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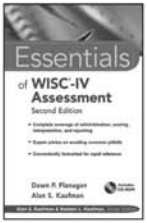

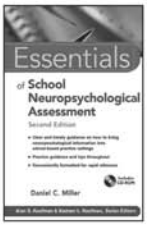

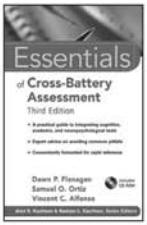

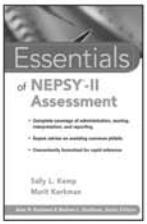

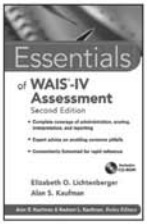

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To the special people in our lives who understood our need to work long hours for many, many months on end, including early mornings and late evenings, weekends, holidays, and "vacations" to complete this project and who helped us during this time in invaluable ways:

My daughter, Megan, and sister, Gale—DPF

My wife, Agnieszka—SOO

My father, Alfred—VCA

This book is also dedicated to everyone who uses it to learn, question, support, and challenge the ideas put forth; to those who improve their understanding of test findings after reading this book; to those who use the methods and procedures in this book to inform assessment for intervention; and to those who practice psychological testing more wisely as a result of reading this book—these are the people who will improve the practice of psychoeducational and neuropsychological evaluation and make a positive difference in the lives of students who struggle to learn.

CONTENTS

*The CD-ROM contains the full versions of all Appendices; three software programs that analyze data (Cross-Battery Assessment Data Management and Interpretive Assistant, Pattern of Strengths and Weaknesses Analyzer, and Culture-Language Interpretive Matrix); and a form (Evaluation and Consideration of Exclusionary Factors for SLD Identification).

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 must be at one's fingertips to begin the complicated process of individual psychological 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 "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.

The most exciting new feature of the third edition of *Essentials of Cross-Battery Assessment* is the improved psychometric foundation upon which the approach is based, as summarized in Chapter 1. For example, cross-battery composites are based on relevant formulas instead of rules of thumb. Also, the software programs on the CD are superb. Each of the three programs from the second edition was expanded and revised extensively. The Cross-Battery Assessment Data

Management and Interpretive Assistant (XBA DMIA v2.0) includes over 100 cognitive, achievement, and neuropsychological batteries and 750 subtests. It contains several new features that make program navigation simple and interpretation of test data within the context of CHC theory comprehensive and efficient.

The *SLD Assistant* program from the second edition was substantially revised and expanded and was renamed *Pattern of Strengths and Weaknesses Analyzer* (PSW-A v1.0). This program has a number of features that aid practitioners in identifying and diagnosing specific learning disabilities (SLD). Rather than relying on a traditional discrepancy analysis, the PSW-A provides a sophisticated synthesis of cognitive strengths, cognitive deficits, and academic deficits. The methods used to analyze an individual's pattern of strengths and weaknesses for the purpose of SLD identification are grounded in CHC ability–achievement relations research and are psychometrically sound. The program is easy to use and will prove to be a valuable resource to practitioners.

The third program on the CD is the *Culture-Language Interpretive Matrix* (C-LIM v2.0). This program evaluates data from standardized norm-referenced tests to determine the relative influence of English-language proficiency and level of acculturation on test performance. The C-LIM v2.0 provides a systematic method that facilitates evaluation of cultural and linguistic factors that may be present in the evaluation of individuals from diverse backgrounds. This version of the C-LIM has been revised to allow for the evaluation of culture and language on test performance separately, which expands the utility of the program to speech-language pathologists, for example. In addition, the program allows for an evaluation of culturally and linguistically diverse individuals who function in the high-average and gifted ranges of ability.

