



Essentials

of **WISC[®]-V** **Assessment**

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- Use of WISC-V in SLD Identification, neuropsychological assessment, and evaluation of English learners
- Comprehensive case reports, guidance on interpreting results using the Cross-Battery Assessment Software System (X-BASS), and advice on linking assessment results to interventions

Dawn P. Flanagan
Vincent C. Alfonso

Alan S. Kaufman & Nadeen L. Kaufman, *Series Editors*

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Essentials of WISC-V Assessment

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Dawn P. Flanagan
Vincent C. Alfonso

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Recently, each of us lost the second of the two most enduring mentors in our lives: our parents. We dedicate this book to them—Frank and Maryann Flanagan and Alfred and Mary Alfonso—for their unwavering belief in our capabilities, acceptance and support of our endeavors, and unconditional love.

We also dedicate this book to those who have mentored us in our professional lives, some who have come and gone but will never be forgotten, and some who remain in the wings, always willing to lend support and offer advice—we have benefited from and thank you for your wisdom and guidance.

And finally, we dedicate this book to all practitioners who use the WISC-V in a manner in which David Wechsler intended—that is, not only to understand the unique pattern of a child or adolescent's strengths and weaknesses, but to use that pattern to help him or her “act purposefully, think rationally and deal effectively with [his or her] environment (Wechsler, 1958, p. 7).”

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We also thank Emma Hettrich, Caitlyn Hynes, Jennifer Mascolo, Carly Meyer, Kathleen Palma, Jaime Seaburg, John Willis, and Noelle Winter for their reviews of several chapters several times! In addition, we appreciate the tenacious efforts of Ou Zhang and Andrea Olson from Pearson, who provided us with norms and critical values for the clinical composites included in Appendix B; Gail Cheramie, Jamie Chaffin, and Robert Lichtenstein, who provided illustrative case studies in Appendix C; and Marlene Sotelo-Dynega, who compiled the WISC-V task characteristics found in Appendix F.

Finally, we recognize the contributions of our longtime colleague and friend, Samuel Ortiz, who spent countless hours incorporating new WISC-V components into X-BASS based on the interpretive method we espoused in this volume; Susie Engi Raiford, our new colleague, who supported our work from the beginning, carefully edited multiple chapters, and wrote the Foreword to this volume; and Alan Kaufman, our longtime mentor who taught us to test intelligently and who wrote the Epilogue to this volume.

SERIES PREFACE

In the Essentials of Psychological Assessment series, we have attempted to provide the reader with books that will deliver key practical information in the most efficient and accessible style. The series features instruments in a variety of domains, such as cognition, personality, education, and neuropsychology. For the experienced clinician, books in the series offer a concise yet thorough way to master utilization of the continuously evolving supply of new and revised instruments as well as a convenient method for keeping up to date on the tried-and-true measures. The novice will find here a prioritized assembly of all the information and techniques that one must have at one's fingertips to begin the complicated process of individual psychological assessment and diagnosis.

Wherever feasible, visual shortcuts to highlight key points are utilized alongside systematic, step-by-step guidelines. Chapters are focused and succinct. Topics are targeted for an easy understanding of the essentials of administration, scoring, interpretation, and clinical application. Theory and research are continually woven into the fabric of each book but always to enhance clinical inference, never to sidetrack or overwhelm. We have long been advocates of what has been called “intelligent testing”: the notion that a profile of test scores is meaningless unless it is brought to life by the clinical observations and astute detective work of knowledgeable examiners. Test profiles must be used to make a difference in the child's or adult's life, or why bother to test? We want this series to help our readers become the best intelligent testers they can be.

In *Essentials of WISC-V Assessment*, Dawn Flanagan and Vincent Alfonso provide practitioners with a complete, step-by-step approach to administering, scoring, and interpreting the most widely used intelligence test in the world: the WISC-V. Each chapter is chock-full of practical tips that make assessment of cognitive functions with the WISC-V efficient and informative. In addition, interpretation of the WISC-V is linked to X-BASS and applied to a case study in a step-by-step approach, highlighting the WISC-V in the identification of specific learning disabilities. This volume also includes chapters on use and interpretation of the

WISC-V in neuropsychological evaluation, use of the WISC-V in the assessment of culturally and linguistically diverse individuals, and how to administer and score the WISC-V on Q-Interactive. All told, Flanagan and Alfonso deliver a one-two knockout punch in this latest essentials volume.

