One

OVERVIEW

The Differential Ability Scales–Second Edition (DAS-II; Elliott, 2007a), developed and standardized in the United States, is a modern psychological assessment instrument with a longer history than its publication date would suggest (see Rapid Reference 1.1). It is based upon its predecessor, the Differential Ability Scales (DAS; Elliott, 1990a, 1990b), which had as its origin the British Ability Scales (BAS; Elliott, 1983). As its name suggests, the DAS-II was developed with a primary focus on specific cognitive abilities rather than on general "intelligence."

STRUCTURE OF THE DAS

The DAS-II consists of a cognitive battery of 20 subtests, covering an age range of 2 years, 6 months through 17 years, 11 months (2:6 through 17:11). The battery is divided into two overlapping age levels: (1) The Early Years battery is normed from age 2:6 through 8:11, with a usual age range of 2:6 through 6:11; (2) The School-Age battery is normed from age 5:0 through 17:11, and has a usual age range of 7:0 through 17:11. With those overlaps between the Early Years and the School Age batteries, it will be seen that the DAS-II Early Years and School-Age batteries were conormed for children ages 5:0 through 8:11 and therefore have a four-year normative overlap. (See Rapid Reference 1.2 for a description of the DAS-II subtests.)

The Early Years battery is further divided into two levels, lower and upper. The Lower Early Years level is most appropriate for young children ages 2:6 through 3:5, although it may also be used with older children with special needs. The Upper Early Years level is suitable for children normally in the age range of 3:6–6:11, although it may also be used with children up to age 8:11 if they have difficulty with the materials in the School-Age battery.

The DAS-II battery yields a composite score called General Conceptual

Rapid Reference 1.1

DAS-II Batteries

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Publication date: 2007

What the test measures: Verbal (*Gc*), Nonverbal Reasoning (*Gf*), Spatial (*Gv*), Working Memory (*Gsm*), Processing Speed (*Gs*), Phonological Processing (*Ga*), Recall of Objects (*Glr*), and General Conceptual Ability (GCA), which is a measure of the general factor *g*.

Age range: 2:6–17:11

Average Administration time: Six core subtests to obtain three clusters and GCA score = 31–40 minutes. Diagnostic subtests—School Readiness = 17 minutes, Working Memory = 12 minutes, Processing Speed = 9 minutes, Phonological Processing = 10 minutes.

Qualification of examiners: Graduate- or professional-level training in psychological assessment

Computer program: Scoring program included as well as a CD, which includes help in administering the Phonological Processing subtest and also useful demonstrations of administering the test using American Sign Language.

Publisher: The Psychological Corporation
A division of Pearson
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San Antonio, TX 78204-2498
Ordering phone number: 800-211-8378
http://www.psychcorp.com
Web site: www.DAS-II.com

Rapid Reference 1.2

DAS-II Subtests

Verbal Subtests

- *Verbal Comprehension:* following oral instructions to point to or move pictures and toys.
- *Naming Vocabulary:* naming pictures.
- *Word Definitions:* explaining the meaning of each word. Words are spoken by the evaluator.
- *Verbal Similarities:* explaining how three things or concepts go together, what they all are (e.g., house, tent, igloo; love, hate, fear)

Nonverbal Reasoning Subtests

- *Picture Similarities:* multiple-choice matching of pictures on the basis of relationships, both concrete (e.g., two round things among other shapes) and abstract (e.g., map with globe from among other round things). [Nonverbal Cluster in Lower Early Years battery]
- *Matrices:* solving visual puzzles by choosing the correct picture or design to complete a logical pattern.
- *Sequential and Quantitative Reasoning:* figuring out sequential patterns in pictures or geometric figures, or common rules in numerical relationships.