This third edition of *Essentials of Cross-Battery Assessment* includes numerous appendices that extend beyond CHC theory. For example, Appendix G provides neuropsychological domain classifications of all subtests from pertinent cognitive and neuropsychological batteries. And this edition features multiple case reports written by well-respected, expert clinicians from across the country that demonstrate the utility of the authors' interpretation methods and programs. Unlike previous editions of this book, the third edition thoroughly covers a much wider range of ability measures, including cognitive, academic, and neuropsychological batteries. Crafted by the international leaders in cross-battery assessment, this book is truly an "essential" resource for examiners from diverse clinical backgrounds.

Alan S. Kaufman, PhD, and Nadeen L. Kaufman, Ed.D., Series Editors
Yale Child Study Center, Yale University School of Medicine

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We also extend a heartfelt and sincere thank-you to our colleagues and friends in Arizona, Christina Hanel and Larry ("Laris") Pristo, for the countless hours they spent beta testing our software programs. They have jokingly made it clear that it is likely impossible for us to ever repay them for their efforts. We will certainly try! Finally, a number of our graduate students, especially Sabrina Ismailer, Alla Zhelinsky, and Sara Douglas, have devoted their time to this book, ordering and organizing tests, conducting literature reviews, devising "Test Yourself" questions, and ensuring that any and all information we needed was delivered accurately and

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Chapter One

OVERVIEW[1]

The Cross-Battery Assessment approach (hereafter referred to as the XBA approach) was introduced by Flanagan and her colleagues over 15 years ago (Flanagan & McGrew, 1997; Flanagan, McGrew, & Ortiz, 2000; Flanagan & Ortiz, 2001; McGrew & Flanagan, 1998). The XBA approach is based on the Cattell-Horn-Carroll (CHC) theory (and now also integrated with neuropsychological theory). It provides practitioners with the means to make systematic, reliable, and theory-based interpretations of any ability battery and to augment that battery with cognitive, achievement, and neuropsychological subtests from other batteries to gain a more psychometrically defensible and complete understanding of an individual's pattern of strengths and weaknesses (Flanagan, Ortiz, & Alfonso, 2007). Moving beyond the boundaries of a single cognitive, achievement, or neuropsychological battery by adopting the rigorous theoretical and psychometric XBA principles and procedures represents a significant improvement over single-battery assessment because it allows practitioners to focus on accurate and valid measures of the cognitive constructs and neurodevelopmental functions that are most

DON'T FORGET

The XBA approach provides practitioners with the means to make systematic, reliable, and theory-based interpretations of ability batteries and to augment them with cognitive, achievement, and neuropsychological tests from other batteries to gain a more defensible and complete understanding of an individual's pattern of strengths and weaknesses.

1. This chapter was adapted with permission from Oxford University Press. Flanagan, D. P., Alfonso, V. C., Ortiz, S. O., & Dynda, A. M. (in press). Cognitive assessment: Progress in psychometric theories of the structure of cognitive abilities, cognitive tests, and interpretive approaches to cognitive test performance. In D. Saklofske and V. Schwean (Eds.), *Oxford Handbook of Psychological Assessment of Children and Adolescents*. Copyright 2013. All Rights Reserved.

germane to referral concerns (e.g., Carroll, 1998; Decker, 2008; Kaufman, 2000; Wilson, 1992).

According to Carroll (1997), the CHC taxonomy of human cognitive abilities "appears to prescribe that individuals should be assessed with respect to the *total range* of abilities the theory specifies" (p. 129). However, because Carroll recognized that "any such prescription would of course create enormous problems," he indicated that "[r]esearch is needed to spell out how the assessor can select what abilities need to be tested in particular cases" (p. 129). Flanagan and colleagues' XBA approach clearly spells out how practitioners can conduct assessments that approximate the total range of cognitive and academic abilities and neuropsychological processes more adequately than what is possible with any collection of co-normed tests.