Alan S. Kaufman and Nadeen L. Kaufman, Series Editors
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FOREWORD

Susie Engi Raiford

In February 2015, the National Association of School Psychologists (NASP) held their first annual convention after the publication of the Wechsler Intelligence Scale for Children-Fifth Edition (WISC-V; Wechsler, 2014). The manuals and data were available, and many school districts had purchased the test. Drs. Dawn Flanagan and Vincent Alfonso were to give a talk about use of the WISC-V in the context of their cross-battery assessment (XBA) approach to interpretation.

I arrived late to a room with a capacity for 200 people. Every seat was full, and dozens of additional people stood in the back and sat crammed in the aisles on the floor. It was hot and crowded, but the room was buzzing with excitement and anticipation. Attendees delighted as Dawn and Vinny joked about the tight space and the fire code, but no attendees left and more hopefuls crowded around the door in the foyer. The school psychology field knew this was a big moment.

I sat quietly in the aisle, snapping pictures and awaiting their thoughts about use of the test that had been carefully and thoughtfully nurtured through a five-year revision process to publication. When you are involved in conceptualization and design of the WISC-V from beginning to end, you watch it take shape and pour your life into it on a daily basis. As its research director, you revise and write items, author the manuals, oversee data collection and scoring, ensure its technical integrity and quality, and help to launch and support it. The feeling is akin to bearing and raising a child, and NASP 2015 felt like the first day of kindergarten.

It was with good reason, then, that I was sitting on the edge of my metaphorical seat (since no real seats were available) awaiting their talk. XBA transcends individual instruments and focuses instead on comprehensively addressing referral questions (Flanagan, Ortiz, & Alfonso, 2013). However, XBA is highly relevant to the clinical utility of individual tests. The modern Wechsler scales are influenced by XBA and Dawn, Vinny, and colleagues' dual discrepancy/consistency pattern

of strengths and weaknesses (PSW) method for learning disability identification (Flanagan, Alfonso, Mascolo, & Sotelo-Dynega, 2012). Using dialectical reasoning processes, the Wechsler theoretical framework of intelligence simultaneously considers these important works alongside other structural models of intellect, clinical utility evidence (e.g., clinical sensitivity, predictive validity, neuroscience), functional models of cognition (e.g., neuropsychological processing theory), and specific ability models (e.g., working memory). The Wechsler theoretical framework informs development to ensure each revision of the WISC is innovative, contemporary, and draws on the best that these different lines of inquiry have to offer.

Dawn, Vinny, and colleagues' collective writings also resonate with the modern Wechsler theoretical framework. They have sought in their own conceptualization of cognitive assessment to link and reconcile the same approaches to their own. For example, they have linked Cattell-Horn-Carroll with the Lurian and neuropsychological approaches (Flanagan, Alfonso, Ortiz, & Dynda, 2010) and have incorporated George McCloskey's neuropsychologically oriented process approach to psychoeducational evaluations (McCloskey, Hartz, & Slonim, 2016) into their own interpretive systems (Flanagan & Kaufman, 2005, 2009). *Essentials of WISC-V Assessment* features interpretation from the general to the specific in the spirit of Alan Kaufman's intelligent testing, beginning with global score selection (e.g., FSIQ, GAI, or NVI) and interpretation at the index score level. Their approach acknowledges that assessment is part science and part art: potentially clinically meaningful findings are investigated further. McCloskey's process approach (see Chapter 6) provides optional analyses that permit the test user to examine weaknesses through drilling down to the subtest and item level to examine the multiple processes involved in carrying out any WISC-V task.