Spatial Subtests

- *Copying:* drawing pencil copies of abstract, geometric designs.
- *Recall of Designs:* drawing pencil copies of abstract, geometric designs from memory after a five-second view of each design.
- *Pattern Construction:* imitating constructions made by the examiner with wooden blocks, copying geometric designs with colored tiles or patterned cubes. There are time limits and bonus points for fast work. An alternative, "untimed" procedure uses time limits but no speed bonuses. [Nonverbal Cluster in Lower Early Years battery]

Diagnostic Subtests

- *Early Number Concepts:* oral math questions with illustrations—counting, number concepts, and simple arithmetic.
- *Matching Letter-Like Forms:* multiple-choice matching of shapes that are similar to letters.
- *Recall of Digits Forward:* repeating increasingly long series of digits dictated at two digits per second.
- *Recall of Digits Backward:* repeating, in reverse order, increasingly long series of digits dictated at two digits per second.
- *Recognition of Pictures:* seeing one, two, or three pictures for five seconds or four pictures for ten seconds and then trying to find those pictures within a group of four to seven similar pictures.
- *Recall of Objects—Immediate:* viewing a page of 20 pictures, hearing them named by the evaluator, trying to name the pictures from memory, seeing them again, trying again to name all the pictures, and repeating the process once more. The score is the total of all the pictures recalled on each of the three trials, including pictures recalled two or three times.
- *Recall of Objects—Delayed:* trying to recall the pictures again on a surprise retest 15 to 20 minutes later.
- *Speed of Information Processing:* the student scans rows of figures or numbers and marks the figure with the most parts or the greatest number in each row. The score is based on speed. Accuracy does not count unless it is very poor.
- *Phonological Processing:* rhyming, blending sounds, deleting sounds, and identifying the individual sounds in words.
- *Rapid Naming:* naming colors or pictures as quickly as possible without making mistakes. The score is based on speed and accuracy
- *Recall of Sequential Order:* sequencing, from highest to lowest, increasingly long series of words that include body parts, and for more difficult items, non-body parts.

Ability (GCA), which provides an estimate of overall reasoning and conceptual abilities. In addition, for ages 3:6 to 17:11, a Special Nonverbal Composite (SNC) is available and derived from the nonverbal core subtests appropriate for each battery level. The DAS-II also provides lower-level composite scores called *cluster scores* that are derived from highly *g*-saturated core subtests. Finally, there are numerous diagnostic subtests and clusters that measure other specific abilities. These diagnostic subtests do not contribute to the GCA or SNC, but give additional information about cognitive strengths and weaknesses. The overall structure is summarized in Figure 1.1.

Battery	**Usual Age Range**	**Full Normative Age Range**
Lower Early Years	2:6 – 3:5	2:6 – 8:11
Core Clusters		
GCA		
Verbal		
Nonverbal		
Upper Early Years	3:6 – 6:11	3:6 – 8:11
Core Clusters		
GCA		
Special Nonverbal Composite		
Verbal		
Nonverbal Reasoning		
Spatial		
Diagnostic Clusters		
School Readiness		
Working Memory		
Processing Speed		
School Age	7:0 – 17:11	5:0 – 17:11
Core Clusters		
GCA		
Special Nonverbal Composite		
Verbal		
Nonverbal Reasoning		
Spatial		
Diagnostic Clusters		
Working Memory		
Processing Speed		

Figure 1.1 DAS-II Clusters by Battery

THEORETICAL UNDERPINNINGS

The DAS-II was not developed solely to reflect a single model of cognitive abilities but was designed to address processes that often underlie children's difficulties in learning and what scientists know about neurological structures underlying these abilities. The selection of the abilities to be measured by the DAS-II was influenced by a variety of theoretical points of view, but the end result is consistent with *Gf-Gc* theory (now commonly referred to as the Cattell-Horn-Carroll theory, or simply CHC). This is probably the best known and most widely accepted theory of intellectual factors among practitioners of individual psychological assessment and is derived from the Horn-Cattell *Gf-Gc* model [e.g., Cattell (1941, 1971, 1987), Cattell & Horn (1978), Horn (1988, 1991), Horn & Noll (1997)]. *Gf* and *Gc* refer, respectively, to "fluid" and "crystallized" intelligence, but current versions of the theory recognize as many as seven different broad cognitive factors or abilities. See Carroll (1993); Flanagan and McGrew (1997); Flanagan, McGrew, and Ortiz (2000); Flanagan and Ortiz (2001); Flanagan, Ortiz, and Alfonso (2007); Flanagan, Ortiz, Alfonso, and Mascolo (2002); Horn (1985, 1988, 1991); Horn and Cattell (1966); Horn and Noll (1997); McGrew (1997); McGrew and Flanagan (1998); Woodcock (1990); and Woodcock and Mather (1989) for discussions of *Gf-Gc,* now usually called the Cattell-Horn-Carroll (CHC) theory. Carroll's monumental (1993) review and re-analysis of hundreds of factor analytic studies of many psychological tests provided a solid empirical foundation for CHC theory. The factor structure that Carroll devised on the basis of his research was remarkably congruent with the theoretical structure developed by Cattell and Horn (1978; Horn, 1988, 1991), which lent further credence to the amalgamated CHC theory as subsequently developed by Woodcock, McGrew, Flanagan, and others [e.g., Flanagan & McGrew (1997); Flanagan, McGrew, & Ortiz (2000); Flanagan & Ortiz (2001); Flanagan, Ortiz, & Alfonso (2007); Flanagan, Ortiz, Alfonso, & Mascolo (2002); Horn (1991); McGrew (1997); McGrew & Flanagan (1998); McGrew, Werder, & Woodcock (1991); Woodcock (1990, 1993); and Woodcock & Mather (1989)]. However, even with a growing consensus as to the nature and structure of human cognitive abilities, there remains substantive debate regarding the number of factors representing independent abilities in a cognitive model, the precise nature of each of those factors (Horn & Blankson, 2005; Carroll, 2005), and to what extent, if any, subtests from different test batteries that purport to measure a given factor actually do so (Alfonso, Flanagan, & Radwan, 2005).