In a review of the XBA approach, Carroll (1998) stated that it "can be used to develop the most appropriate information about an individual in a given testing situation" (p. xi). In Kaufman's (2000) review of XBA, he said that the approach is based on sound assessment principles, adds theory to psychometrics, and improves the quality of the assessment and interpretation of cognitive abilities and processes. More recently, Decker (2008) stated that the XBA approach "may improve school psychology assessment practice and facilitate the integration of neuropsychological methodology in school-based assessments [because it] shift[s] assessment practice from IQ composites to neurodevelopmental functions" (p. 804). Finally, a recent listserv thread of the National Association of School Psychologists focused on the potential weaknesses of the XBA approach. In that thread, Kevin McGrew (2011, March 30) stated, "In the hands of 'intelligent' intelligence examiners the XBA system is safe and sound."

Noteworthy is the fact that assessment professionals "crossed" batteries long before Woodcock (1990) recognized the need and before Flanagan and her colleagues introduced the XBA approach. Neuropsychological assessment has crossed various standardized tests in an attempt to measure a broader range of brain functions than that offered by any single instrument (Hale & Fiorello, 2004; Hale, Wycoff, & Fiorello, 2011; Lezak, 1976, 1995; Lezak, Howieson, & Loring, 2004; see Wilson, 1992, for a review). Nevertheless, several problems with crossing batteries plagued assessment related fields for years. Most of these problems have been circumvented by Flanagan and colleagues' XBA approach (see Table 1.1 for examples). But unlike the XBA approach, other various so-called cross-battery and flexible battery techniques applied within the fields of school psychology and neuropsychology are not grounded in a systematic approach that is theoretically and psychometrically sound. Thus, as Wilson (1992) cogently pointed out, the field of neuropsychological assessment is in need of an approach

Table 1.1. Parallel Needs in Cognitive Assessment–Related Fields Addressed by the XBA Approach

Need Within Assessment-Related Fields	Need Addressed by XBA Approach
School psychology, clinical psychology, and neuropsychology have lagged in the development of conceptual models of the assessment of individuals. There is a need for the development of contemporary models.	The XBA approach provides a contemporary model for measurement and interpretation of cognitive and academic abilities and neuropsychological processes.
Likely there is a need for events external to a field of endeavor to give impetus to new developments and real advances in that field.	Carroll and Horn's *Fluid-Crystallized* theoretical models (and more recently Schneider and McGrew's [2012] CHC model) and research in cognitive psychology and neuropsychology provided the impetus for and continued refinements to the XBA approach and led to the development of better assessment instruments and interpretive procedures.
There is a need to utilize a conceptual framework to direct any approach to assessment. This would aid both in the selection of instruments and methods and in the interpretation of test findings.	The XBA approach is based mainly on CHC theory but also neuropsychological theory. Since the XBA approach links all the major cognitive and achievement batteries as well as selected neuropsychological instruments to CHC theory, in particular, selection of tests and interpretation of test findings are easier.
The conceptual framework or model underlying assessment must incorporate various aspects of neuropsychological and cognitive ability function that can be described in terms of constructs recognized in the neuropsychological and cognitive psychology literature.	The XBA approach incorporates various aspects of neuropsychological and cognitive ability functions that are described in terms of constructs recognized in the literature. In fact, a consistent set of terms and definitions within the CHC literature (e.g., Schneider & McGrew, 2012) and the neuropsychology literature (e.g., Miller, 2013) underlie the XBA approach.
There is a need to adopt a conceptual framework that allows for the measurement of the full range of behavioral functions subserved by the brain. In	XBA assessment allows for the measurement of a wide range of broad and narrow cognitive abilities specified in CHC theory and neuropsychological processes specified

(*continued*)

Table 1.1. (*Continued*)

