant correlations between the WISC–R FFD subtests and other established measures of attention, such as Continuous Performance Tests (Klee & Garfinkel, 1983) and teacher ratings (Reschly & Reschly, 1979). Additional support comes from investigations that detected significantly lower FFD scores among groups of children with attention deficit hyperactivity disorder (ADHD; American Psychiatric Association, 1987) in comparison with control children (Lufi, Cohen, & Parish-Plass, 1990).

On the basis of such group findings, many educators and practitioners have routinely assumed that when an individual child has a low FFD factor score, ADHD may be present. Conversely, the absence of a low FFD factor score has often been interpreted as evidence against an ADHD diagnosis. Although appealing at face value, using FFD factor scores in this manner may not be sound clinical practice, for the simple reason that what is characteristic of groups of children with ADHD may not hold true for individual children with this diagnosis (Greenblatt, Mattis, & Trad, 1991).

At a time when this matter remains far from resolved, the WISC–R no longer is in use, having been replaced by the Wechsler Intelligence Scale for Children—Third Edition (WISC–III; Wechsler, 1991). As was the case for the WISC–R, preliminary factor analytic studies of the WISC–III have suggested that it too includes an FFD component (Wechsler, 1991). Unlike its predecessor, however, the WISC–III FFD factor does not include the Coding subtest.
The degree to which this newer version of the FFD factor is a measure of distractibility or inattention has not yet been examined. No attempt has yet been made, either, to clarify whether or not the WISC–III FFD factor can be used to identify individual children suspected of having

ADHD. As a first step in addressing these matters, the current study examined the construct validity and diagnostic utility of the WISC–III FFD factor in a sample of children identified as having ADHD on the basis of parent and teacher reporting.

Method

Forty participants were drawn from a pool of consecutive referrals to an ADHD specialty clinic in a university medical center. Each child underwent a comprehensive multimethod intake assessment (Barkley, 1990), portions of which then served as the data for this investigation. Each assessment included, but was not limited to, the following procedures: the PC version of the National Institute of Mental Health Diagnostic Interview Schedule for Children (PC–DISC; Dulcan, 1992); the Child Behavior Checklist (CBCL; Achenbach, 1991); the ADHD Rating Scale (DuPaul, 1991); the Child Attention Problem (CAP) Rating Scale (Edelbrock, 1991); and the WISC–III (Wechsler, 1991). With the exception of the child testing, all phases of this evaluation were conducted by licensed, doctoral-level psychologists. Two master's-level assistants adminstered the WISC–III to all but 6 children, who had undergone this procedure elsewhere prior to their intake. Although not obtained directly, the WISC–III results reported for these children were included in the data.

All of the children met *Diagnostic and Statistical Manual of Mental Disorders—Third Edition—Revised (DSM–III–R*: American Psychiatric Association, 1987) criteria for an ADHD diagnosis on the basis of parent responses to the PC–DISC in combination with *T scores of* 67 or above on the Attention Problem subscale of parent-completed CBCLs. The final sample included 34 boys and 6 girls, ranging in age from 72 to 141 months (M = 101.8, SD = 20.3). All were enrolled in regular kindergarten through sixth-grade classrooms, with 19 receiving supplemental special education assistance. In addition to having ADHD, 11 children had been identified by their schools as having specific learning disabilities. Twenty met *DSM–III–R* criteria for a secondary Axis I diagnosis, including 10 with oppositional–defiant disorder, 1 with conduct disorder, 5 with overanxious disorder, 1 with adjustment disorder, and 3 with functional enuresis. The overall socioeconomic status (SES) of the sample was predominantly Caucasian and middle class.

In accordance with the WISC–III manual guidelines (Wechsler, 1991), Verbal Comprehension (VC), Perceptual Organization (PO), and FFD factor index scores were calculated for each child, as were Verbal, Performance, and Full Scale IQ estimates of global intellectual functioning. For the purposes of comparison with prior WISC–R research, the Arithmetic, Digit Span, and Coding subtest scaled scores were combined to yield an “old” FFD factor score. For similar reasons, these same three subtest scaled scores were added together with the Information subtest scaled score to create Arithmetic, Coding, Information, and Digit Span (ACID) profile scores.