Despite the fact that no single theory or model has universal acceptance, there is a common core of theory and research that supported the development of the

DAS-II. Such research indicates that human abilities are complex and often are not best explained solely in terms of a single cognitive factor (*g*), or even in terms of several lower-order factors. These abilities are presented as multiple dimensions on which individuals show reliably observable differences, and are related to how children learn, achieve, and solve problems. Although these abilities are interrelated, they do not completely overlap, thus making many of them distinct (Carroll, 1993). The wide range of human abilities represents a number of interlinked subsystems of information processing that have structural correlates in the central nervous system, in which some functions are distinct and others are integrated. Some formulations of CHC theory (e.g., Carroll, 1993, 2005) include an overarching, single factor, *g,* at the top of the hierarchy. Others (e.g., Horn, 1991; Horn & Blankson, 2005) dispute the importance, or even the existence, of a single, overall level of cognitive ability and emphasize the importance of the separate abilities. Yet others (e.g., Flanagan & McGrew, 1997; Flanagan, McGrew, & Ortiz, 2000) do not take a rigid stand on the question of an overall *g,* but operationalize the theory on the basis of the separate factors. All of these versions of CHC theory maintain at least two strata of abilities: several broad abilities each including several narrow abilities. In the three-stratum model (e.g., Carroll, 2005), the narrow abilities are called Stratum I, the broad abilities Stratum II, and *g,* at the top of the hierarchy, Stratum III.

Flanagan and McGrew (1997); Flanagan, McGrew, and Ortiz (2000); Flanagan and Ortiz (2001); Flanagan, Ortiz, and Alfonso (2007); Flanagan, Ortiz, Alfonso, and Mascolo (2002); Horn (1991); McGrew (1997); McGrew and Flanagan (1998); McGrew, Werder, and Woodcock (1991); Woodcock (1990, 1993); and Woodcock and Mather (1989) have adopted a notation system, largely based on that of Carroll (1993). Symbols for broad (Stratum II) abilities are written with a capital G and italicized, lowercase letters (e.g., *Ga* is auditory processing, and *Glr* is long-term storage and retrieval). Symbols for narrow (Stratum I) abilities within the various broad abilities are usually written with one or two capital letters or a capital letter and a digit (e.g., SR is spatial relations within *Gv,* I is induction within *Gf,* and K1 is general science information within *Gc*). Other notations are used occasionally (e.g., PC:A and PC:S are, respectively, phonetic coding: analysis and phonetic coding: synthesis). Several similar, but not identical, verbal labels are given to the abilities (e.g., *Gv* has been called "visual processing," "visual/spatial processing," and "visual/spatial thinking"), so the more-or-less agreed-upon symbols function as a valuable common notation with less risk of misunderstanding.

The following section outlines some links between the DAS-II ability constructs and neuropsychological structures in the areas of verbal and spatial abilities, fluid reasoning abilities, several aspects of memory, and processing speed.

Broad Verbal and Spatial Abilities

The DAS-II Verbal and Spatial ability clusters reflect major systems through which individuals receive, perceive, remember, and process information. Both systems are linked to auditory and visual modalities and factorially represent verbal [crystallized intelligence (*Gc*)] and visual [visual-spatial (*Gv*)] thinking.

