Intelligent Testing in the 21st Century

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When I wrote Intelligent Testing with the WISC-R (Kaufman, 1979), the field of intellectual assessment was different from today. At that time, the emphasis was on the test scores, not on the child. There were few IQ tests to choose from, there was little understanding of the importance of statistical significance as a guide to profile interpretation, and theories of intelligence and learning were totally ignored by those who developed and interpreted IQ tests. At the core of the “intelligent testing” approach was: (a) emphasizing the child, not the test scores; (b) understanding that the child's test behaviors are as important as the scores themselves and affect how the scores are interpreted; (c) recognizing that the psychologist's training, experience, and clinical skills are just as important as the tests themselves; and (d) realizing that applying theories of intelligence, learning, child development, and neuropsychology to the child's test profile is essential to truly understand children's strengths and weaknesses.

When Nadeen and I developed the Kaufman Assessment Battery for Children (K-ABC; Kaufman & Kaufman, 1983), one of our main goals was to put the “intelligent testing” model into action by developing a test directly from theory that was composed of interesting new tasks that would “capture the hearts” of children. And we wanted to focus on how children best process information (sequentially or simultaneously), not on the content of the items (verbal or nonverbal). Our guiding principle: If we understand how children learn best, we will understand how we can best teach them, especially children with learning disabilities and attention-deficit disorders. After the K-ABC was published, numerous other cognitive tests were published in the United States that were theory-based, such as the Woodcock-Johnson; The Wechsler-Binet “monopoly” on IQ testing was broken. The contemporary scene has definitely changed from a generation ago.

In the late 1970s, it was important to understand the child's profile of strong and weak areas by applying statistical significance, clinical observations, and theories to profile interpretation. In 2008, understanding is still important, but it is no longer enough. Now we must apply the results of an IQ test to the real world. We must translate the test results to educational action. We must make a difference in children's lives.

Two theories have proven to be especially influential in the development and interpretation of intelligence tests: (a) Luria's (1970) neuropsychological model, and (b) the Cattell-Horn-Carroll (CHC) theory of intelligence (McGrew, 2005). Luria developed his theory as a clinical neuropsychologist who was evaluating brain damage, usually in the left hemisphere. Luria identified three Blocks or Functional Units, each of which has a specific role to play in the intellectual process. Block 1, associated with the reticular activating system (subcortical), is responsible for arousal or attention. Block 2, associated with many parts of the cerebral cortex, is responsible for coding and storage of information (usually by sequential and simultaneous processes). And Block 3, associated with the anterior portion of the frontal lobes, is responsible

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for the highest level of thinking that the brain is capable of, namely planning and executive functioning. The three Blocks must work together in order for children and adults to demonstrate their intelligence, as illustrated by the arrows in Figure 1, which depicts Luria’s three Blocks.

Cattell and Horn developed a theory that focused on two main types of intelligence: Fluid Reasoning, often referred to as Gf, which measures a person’s ability to solve novel problems, the kind that are not taught in school; and Crystallized Knowledge (Gc), the person’s store of facts and ability to use language-aspects of intelligence that are a direct function of education and acculturation (Horn & Cattell, 1966). Over time, Cattell and Horn expanded their theory to include additional specific abilities, such as Visual Processing (Gv), Short-term Memory (Gsm), Long-term Storage and Retrieval (Gir), and Processing Speed (Gs). Cattell and Horn developed their theory based on research studies of child and adult development and on the statistical technique of factor analysis. Carroll (1993) developed a very similar theory based exclusively on factor analysis, and in the late 1990s, these theories were merged to form CHC theory (McGrew, 2005). The theory features eight broad abilities.

The second edition of the K-ABC (KABC-II; Kaufman & Kaufman, 2004) is built on both Luria’s theory and CHC theory, and its scales make it clear that the two theories are complementary: For example, Luria’s simultaneous processing is virtually identical to Gv from CHC theory, and Luria’s planning ability has much in common with Gf. (Figure 2)

The Wechsler Intelligence Scale for Children-fourth edition (WISC-IV; Wechsler, 2003) is not specifically built from either theory but can easily be interpreted from the perspective of both theories. Indeed, the specific abilities that form the foundation of CHC theory—and their corresponding processes from the vantage point of Luria’s theory—provide extremely useful information about the way children learn and solve problems. Understanding the child’s specific strengths and weaknesses tells us much about how the child learns and processes information. Based on that knowledge, psychologists can provide important suggestions to teachers concerning the best way to teach specific children. Psychologists who administer either the KABC-II or the WISC-IV will obtain a profile of scores for each child or adolescent that identifies specific areas of strengths or weaknesses. The strengths help teachers structure interventions by using instructional materials that capitalize on these strong areas (e.g., long-term retrieval or planning ability). A child with strong planning ability can be given remedial activities to improve academic achievement in reading or math that take advantage of the child’s excellent ability to reason. Similarly, a child’s weak areas enable a clinician to advise teachers on the best ways to accommodate for these weaknesses. Table 1 presents an example of these accommodations for children with weaknesses in short-term memory (based on information presented by Mather & Jaffe, 2002).

Table 1  Translating Intelligence Test Scores to Educational Intervention-Educational Accommodations for a Student's Weakness in Short-Term Memory

<table>
<thead>
<tr>
<th>Accommodation</th>
<th>Description</th>
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<tr>
<td>Keep oral directions short &amp; simple</td>
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<tr>
<td>Provide aids to help student compensate (e.g., write directions on the board or paper)</td>
<td></td>
</tr>
<tr>
<td>Keep lessons short</td>
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<tr>
<td>Allow for overlearning, review, &amp; repetition</td>
<td></td>
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<tr>
<td>Teach memory strategies (e.g., chunking, verbal rehearsal, visual imagery)</td>
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Source: Mather and Jaffe (2002).
Note: Short-term memory is measured reliably and validly by WISC-III Freedom from Distractibility Index, WISC-IV Working Memory Index (WMI), K-ABC Sequential Processing Scale, and KABC-II Sequential/Gsm.

References


**Appendix**

**CHC Theory Applied to KABC-II**

*Note. CHC=Cattell-Horn-Carroll*