Need Within Assessment-Related Fields	Need Addressed by XBA Approach
neuropsychological assessment, no inclusive set of measures is standardized on a single normative population.	by neuropsychology theory and research. Although an XBA norm group does not exist, the crossing of batteries and the interpretation of assessment results are based on sound psychometric principles and procedures.
Because there are no truly unidimensional measures in psychological assessment, there is a need to select subtests from standardized instruments that appear to reflect the neurocognitive function of interest. In neuropsychological assessment, the aim therefore is to select those measures that, on the basis of careful task analysis, appear mainly to tap a given construct.	The XBA approach is defined in part by a CHC classification system. Most subtests from the major cognitive and achievement batteries as well as selected neuropsychological instruments were classified empirically as measures of broad and narrow CHC constructs (either via CHC within- or cross-battery factor analysis or expert consensus or both). In addition, the subtests of cognitive and neuropsychological batteries were classified according to several neuropsychological domains (e.g., attention, visual-spatial, auditory-verbal, speed and efficiency, executive). Use of evidence-based classifications allows practitioners to be reasonably confident that a given test taps a given construct.
An eclectic approach is needed in the selection of measures, preferably subtests rather than the omnibus IQs, in order to gain more specificity in the delineation of patterns of function and dysfunction.	The XBA approach ensures that two or more relatively pure, but qualitatively different indicators of each *broad* cognitive ability are represented in a complete assessment. Two or more qualitatively similar indicators are necessary to make inferences about specific or *narrow* CHC abilities. This process is eclectic in its selection of measures.
There is a need to solve potential problems that can arise from crossing normative groups as well as sets of measures that vary in reliability.	In the XBA approach, baseline data in cognitive functioning typically can be achieved across seven to nine CHC broad abilities through the use of only two well-standardized batteries, which minimizes the effects of error due to norming differences. Also, since interpretation of both broad and narrow CHC abilities is made at the cluster (rather than subtest)

Table 1.1. (*Continued*)

Need Within Assessment-Related Fields	Need Addressed by XBA Approach
	level, issues related to low reliability are less problematic in this approach. Finally, because cross-battery composites are generated using median reliabilities and intercorrelations, the data yielded by this approach are psychometrically sound.

Source: Information obtained, in part, from Wilson (1992).

to guide practitioners through the selection of measures that would result in more specific and delineated patterns of function and dysfunction—an approach that provides more clinically useful information than one that is "wedded to the utilization of subscale scores and IQs" (p. 382).

"Indeed, all fields involved in the assessment of cognitive and neuropsychological functioning have some need for an approach that would aid practitioners in their attempt to tap all of the major cognitive areas, with emphasis on those most suspect on the basis of history, observation, [current hypotheses] and on-going test findings" (Wilson, 1992, p. 382; see also Flanagan, Alfonso, Ortiz, & Dynda, in press; Miller, in press). Ever since publication of the first edition of *Essentials of Cross-Battery Assessment* (Flanagan & Ortiz, 2001), the XBA approach has met this need and it now provides practitioners with a framework that is based on more psychometrically and theoretically rigorous procedures than ever before. For those new to the approach, the definition of and rationale for XBA is presented next followed by a description of the XBA method. Figure 1.1 provides an overview of the information presented in this chapter.

DEFINITION

The XBA approach is a method of assessing cognitive and academic abilities and neuropsychological processes that is grounded in CHC theory and research and neuropsychological theory and research (e.g., Miller, 2007, 2010, 2013). It allows practitioners to measure a wider range (or a more in-depth but selective range) of ability and processing constructs than that represented by any given stand-alone assessment battery, in a reliable and valid manner. The XBA