Dawn and Vinny have the breadth and depth of knowledge and practicality that comes from devouring every article about assessment and test technical manual that was available and mentoring trainees and practitioners for decades. As a result, their thinking is steeped in psychometric knowledge and clinical utility, and seeks what will be useful in practice and clear to clinicians. Their approaches to interpretation of test results endeavor to link science to practice in ways that are understandable and useful. They don't just achieve this goal, they knock the ball out of the park. Their model is beautiful in its simplicity and sophistication; a masterpiece of practicality built on a strong theoretical foundation and psychometric excellence. Practitioners who follow their approach to comprehensive assessment and interpretation find it accessible and effective.

Research- and theory-based approaches to cognitive test interpretation now dominate the cognitive assessment scene (Kamphaus, Winsor, Rowe, Kim, & 2012), and they are here to stay. A systematic approach based firmly

on research and theory helps us to make sense of the data we obtain so that we can explain assessment results to teachers and parents in a way that makes sense and that is defensible theoretically and empirically, and can help children to learn successfully. The sum total of human knowledge now doubles every 12 months and is projected soon to double every 12 hours (IBM, 2006). That knowledge is accessible to nearly everyone in the digital age, so teachers and parents expect answers that make sense and have scientific merit. Clinicians who approach test interpretation from sound underlying theoretical frameworks that stand up to psychometric investigations and are bolstered by neuroscience, such as the system presented in *Essentials of WISC-V Assessment*, are at a distinct advantage and are more likely to be able to help more children to learn effectively.

Remarkably, Dawn and Vinny don't rest on their laurels. They are keen to improve upon their methods. They seek criticism of their models and make refinements in response to new empirical findings. For example, *Essentials of WISC-IV Assessment* (Flanagan & Kaufman, 2005, 2009) recommended that if a 23-point discrepancy was present between the highest and lowest index scores, the FSIQ was to be considered invalid and should not be interpreted. *Essentials of WISC-V Assessment* marks a departure from this recommendation, in response to psychometric investigations demonstrating that such a discrepancy is quite common in both normative and clinical samples (Kaufman, Raiford, & Coalson, 2016; Orsini, 2014; Raiford & Coalson, 2014) and that cognitive ability composite scores show equal predictive validity in relation to achievement whether or not such a discrepancy is present between its component parts (Daniel, 2007, 2009). In response, *Essentials of WISC-V Assessment* features an updated interpretation approach to the WISC-V that relies on base rates to determine what is unusual, rather than using a cutoff of 23 points. Furthermore, the FSIQ is not considered invalid, but merely lacking sufficient detail to describe the child's abilities comprehensively.

Given their works' influence on the field in general and on the Wechsler theoretical framework in particular, it should come as no surprise that XBA, the dual-discrepancy PSW approach, and the modern WISC-V are highly compatible. The test was designed from the start to accommodate XBA and to complement cutting-edge achievement instruments such as the KTEA-3 (Kaufman & Kaufman, 2014) and the WIAT-III (Pearson, 2009) to optimize use within PSW approaches. When the WISC-V is administered with one of these measures, together they cover the major cognitive processes that have been shown to be important to learning and sensitive to learning problems and are necessary for PSW analyses (Breux & Lichtenberger, 2016).

I held my breath as their presentation began. It quickly became apparent to me that they had detected the careful planning that went into the WISC-V. They discussed slide after slide that showed which WISC-V subtests and index scores would be appropriate measures of the constructs research had shown important to reading, math, and written expression skills. Their verdict? The new WISC-V has great utility within XBA. I looked around me at these school psychologists hanging on their every word and was overwhelmed with a sense of gratitude because Dawn and Vinny are helping clinicians to use the WISC-V well and impacting thousands of children by helping them to learn effectively. I exhaled as I remembered what I remind myself of on a daily basis: The test isn't my kid, it's for the kids. That's why we do what we do.