Neuropsychologically, there is strong evidence for the existence of these systems. They tend to be localized in the left and right cerebral hemispheres, respectively, although the localization is complicated (see, for example, Hale & Fiorello, 2004, pp. 67–78) and there are individual differences in areas of localization of function. Moreover, the systems are doubly dissociated—that is, they represent two distinct, independent systems of information processing (McCarthy & Warrington, 1990; Springer & Deutsch, 1989). The systems are independent insofar as each one may remain intact if the other is damaged. In the DAS-II, the two factors (verbal and spatial) are measured by the Verbal and Spatial clusters in both the Early Years and School-Age batteries.

Crystallized ability (*Gc*) refers to the application of acquired knowledge and learned skills to answering questions and solving problems presenting at least broadly familiar materials and processes. Virtually all tests of *Gc* are verbal, as that is the nature of many crystallized tasks: language is the primary means by which we express and use acquired knowledge. Most verbal subtests of intelligence scales primarily involve crystallized intelligence. Subtests of general knowledge and vocabulary are relatively pure measures of crystallized intelligence. The overlap between crystallized intelligence and verbal information processing is indeed so strong that we believe that the meaning of the factor and the test scores that measure it is best expressed as "Verbal," as in the DAS-II cluster score.

We note here that within the area of auditory-verbal processing there are distinctions that have to be made between different types of cognitive processes. Most of the tasks that are included under the *Gc* factor are concerned with verbal knowledge (including vocabulary), comprehension of single or multiple sentences, and verbal reasoning. All these are relatively high-level cognitive tasks, requiring complex processing, analysis of meaning, and retrieval of information that has been stored in long-term verbal memory. In contrast, there are other verbal factors that require immediate, less complex verbal processing. *Auditory short-term memory* (*Gsm*) is measured by tasks that entail repeating words that have been heard, with little or no processing of the meaning of the words themselves.

We can characterize this as relatively simple information processing. Similarly, *auditory processing ability* (*Ga*) is measured by tasks that require the individual to analyze the component sounds of words that are presented. Again, such tasks do not require the meaning of those words to be an important component of the task. Both *Gsm* and *Ga* will be discussed below.

Visual-spatial thinking (*Gv*) involves a range of visual processes, ranging from fairly simple visual perceptual tasks to higher level, visual, cognitive processes. Woodcock and Mather (1989) define *Gv* in part: "In Horn-Cattell theory, 'broad visualization' requires fluent thinking with stimuli that are visual in the mind's eye. . . ." Although *Gv* tasks are often complex and mentally challenging, *Gv* primarily relies on visual processing that involves the perception of and ability to visualize mental rotations and reversals of visual figures. It is not dependent on the ability of the individual to use internal verbal language to help solve problems.

Again, we note at this point that not all "nonverbal" tasks measure *Gv*. Because we have stipulated the condition (which is borne out by factor-analytic research) that *Gv* tasks are not dependent upon the ability of the individual to use internal language in solving a problem, it follows that tasks that require this are measuring a different cognitive process. *Gv* tasks do not include the aspect of dealing with novel stimuli or applying novel mental processes, or using internal language to reason out the solution to a visually-presented problem, all of which characterize *Gf* tasks. This will be discussed below in the section on Integration of Complex Information Processing.

Auditory Processing Ability: Is it a Component of Verbal Ability?

It should be noted that Horn and Carroll both accepted that there is a separate factor of auditory processing (*Ga*) that is distinct from the verbal or *Gc* information processing system. Auditory processing is concerned with the analysis of sound patterns such as in speech sounds, rhythm, and sequences of sounds (Carroll, 2005; Horn & Blankson, 2005). Auditory processing ability is certainly related to the development of complex higher-order language skills. It is necessary but not sufficient for language development. It seems reasonable to suppose that auditory processing is mediated by a separate processing system that handles the analysis of auditory sensory input, and because of this, children with hearing impairment are likely to have difficulties with *Ga* tasks.

In the DAS-II, auditory processing (*Ga*) is measured by the Phonological Processing subtest, comprising four distinct components: Rhyming, Blending, Deletion, and Phoneme Identification and Segmentation.