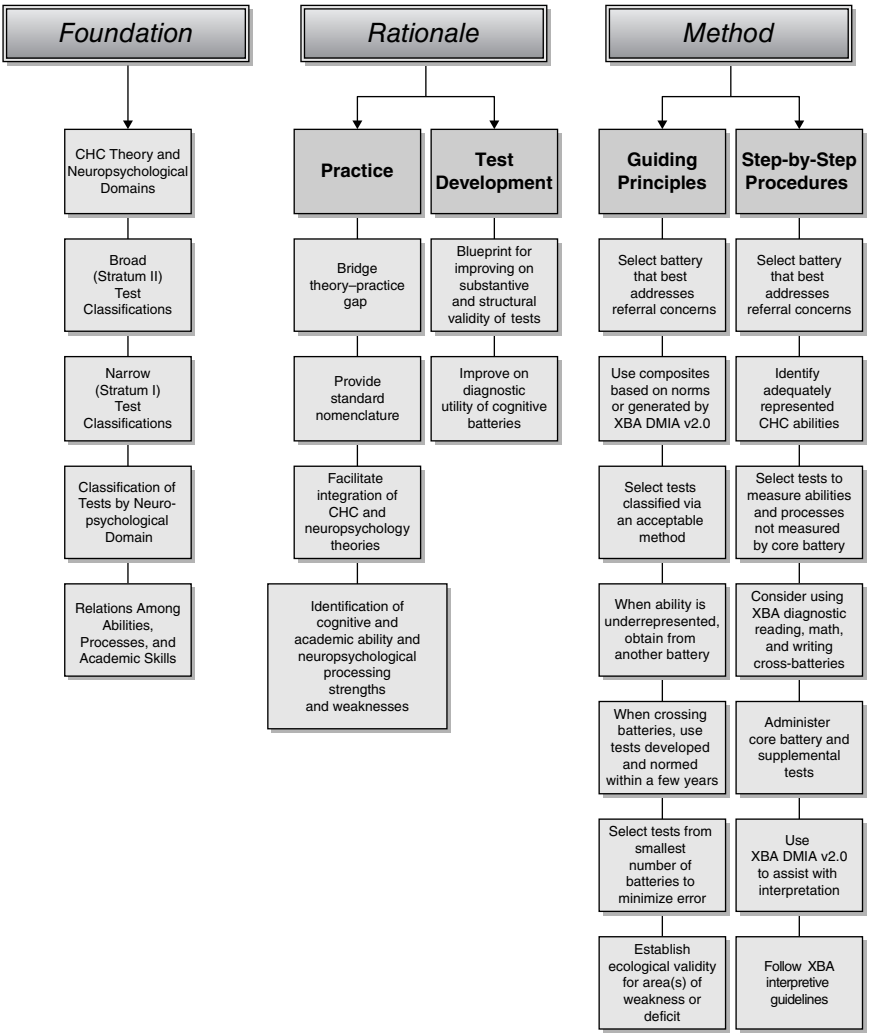

Figure 1.1. Overview of the XBA Approach

Note: CHC = Cattell-Horn-Carroll

XBA DMIA = Cross-Battery Data Management and Interpretive Assistant v2.0. This program automates the XBA approach and is found on the CD accompanying this book.

approach is based on four foundational sources of information that together provide the knowledge base necessary to organize a theory-driven, comprehensive assessment of cognitive, academic, and neuropsychological constructs.

DON'T FORGET

The XBA approach allows practitioners to reliably measure a wider range (or a more in-depth but selective range) of abilities than that represented by any single assessment battery.

FOUNDATION OF THE XBA APPROACH

The foundation of the XBA approach rests, in part, on CHC theory and the broad and narrow CHC ability classifications of all subtests that comprise current cognitive, achievement, and selected neuropsychological batteries (i.e., tests published after 2000). CHC theory is discussed first, followed by a summary of the broad and narrow CHC ability classifications of tests. The fourth foundational source of information underlying the XBA approach—relations among cognitive abilities, neuropsychological processes, and academic skills—is discussed in Chapter 2.

CHC THEORY

Psychometric intelligence theories have converged in recent years on a more complete or expanded multiple intelligences taxonomy, reflecting syntheses of factor analytic research conducted over the past 60 to 70 years. The most recent representation of this taxonomy is the CHC structure of cognitive abilities. CHC theory is an integration of Cattell and Horn's *Gf-Gc* theory and Carroll's three-stratum theory of the structure of cognitive abilities.