Because of the WISC-V's compatibility with XBA, this book provides interpretive assistance through a link with the XBA using the Cross-Battery Assessment Software System (X-BASS; Ortiz, Flanagan, & Alfonso, 2017). Administration and scoring are reviewed in depth in Chapters 2 and 3, with the helpful "Essentials" features and callout boxes that highlight important points to remember and provide strategies to avoid common errors. New clinical composites, exclusive analyses with the actual WISC-V standardization data, and a fresh approach to interpretation arm the reader with invaluable insights in the use and interpretation of the contemporary WISC-V.

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Susie Engi Raiford
June 25, 2016

One

OVERVIEW OF THE WISC-V

W. Joel Schneider, Dawn P. Flanagan, and Vincent C. Alfonso

This book was written for assessment professionals who want to use the *Wechsler Intelligence Scale for Children-Fifth Edition* (WISC-V; Wechsler, 2014a) to help children and adolescents by understanding their cognitive strengths and weaknesses. Such a statement should be too obvious to mention, but it is not. Too often, in the public's eye, the purpose of intelligence tests is to assign labels to people, not to help them. Among some intellectuals, it is common to view intelligence tests as tools of oppression, designed to harm the least privileged and most vulnerable among us (Carroll, 1997).

Intelligence tests are—and have always been—powerful tools, and powerful tools can be used for good or for ill. People who are uneasy about the use of intelligence tests would likely be reassured if we clearly communicate to them what we actually do with intelligence tests: We use them as one tool among many to decide how best to help people. Professionals who use individually administered intelligence tests such as the WISC-V are not callous bureaucrats mechanically rendering judgments that decide the course of people's lives. Most of us sacrificed our twenties on the altar of graduate school. We did so gladly; becoming a member of the helping professions is a great honor. The thought of using intelligence tests to harm anyone, children in particular, is frightful.

Indeed, Alfred Binet and his colleagues developed modern intelligence tests because of their egalitarian ideals. They needed to find a fair and accurate method of identifying children and adolescents who needed additional help in school (Binet & Simon, 1916). This purpose continues to motivate most practitioners. Nevertheless, there is no denying that intelligence tests have been used to perpetrate injustice, particularly in their early history (Fancher, 1985). From the beginning, though, there were thoughtful and sophisticated theorists, practitioners,

and ordinary people who fought against these injustices (Lohman, 1997). Even the person who coined the term *intelligence quotient* or IQ, William Stern (1933), worked tirelessly to ensure that intelligence tests were used for preserving human dignity instead of degrading individuals:

Under all conditions, human beings are and remain the centers of their own psychological life and their own worth. In other words, they remain persons, even when they are studied and treated from an external perspective with respect to others' goals. . . . Working "on" a human being must always entail working "for" a human being. (Trans. Lamiell, 2003, pp. 54–55)

FROM PREDICTION TO PREVENTION

Although it is true that intelligence tests are potent long-term predictors of a wide array of important life outcomes such as academic achievement, high school graduation, and income (Deary, Whiteman, Starr, Whalley, & Fox, 2004; Gottfredson, 1997), they do not speak with the authority of the white-robed Fates. Hardship is not inevitable, and success is never assured. Many people possess personal virtues that more than offset whatever weaknesses an IQ test might reveal. Some have liabilities that negate any intellectual advantages they might otherwise have enjoyed. Nevertheless, the forecast is still useful. The weather report is not always correct, but it helps us plan for the day.

DON'T FORGET

Performance on intelligence tests is a potent predictor of important life outcomes such as academic achievement, high school graduation, and income.

It is not difficult to identify struggling children and adolescents after they have already fallen behind in school—no IQ test is needed for that. What is difficult is to prevent problems before they occur. Intelligence or cognitive ability tests can help professionals prioritize scarce resources so that students most likely to fall behind are better able to keep up and succeed. As Kaufman (1979, p. 14) famously quipped, "Intelligence test scores should result ultimately in killing the prediction." That is, the proper role of cognitive ability tests is to predict problems that never happen—because skilled professionals, dedicated teachers, and loving parents make plans and labor long hours to prevent them.

Unfortunately, not all problems, such as traumatic brain injuries, can be foreseen. Cognitive ability tests are essential tools for evaluating the nature and severity of these injuries. Sometimes they are used to monitor the rate of an individual's recovery.