Integration of Complex Information Processing

For normal cognitive functioning, the verbal and visual-spatial abilities operate as an integrated information processing system that is necessary for complex mental activity. Factorially, this integrative system is represented by the *fluid reasoning* (*Gf*) ability. Fluid reasoning refers to inductive and deductive reasoning, presenting problems that are new to the person doing the reasoning. The vast majority of fluid reasoning tests use nonverbal (that is, visual) stimuli using pictures or figures. These require an integration of verbal and nonverbal thinking. Indeed, it seems likely that the best measures of *Gf* always require integrated analysis of both verbal and visual information. This is achieved through the presentation of visual problems that, for most efficient solution, require the individual (1) to encode the components of the visual stimulus, (2) to use internal language to generate hypotheses, (3) to test the hypotheses, and (4) to identify the correct solution.

Neuropsychologically, it seems that the integrative function of frontal lobe systems is central to executive function, which is involved in planning and other complex mental processes (Hale & Fiorello, 2004, pp. 64–67; Luria, 1973; discussed by McCarthy & Warrington, 1990, pp. 343–364), and it is therefore reasonable to hypothesize that it may provide a structural correlate for *Gf*. Similarly, it is clear that the corpus callosum has a major role in connecting the right and left cerebral hemispheres, and that limitations in callosal transmission may be implicated in cases of poor visual-verbal integration. Whatever the localization of specific mechanisms may be, the fact that our brains have an integrative function seems incontrovertible. The best tests of *Gf* require that integrative process.

In the DAS-II, the *Gf* factor is measured in the Upper Early Years and School-Age batteries by the Nonverbal Reasoning cluster.[1] The subtests measuring this ability require integrated analysis and complex transformation of both visual and verbal information, and verbal mediation is critical for the solution of these visually presented problems for most individuals.

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[1]In the Lower Early Years battery (ages 2:6 through 3:5 only), fluid reasoning (G*f*) and visual-spatial thinking (G*v*) are measured by one subtest each. The Nonverbal cluster combines these two subtests. Therefore the factors are only differentiated at the subtest level and not at the cluster level.

Short-Term Memory (Verbal and Visual) Systems

Short-term memory (*Gsm*) refers to one's ability to apprehend and maintain awareness of elements of information for events that occurred in the last minute or so. *Gsm* refers to aspects of memory that have limited capacity and that lose information quickly unless an individual activates other cognitive resources to maintain the information in immediate awareness. CHC theory does not distinguish, at the second-order, group factor level, between separate, modality-related visual and verbal memory systems. At the broad factor level there is only a single short-term memory factor (*Gsm*) that should really be called *auditory* short-term memory.

Because of evidence from both cognitive psychology and neuropsychology that shows clearly that verbal and visual short-term memory systems are distinct and independent (Hitch, Halliday, Schaafstal, & Schraagen, 1988; McCarthy & Warrington, 1990, pp. 275–295), the DAS-II does not treat short-term memory as unitary but keeps auditory and visual short-term memory tasks as distinct measures. Additionally, several subtests combine to create a working memory (*Gsm* MW) factor that is separate from auditory short-term memory (*Gsm* MS), as measured by the Recall of Digits Forward subtest, *and* the visual short-term memory (*Gv* MV) abilities measured by the Recall of Designs and Recognition of Pictures subtests.

Integration of Verbal and Visual Memory Systems

The *long-term storage and retrieval* (*Glr*) factor in the CHC model is typically measured by tests that have both visual and verbal components. *Long-term storage and retrieval* ability involves memory storage and retrieval over longer periods of time than *Gsm*. How much longer varies from task to task, but it is typically of the order of 1 to 30 minutes.

McCarthy and Warrington (1990, p. 283) call this "visual–verbal" short-term memory and conclude that it is underpinned by another distinct and independent, dissociable information-processing system. While its relationship with other processes is relatively small, it may be an important type of "gateway" process underlying some types of working memory. Holding information in visual-verbal short-term memory may be necessary in order to solve problems that require the manipulation and transformation of visual information that can be labeled verbally.

In the DAS-II, the visual-verbal memory factor (*Glr*) is measured by the Recall of Objects subtest. In this task, an array of pictures is presented, but they have to be recalled verbally. Sequential order is not important, and the child is able to organize and associate pictures in any way that helps in remembering them.