Original *Gf-Gc* Theory and the Cattell-Horn Expanded *Gf-Gc* Theory: First Precursors to CHC Theory

The original conceptualization of intelligence developed by Cattell in the early 1940s was a dichotomous view of cognitive ability and was referred to as fluid-crystallized theory or *Gf-Gc* theory. Cattell based his theory on his own factor-analytic work as well as on that of Thurstone, conducted in the 1930s. Cattell believed that fluid intelligence (*Gf*) included inductive and deductive reasoning abilities that were influenced by biological and neurological factors as well as incidental learning through interaction with the environment. He postulated further that crystallized intelligence (*Gc*) consisted primarily of acquired

knowledge abilities that reflected, to a large extent, the influences of acculturation (Cattell, 1957, 1971).

In 1965, Cattell's student, John Horn, reanalyzed Cattell's data and expanded the dichotomous *Gf-Gc* model to include four additional abilities, namely visual perception or processing (*Gv*), short-term acquisition and retrieval (SAR; now coded *Gsm*), long-term storage and retrieval (or tertiary storage and retrieval [TSR]; now coded *Glr*), and speed of processing (*Gs*). Later, Horn also added auditory processing ability (*Ga*) to the theoretical model and refined the definitions of *Gv*, *Gs*, and *Glr* (Horn, 1967; Horn & Stankov, 1982). By the early 1990s, Horn had added a factor representing an individual's quickness in reacting (reaction time) and making decisions (decision speed). The decision speed factor was labeled *Gt* (Horn, 1991). Finally, factors for quantitative ability (*Gq*) and broad reading/writing ability (*Grw*) were added to the model, based on the research of Horn (e.g., 1991) and Woodcock (1994), respectively. As a result of the work of Horn and his colleagues, *Gf-Gc* theory expanded to a 10-factor model (see Figure 1.2) that became known as the Cattell-Horn *Gf-Gc* theory, or sometimes as contemporary or *modern* Gf-Gc *theory* (Horn, 1991; Horn & Blankson, 2005; Horn & Noll, 1997).

Carroll's Three-Stratum Theory: Second Precursor to CHC Theory

In his seminal review of the world's literature on cognitive abilities, Carroll (1993) proposed that the structure of cognitive abilities could be understood best via three strata that differ in breadth and generality (see Figure 1.3). The broadest and most general level of ability is represented by stratum III. According to Carroll, stratum III represents a general factor consistent with Spearman's (1927) concept of *g* and subsumes both broad (stratum II) and narrow (stratum I) abilities. The various broad (stratum II) abilities are denoted with an uppercase *G* followed by a lowercase letter or letters, much as they had been written by Cattell and Horn (e.g., *Gf* and *Gc*). The eight broad abilities included in Carroll's theory subsume approximately 70 narrow (stratum I) abilities (Carroll, 1993; see also Carroll, 1997).

Comparison of the Cattell-Horn and Carroll Theories

Figure 1.4 provides a comparison of the Cattell-Horn *Gf-Gc* theory and Carroll's three-stratum theory (with only broad abilities shown). These theories are presented together in order to highlight the most salient similarities and differences between them. It is readily evident that the theories have much in common;

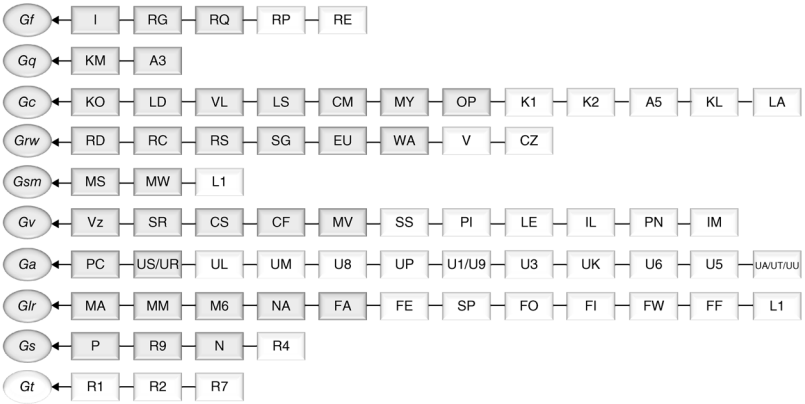

Figure 1.2. Cattell-Horn-Carroll Theory of Cognitive Abilities That Guided Intelligence Test Construction in the First Decade of the New Millennium