Even perfectly predicted problems cannot always be completely prevented. Much can be done to improve the lives of individuals with intellectual disabilities and learning disabilities, even if we cannot yet eliminate their cognitive deficits entirely (Patterson, Rapsey, & Glue, 2013). Intelligence tests help us identify children with intellectual disabilities and learning disabilities very early so that interventions can have maximal effect.

FROM EXPLANATION TO ENDURING EMPATHY

Alongside *prediction*, the second major function of intelligence tests is *explanation*. That is, intelligence tests play a role in informing comprehensive case conceptualizations, and thus are particularly useful when preventative efforts are not working. Understanding why a student is performing poorly in school despite the best efforts of all involved is often the first step toward finding a better approach. More than that, understanding a student's learning difficulties often results in greater empathy for him or her.

Many students who are performing poorly in school often work hard to avoid academic activities they find to be difficult and unpleasant, sometimes by making things difficult and unpleasant for the adults who are trying to help them. When parents and teachers understand why the tasks are difficult, they are likely to be more patient. It is for this reason that one of the most important goals of writing effective psychoeducational reports is to help foster in the reader an enduring sense of empathy for the student.

DON'T FORGET

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GENERAL TRENDS IN INTELLIGENCE TEST INTERPRETATION

Kamphaus and colleagues (1997, 2012) have outlined a number of long-term trends in how the use of cognitive ability tests has changed. Over the past 11 decades, there has been a shift away from the interpretation of a global IQ score

toward the integrative understanding of how multiple factors of ability influence an individual's life. Multifactor tests are not exactly new, but recently developed tests are better grounded in strongly supported multifactor theories of cognitive abilities. Intuitively plausible, but haphazard and speculative interpretation systems are being replaced by systematic, empirically vetted, statistically sound approaches to interpretation. In this book, we strongly recommend one of these interpretive systems, the Cross-Battery Assessment approach (XBA; Flanagan, Ortiz, & Alfonso, 2013), which is closely aligned with the Cattell-Horn-Carroll Theory of Cognitive Abilities (CHC Theory; McGrew, 1997, 2005, 2009; Schneider & McGrew, 2012). (For a brief overview of CHC theory, including broad and narrow ability definitions, see Appendix A.)

DON'T FORGET

Appendix A includes a brief description of CHC theory, definitions of broad and narrow CHC abilities, and task examples of each narrow ability.

With each new edition, the WISC has become more amenable to the application of XBA and CHC Theory—changes we applaud! That said, progress is not always linear, and sometimes psychometric advances are dearly bought. There are subtests from previous editions of the WISC that sophisticated veteran users regret losing because they afforded opportunities to observe clinically rich samples of behavior. Thus, before talking about how the XBA approach can be applied to the WISC-V, we retrace our steps and perhaps recover some half-forgotten bits of wisdom from the creator of the original WISC, David Wechsler.

WHY THE HISTORY OF THE WECHSLER SCALES MATTERS

It is possible to administer the WISC-V competently without knowing much of anything about its history. Is it really necessary to become familiar with every twist and turn the evolution of the WISC has taken? Why not just study the most recent version?

The Wechsler scales are commercial products, and businesses respond to market demands. If practitioners are unaware of what made the original WISC great, they can clamor for changes that can inadvertently ruin the test. David Wechsler had a well-articulated vision for his instruments (Kaufman, 2009, pp. 29–54). Unless we come to know and appreciate what that vision was, the test's publishers will yield to pressures to give us more of what we think we want and less of what

David Wechsler thought we needed—to which, in our naiveté and ignorance, we will say, “Good riddance!”