Processing Speed

The DAS-II Processing Speed cluster measures the CHC *processing speed factor* (*Gs*). This factor refers to the ability to automatically and fluently perform relatively easy or over-learned cognitive tasks, especially when high mental efficiency (i.e., attention and focused concentration) is required. It is typically measured by tests that require relatively simple operations that must be performed quickly—speed of decision, speed of naming, clerical speed, and so on. These types of timed activities are more complex than those involved in simple reaction-time paradigms, which seem to form their own factor (*Gt*), a factor not assessed by the DAS-II, nor by most cognitive ability tests.

While individual differences in neural speed may be one of the determinants of performance on processing speed tasks, it is clear that other determinants are involved. Speed of response may reflect not only neural speed but also perhaps efficiency in accessing information, efficiency in holding information in short-term memory, efficiency in visual-verbal integration, and willingness to commit to a decision and threshold for doing so. Performance on *Gs* tasks is not easily improved with practice. Prior experience on similar tasks is unlikely to be helpful. Therefore, measures on such tasks do reflect some function of the underlying speed and efficiency of processing systems.

DESCRIPTION OF DAS-II

The Differential Ability Scales—Second Edition (DAS-II; Elliott, 2007a) is an individually administered battery of cognitive tests for children and adolescents aged 2 years, 6 months (2:6) through 17 years, 11 months (17:11). Because the DAS-II covers such a wide age range, it is divided into three levels: Lower Early Years (ages 2:6 through 3:5); Upper Early Years (normally covering ages 3:6 through 6:11, but normed through 8:11); and School-Age (normally covering ages 7:0 through 17:11, but also normed for ages 5:0 through 6:11). The three levels allow both items and clusters that are appropriate to the several age ranges. It was designed to measure specific, definable abilities and to provide reliable, interpretable profiles of strengths and weaknesses. These profiles may lead to individualized interventions or treatments for students with learning concerns or issues. The DAS-II is considered suitable for use in any setting in which the cognitive abilities of children and adolescents are to be evaluated, although sev-

CAUTION

Several of the DAS-II subtests may not be appropriate for students with severe sensory or motor disabilities.

eral of the DAS-II subtests may not be appropriate for students with severe sensory or motor disabilities. The DAS-II cognitive battery yields a composite score labeled *General Conceptual Ability* (GCA) that is a measure of psychometric *g,* defined as "the general ability of an individual to perform complex mental processing that involves conceptualization and transformation of information" (Elliott, 2007b, p. 17).

Organization of the DAS-II

The DAS-II contains a total of 20 subtests grouped into *Core* or *Diagnostic* subtests. The *Core* subtests are those used to compute the GCA and three cluster scores: Verbal Ability, Nonverbal Reasoning Ability, and Spatial Ability. The *Diagnostic* subtests measure aspects of memory, speed of processing and early concepts taught in schools. They yield three cluster scores: Processing Speed, Working Memory, and School Readiness. These diagnostic subtests are considered important and useful in the interpretation of an individual's strengths and weaknesses in information processing, but they do not contaminate the GCA with subtests that have low *g* loadings.

This separation of Core and Diagnostic subtests is one of the strengths of the DAS-II. For a point of comparison, the Wechsler Intelligence Scale for Children, 4th ed. (WISC-IV; Wechsler, 2003) excludes the Information, Word Reasoning, Arithmetic, Picture Completion, and Cancellation subtests from the FSIQ and Indices, but does include in the IQs subtests such as Coding and Symbol Search, which are not good measures of complex mental processing or intellectual ability (*g*). The Stanford-Binet Intelligence Scale, 5th ed. (SB5; Roid, 2003) includes all subtests in the total score. The Woodcock-Johnson III Cognitive battery (WJ III; Woodcock, McGrew, & Mather, 2001) includes low-*g*-loading tests, but only in proportion to their *g* loading

DON'T FORGET

The separation of the DAS-II into *Core* and *Diagnostic* subtests can be helpful in reducing the overall administration time and a student's fatigue since examiners can tailor their assessments, administering only those subtests that are relevant based on the specific and different referral questions.