Results and Discussion

A descriptive summary of the group-averaged IQ scores, factor index scores, and subtest scaled scores appears in Table 1. Paired samples *t*-test analyses revealed the FFD factor index score to be significantly lower than either the VC factor index score, $t(39) = 6.2$, $p < .001$, or the PO factor index score, $t(39) = 4.1$, $p < .001$. Similar analyses indicated that the Arithmetic and Digit Span subtests were significantly lower than Information, Vocabulary, and Comprehension, with Digit Span also being significantly lower than Similarities, Picture Completion, and Block

Design ($p < .01$). No other significant differences emerged for any other paired subtest comparisons.

Table 1
Means and Standard Deviations for IQ, Factor Index, and Subtest Scaled Scores

Scores	*M*	*SD*
IQ		
Verbal	101.9	15.8
Performance	102.9	12.0
Full Scale	102.4	13.3
Factor index		
Verbal Comprehension	103.9	15.1
Perceptual Organization	103.3	11.5
Freedom From Distractibility	96.0	13.9
Subtest scaled		
Information	10.4	3.4
Similarities	10.2	3.2
Arithmetic	9.3	3.2
Vocabulary	10.9	3.1
Comprehension	10.4	2.8
Digit Span	9.0	2.5
Picture Completion	10.7	2.9
Coding	10.0	3.6
Picture Arrangement	10.2	3.2
Block Design	10.6	2.7
Object Assembly	10.0	2.5

Note. $n = 40$.

The sums of the subtest scaled scores for the new FFD, the old FFD, and the ACID profile were entered into correlational analyses with the CBCL, the ADHD Rating Scale, and the CAP Rating Scale. A level of significance of $p < .01$ was used to adjust for multiple comparisons. None of the correlations involving the mothers' ratings met this level of significance. A somewhat different picture emerged for the teacher ratings, which are summarized in Table 2.

Table 2
Correlations Between Wechsler Intelligence Scale for Children—Third Edition (WISC–III) and Teacher Ratings

Measure	New FFD	Old FFD	ACID
ADHD Rating Scale			
Inattention	−.49*	−.25	−.33
Impulsivity	−.28	−.08	−.15
Total	−.42*	−.19	−.27
CAP Rating Scale[a]			
Inattention	−.52*	−.33	−.38
Overactivity	−.27	−.14	−.18
Total	−.49*	−.29	−.35
CBCL–TRF[b]			
Attention Problems	−.39	−.27	−.34
Aggressive Behavior	−.11	.10	−.03
Delinquent Behavior	−.40	−.28	−.38
Internalizing	−.11	−.06	−.10

Note. New FFD = Freedom From Distractibility based on WISC–III formula (Arithmetic + Digit Span); Old FFD = Freedom From Distractibility based on WISC–R formula (Arithmetic + Digit Span + Coding); ACID = Arithmetic + Coding + Information + Digit Span; ADHD = attention deficit hyperactivity disorder; CAP = Child Attention Problem; CBCL–TRF = Child Behavior Checklist—Teacher Report Form.
[a] $n = 38$. [b] $n = 39$.
* $p < .01$.

The data were also analyzed at an individual level. For each child, difference scores were calculated between the FFD factor index score and the index scores for either the VC or PO factors. These difference scores were then examined for statistical significance at the $p < .05$ level, first, according to the tables found in Appendix B of the WISC–III manual, and second, in the context of the Naglieri (1993) tables, which adjust for multiple comparisons and thereby reduce the likelihood of chance findings that can lead to high false-positive rates.

Appearing in Table 3 is a summary of the percentages of children showing significant VC − FFD or PO − FFD factor differences, derived from both the WISC–III and Naglieri tables. Regardless of which method was used, relatively higher percentages of children exhibited significant PO − FFD factor differences (18% to 30%) than VC − FFD factor differences (5% to 25%). Up to 52% displayed significant VC – FFD or PO − FFD differences according to the WISC–III tables, whereas only 23% showed these same differences when the more conservative Naglieri tables were used.