For example, statistical training can sensitize us to the researcher’s need for tests that cleanly measure unidimensional traits. From this perspective, the Wechsler scales are hopelessly messy. Why not make the Wechsler scales more like the relatively tidy tests from the Woodcock-Johnson cognitive batteries (e.g., *Woodcock-Johnson IV Tests of Cognitive Abilities* [WJ IV COG]; Schrank, McGrew, & Mather, 2014)? Because doing so would likely compromise what is special about the Wechsler scales, that they allow us to observe complex problem-solving processes as they unfold in real time. Unless we know more about what Wechsler was aiming for, we might not appreciate the fact that the “messiness” is a feature, not a bug. Wechsler did not create his tests to serve the needs of research. As he continually reminded Alan Kaufman, his former mentee, “First and foremost, the Wechsler scales are clinical tests—not psychometric tests but clinical tests” (Kaufman, 1994, p. xv).

With each revision of the WISC, *Wechsler Adult Intelligence Scale* (WAIS), and *Wechsler Preschool and Primary Scale of Intelligence* (WPPSI), old subtests are retired and new ones are added. The new developers of the Wechsler scales appear to be clearing away measures with clinical clutter to make room for tests that are more psychometrically sleek. There is a clear upside to this trend in that specific abilities are more easily isolated, but the downside is also very real. We are not making a plea for sloppy psychometrics, but for a diversity of options, including complex measures that allow for clinically rich observations. It is inevitable that Wechsler’s tests should change with the times, but perhaps not too much, and not too soon. Likewise, it is probably better that the WJ tests stay true to Richard Woodcock’s original vision; it is better for the field as a whole that we can choose among tests with complementary virtues.

Exposure to the history of the Wechsler scales not only broadens our knowledge of the tests, but often, in subtle ways, deepens our commitment to our field. When we learn about what mattered to David Wechsler as he constructed his tests, often we come to care about those things, too, to a degree that we did not before. Even learning about the weaknesses of the original tests is helpful. The missteps along the way as the tests evolved serve as cautionary tales, ultimately affirming what is most important to us as professionals.

DON'T FORGET

Exposure to the history of the Wechsler scales not only broadens our knowledge of the tests, but deepens our commitment to our field.

Sometimes simply learning about the humanizing details of important figures' lives changes our outlook on their work. For example, Alan Kaufman's (2009) moving tribute to his mentor reveals Wechsler to have been a kind, thoughtful person with a sometimes imposingly strong sense of personal dignity. He was passionate about his work, if somewhat out of step with the times; as they worked to revise the WISC in the early 1970s, he bristled at Kaufman's suggestion that the Comprehension item "Why should women and children be saved first in a shipwreck?" might be perceived as sexist. Kaufman was taken aback at the inordinate intensity of Wechsler's instant response. Flushed with emotion, Wechsler objected, "Chivalry may be dying! Chivalry may be dead! But it will not die on the WISC!" Kaufman was afraid he had crossed a line he did not know was there.

In time, though, Wechsler relented. Chivalry did not die, but it *was* retired from the WISC-R. This anecdote says little about the theorist, but it says something about the complexity of the man. From where did this passion for a test item about protecting women and children in times of crisis come? Probably it is a manifestation of his upbringing, his experiences, and his personality as a whole. It is interesting to note, though, that his first book, *The Range of Human Capacities*, published in 1935, was dedicated to "the undying memory of Florence Felske," a commercial artist who in 1934, just three weeks after becoming David Wechsler's bride, was killed in a vehicular accident (Carson, 1999).

Alfred Binet and the "First" Intelligence Tests

The fastest way to disabuse oneself of the false notion that Binet invented the first intelligence test is to read the works of Binet himself. He and his colleagues presented several attempts by previous scholars to measure intelligence and to identify children with intellectual disabilities (Binet & Simon, 1916, pp. 15–36). Indeed, it is clear that Binet's methods include many borrowings from these earlier scholars, including exact copies of specific test items. Though intelligence tests have many historical anticipations, stretching back to antiquity (Deary, 2000, p. 34), the tests designed by Binet and colleagues were superior to earlier tests along many dimensions. For example:

1. The procedures were standardized.
2. Test items were vetted by thousands of clinicians and refined over multiple editions.
3. The test scores were given proper norms.
4. The test scores were validated by correlations with multiple criteria and life outcomes (e.g., health, wealth, degrees, and grades).