Note: This figure is based on information presented in McGrew (1997) and in Flanagan et al. (2000). Ovals represent broad abilities and rectangles represent narrow abilities. Overall *g*, general ability, is omitted from this figure intentionally, due to space limitations. Darker rectangles represent those narrow abilities that are most consistently represented on tests of cognitive and academic abilities. See Rapid Reference 1.1 (on page 17) for the definitions of the broad abilities that correspond to the codes in the ovals in this figure. See Appendix A for the definitions and examples of the narrow abilities that correspond to the codes in the rectangles.

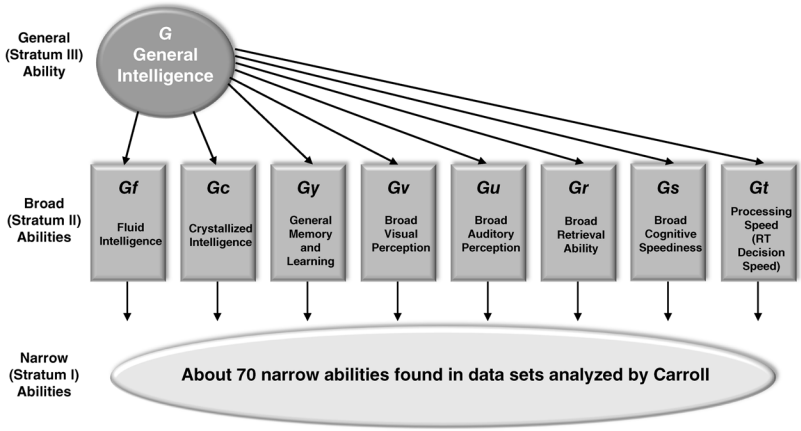

Figure 1.3. Carroll's (1993) Three-Stratum Theory of Cognitive Abilities

Note: Figure adapted with permission from D. P. Flanagan, K. S. McGrew, and S. O. Ortiz. Copyright 2000. *The Wechsler Intelligence Scales and Gf-Gc theory: A contemporary approach to interpretation.*

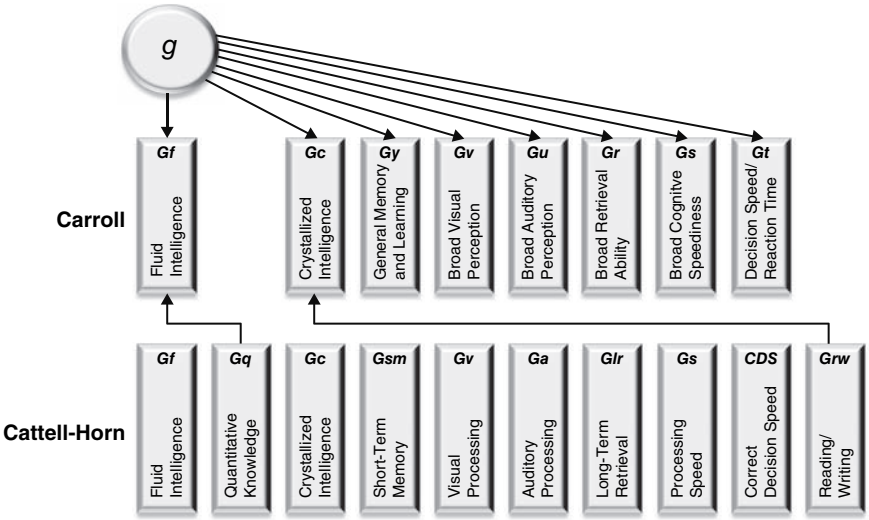

Figure 1.4. A Comparison of Cattell-Horn *Gf-Gc* Theory and Carroll's Three-Stratum Theory