Table 3
Percentages of Children With Attention Deficit Hyperactivity Disorder Showing Significant Factor Index Score Differences

Method for determining significance	Factor index score differences (%)		
	VC − FFD/	PO − FFD	VC − FFD/ PO − FFD
WISC–III manual[a]	25	30	52
Naglieri (1993)[a]	5	18	23

Note. VC − FFD = difference between Verbal Comprehension and Freedom From Distractibility factor index scores; PO − FFD = difference between Perceptual Organization and Freedom From Distractibility factor index scores. WISC–III Manual = *Manual for the Wechsler Intelligence Scale for Children—Third Edition* (Wechsler, 1991).
[a] All differences assessed at $p < .05$.

Because a substantial percentage of children (48% to 77%) did not show any significant VC − FFD or PO − FFD factor score differences, further analyses were conducted to examine what variables might distinguish those who exhibited such differences from those who did not. In particular, chi-square and *t*-test analyses were performed with respect to gender, race, secondary Axis I diagnoses, learning disability status, receipt of special education services, age, SES, and CBCL, ADHD Rating Scale, CAP Rating Scale, and WISC–III IQ scores. All such comparisons were nonsignificant, suggesting that these variables had little bearing on whether children displayed significant VC − FFD or PO − FFD factor score differences.

As noted earlier, the ADHD sample was defined largely on the basis of parent input, leaving open the possibility that some children might not have been identified as having ADHD by their teachers. Given that the FFD factor was correlated only with the teacher ratings, this may have created a sampling bias, helping to explain why so few children displayed significant VC − FFD or PO − FFD differences. To address this possibility, the VC − FFD and PO − FFD differences were reexamined for 30 children for whom there was parent and teacher agreement on the ADHD diagnosis. For this subgrouping as well, only 27% to 53% showed significant VC − FFD or PO − FFD differnces, as determined by the Naglieri and WISC–III tables, respectively.
As noted earlier, the purpose of this investigation was to examine the construct validity and diagnostic utility of the WISC–III FFD factor. Given that the group-averaged results showed that the FFD factor was significantly lower than either the VC or PO factors and that its subtest components represented the two lowest subtests within the group-averaged WISC–III profile, there would appear to be support for its construct validity. Lending further support is that is showed especially strong correlations with teacher ratings of inattention, but not for their ratings of impulsivity and hyperactivity or other internalizing and externalizing problems. Because these same inattention ratings were not significantly correlated with either the WISC–R version of the FFD factor or the ACID profile, this new version of the FFD factor would appear to be a more appropriate measure of this construct.

Despite the promising nature of these findings, the WISC–III FFD factor did not fare well when examined at an individual level. Depending on which method of analysis was used, only 23% to 52% of the children showed significant VC − FFD or PO − FFD differences. Conversely, as many as 48% to 77% of these same children, all of whom met stringent criteria for an ADHD diagnosis, did not show any significant VC − FFD or PO − FFD factor score differences. Several factors may help to explain this unacceptably high false-negative rate. As has been discussed elsewhere (Wielkiewicz, 1990), the FFD factor may not be as pure a measure of inattention as some have contended. Given that it does not capture the impulsivity or hyperactivity features of ADHD, it therefore misses an essential portion of the symptomatology that goes into making an ADHD diagnosis. Moreover, because children with ADHD can perform well when engaged in closely monitored, one-to-one situations that are novel and interesting (Barkley, 1990)—conditions under which the WISC–III is administered—it remains entirely possible that a child with ADHD could do well on the FFD factor subtests.

Before concluding, two important limitations need to be addressed. First, this study did not include normal controls or other clinic-referred groups that would have allowed for an examination of the FFD's false-positive rate or its capacity for differential diagnosis. Second, this study used a relatively small sample, which precluded analyses of clinical subgroupings within the ADHD diagnosis.

Bearing such limitations in mind, this study provides preliminary support for the construct validity of the WISC–III FFD factor but casts serious doubt on its diagnostic utility. Thus rather than rely on FFD factor scores or other questionable child testing procedures (DuPaul, Anastopoulos, Shelton, Guevremont, & Metevia, 1992), clinicians and educators would be well advised to consider using structured interviews, child behavior rating scales, and direct observations in their evaluations of individual children suspected of having ADHD.

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