Before Binet, it was common for doctors and other specialists to interview individuals suspected of having low intelligence, asking them to perform various tasks and answer test-like questions. The diagnosis of the condition now termed *intellectual disability* was then made based mostly on the holistic judgment of the interviewer. Binet was never against holistic judgment, just holistic judgment that was uninformed by high-quality data. The value of high-quality norms was not self-evident at the time; Binet and Simon (1905, 1916) had to write several persuasive papers and book chapters about the dangers of nonstandard procedures and the benefits of carefully compiled national norms. Although the standardization procedures used to create the norms for the Binet-Simon would be inadequate by today's standards, they were reasonably good—and vastly superior to no norms at all.

From Mental Ages to Intelligence Quotients to Standard Scores

If Binet's tests were good, why did Wechsler need to improve upon them? There were certain psychometric problems with Binet's idea of closely aligning test scores with the age of the child. Almost anyone can immediately understand what it means when we say that an 8-year-old child obtained a test score equal to that of the average 6-year-old—the child is 2 years behind the average. What is not immediately apparent is how unusual this is. No matter—norms can be compiled. Maybe 5% of 8-year-olds perform at this level or lower. Unfortunately, being 2 years behind does not mean the same thing, nor is it equally common at every age. Separate tables would need to be compiled for each age group. At some point there are too many tables. Some simplification is necessary to make the meaning of scores consistent.

CAUTION

Being 2 years behind in ability does not mean the same thing at every age, nor is it equally common at every age.

William Stern (1914, p. 42) addressed this problem by inventing the *intelligence quotient* (IQ), which originally was a fractional quantity calculated like so:

$$IQ = \frac{\text{Mental Age}}{\text{Chronological Age}}$$

Later, this ratio was multiplied by 100 and rounded to the nearest integer. A child who is one year behind at age 4, two years behind at age 8, and three years at age 12

would at every age obtain an IQ of 75. A simple interpretation of this kind of IQ is that the mental capacities of a child with an IQ of 75 is advancing only three-quarters as fast as those of the average child. Stern knew that this was not strictly true, but believed that the IQ metric was a useful way of thinking about intellectual level.

The ratio of mental age to chronological age was more stable than Binet's measure of the difference of those values. However, the variability of intelligence quotients was not the same at all age levels (Wechsler, 1944, p. 25). For example, different percentages of children had IQs of 75 at different ages. Furthermore, the whole idea of *mental age* breaks down when intellectual growth tends to level off as adolescents approach adulthood. In late adulthood, intellectual decline is typical. An 80-year-old individual who scores as well as the average 40-year-old has performed better than the average 80-year-old. However, if the original IQ formula were mindlessly applied, this would result in a score of 50, which is absurd. Early test developers knew this and therefore applied other formulas for adults (e.g., comparing all adults to 14-year-olds), none of which were particularly satisfactory.

To address these problems, Wechsler reconceptualized *mental age* not as an age per se but as a score (i.e., the obtained score). From here, *chronological age* was also translated into a score (i.e., the expected mean score for a given age). Thus, the reconceptualized IQ:

$$IQ = 100 \times \frac{\text{Obtained Score}}{\text{Mean Score}}$$

Comparing obtained scores to mean scores like this is something of an improvement over the traditional IQ, especially for adults. Still, the problem with this method is that different score ratios would not always have the same meaning from test to test and from age to age. After a slight detour using a quirky type of deviation score, the Wechsler IQ scores eventually were expressed as *standard scores* instead of traditional intelligence quotients (Wechsler, 1958, pp. 241–242). Wechsler did not invent standard scores, but he adeptly adapted them for his tests and promoted their use.

Recall that Binet used the difference between mental age and chronological age. This tells us how far from the average a child performed. However, this distance does not have a consistent meaning. A *standard score*, in effect, puts this difference in the numerator and then gives it standardized meaning by dividing by the standard deviation, a measure of the typical distance a score is from the mean:

$$\frac{\text{Deviation from the Mean}}{\text{Typical Deviation from the Mean}}$$