Note: Figure adapted with permission from D. P. Flanagan, K. S. McGrew, and S. O. Ortiz. Copyright 2000. *The Wechsler Intelligence Scales and Gf-Gc theory: A contemporary approach to interpretation.*

each posits multiple broad (stratum II) abilities that, for the most part, have similar or identical names and abbreviations. But at least four major structural differences between the two models deserve mention.

1. Carroll's theory includes a general ability factor (stratum III) whereas the Cattell-Horn theory does not, as Horn and Carroll differed in their beliefs about the existence of this elusive construct (see Schneider & McGrew, 2012, for a more detailed discussion regarding *g* in this context).
2. The Cattell-Horn theory includes quantitative reasoning as a distinct broad ability (i.e., *Gq*) whereas Carroll's theory includes quantitative reasoning as a narrow ability subsumed by *Gf.*
3. The Cattell-Horn theory includes a distinct broad reading and writing (*Grw*) factor. Carroll's theory includes reading and writing as narrow abilities subsumed by *Gc.*
4. Carroll's theory includes short-term memory with other memory abilities, such as associative memory, meaningful memory, and free-recall memory,

under *Gy* whereas the Cattell-Horn theory separates short-term memory (*Gsm*) from associative memory, meaningful memory, and free-recall memory, because the latter abilities are purported to measure long-term retrieval (*Glr* in Figure 1.2). Notwithstanding these differences, Carroll (1993) concluded that the Cattell-Horn *Gf-Gc* theory represented the most comprehensive and reasonable approach to understanding the structure of cognitive abilities at that time.

Decade of CHC Theory (2001–2011)

In the late 1990s, McGrew (1997) attempted to resolve some of the differences between the Cattell-Horn and Carroll models. On the basis of his research, McGrew proposed an "integrated" *Gf-Gc* theory, and he and his colleagues used this model as a framework for interpreting the Wechsler Scales (Flanagan et al., 2000). This integrated theory became known as the CHC theory of cognitive abilities (using the initials of the authors in order of contribution, Cattel, Horn, then Carroll) shortly thereafter (see McGrew, 2005). The Woodcock-Johnson III Normative Update Tests of Cognitive Abilities (WJ III NU COG; Woodcock, McGrew, & Mather, 2001, 2007) was the first cognitive battery to be based on this theory. The components of CHC theory are depicted in Figure 1.2. This figure shows that CHC theory consists of 10 broad cognitive abilities and more than 70 narrow abilities.

The CHC theory presented in Figure 1.2 omits a *g* or general ability factor, primarily because the utility of the theory (as it is employed in assessment-related disciplines) is in clarifying individual cognitive and academic strengths and weaknesses that are understood best through the operationalization of broad (stratum II) and narrow (stratum I) abilities (Flanagan et al., 2007). Others, however, continue to believe that *g* is the most important ability to assess because it predicts the lion's share of the variance in multiple outcomes, both academic and occupational (e.g., Canivez & Watkins, 2010; Glutting, Watkins, & Youngstrom, 2003). Regardless of one's position on the importance of *g* in understanding various outcomes (particularly academic), there is considerable evidence that both broad and narrow CHC cognitive abilities explain a significant portion of variance in specific academic abilities, over and above the variance accounted for by *g* (e.g., Floyd, McGrew, & Evans, 2008; McGrew, Flanagan, Keith, & Vanderwood, 1997; Vanderwood, McGrew, Flanagan, & Keith, 2002). The research on the relationship between cognitive abilities and academic skills (or the fourth foundational source of information underlying XBA) is presented in Chapter 2.