The Lower Early Years battery of the DAS-II consists of four core subtests that combine to yield the

GCA and three diagnostic subtests that may be administered. The Upper Early Years battery includes six core subtests and an additional 11 optional diagnostic subtests. The School-Age battery includes six core subtests and nine additional diagnostic subtests. Some of the Early Years subtests can also be used at the school-age level, especially at younger ages, for diagnostic purposes. For the Upper Early Years and the School-Age batteries, the subtests not only combine to produce the GCA but also yield five or six cluster scores. For Upper Early Years children, these cluster scores represent Verbal (*Gc*), Nonverbal Reasoning (*Gf*), and Spatial (*Gv*) abilities along with School Readiness, Working Memory (*Gsm*), and Processing Speed (*Gs*). For School-Age children, the cluster scores represent Verbal (*Gc*), Nonverbal Reasoning [(*Gf*) fluid reasoning (Keith, 1990)], and Spatial (*Gv*) abilities along with Working Memory (*Gsm*) and Processing Speed (*Gs*) (see Rapid Reference 1.2 and Figure 1.1). Although the "typical" Upper Early Years battery is given to children aged 3 years, 6 months through 6 years, 11 months and the "typical" School-Age battery to children 7 years, 0 months through 17 years, 11 months, the Upper Early Years and School-Age batteries were also normed for an overlapping age range (5 years, 0 months through 8 years, 11 months).

Normative Overlaps

Depending on the examinee's age, if an examinee of low ability has little success at the ages covered by the battery you initially selected, you may be able to administer subtests from a lower level of the test. Conversely, if an examinee has high ability and has few failures at the ages covered by the battery you initially selected, you can administer subtests from a higher level of the test. All subtests at the Upper Early Years and School-Age Level have overlapping normative data for children ages 5:0 to 8:11. This overlap provides the examiner flexibility when testing bright younger children or less able older children. In these cases, subtests appropriate for the individual's abilities are available. For example, the Upper Early Years subtests can be administered to children ages 6:0 to 8:11 for whom the School-Age Level is too difficult. Similarly, the School-Age subtests can be administered to children ages 5:0 to 6:11 for whom the Upper Early Years is insufficiently challenging. In such cases, the examinee's raw scores can be converted to ability scores and then to *T* scores in the normal way.

> **DON'T FORGET**
>
> If a student has little success at the ages covered by the battery you initially selected, you may be able to administer subtests from a lower level of the test.

For children in the overlapping age range, examiners may choose to give either battery or choose one battery and administer additional subtests from the other battery.

Changes from DAS to DAS-II

Several goals were accomplished with the revision of the DAS to the DAS-II. Rapid Reference 1.3 lists the key features that were accomplished and changes made for this second edition.

In the DAS-II, many of the core subtests will be recognizable to DAS examiners, but there have been significant changes and modifications to some. For example, Block Building and Pattern Construction have been combined into one subtest; Recall of Digits has been expanded to two subtests: Recall of Digits–Forward and Recall of Digits–Backward; and Early Number Concepts has been

Rapid Reference 1.3

DAS-II Key Revisions

- Updating of norms
- CHC interpretative basis now noted explicitly in manual and record form
- Development of three new Diagnostic Clusters (Working Memory, Processing Speed, School Readiness)
- Addition of four new subtests (Phonological Processing, Recall of Digits Backward, Recall of Sequential Order, Rapid Naming)
- Downward extension of Matrices subtest to age 3 years, 6 months, enabling the Nonverbal Reasoning cluster to be measured at the Early Years level.
- Core cluster scores (Verbal, Nonverbal Reasoning, Spatial) are now the same throughout the age range from 3:6 through 17:11
- Block Building and Pattern Construction combined into one subtest
- Revising content of 13 subtests
- Updating artwork
- Eliminating three achievement tests
- Linking DAS-II to the WIAT-II and providing correlational data also for the K-TEA-II and the WJ-III Achievement batteries
- Providing Spanish translation for nonverbal subtests
- Providing American Sign Language translation for nonverbal subtests in every kit for use by, and the training of, interpreters
- Publishing with Scoring Assistant computer software

removed from the GCA and is now included in the School Readiness cluster. There are four new diagnostic subtests (Phonological Processing, Recall of Digits–Backward, Recall of Sequential Order, Rapid Naming). The major structural changes in the DAS-II are the inclusion of separate Nonverbal Reasoning and Spatial Ability clusters at the Upper Early Years and the creation of three new clusters (Working Memory, Processing Speed, School Readiness), developed to help examiners assess the skills of the child.

Rapid Reference 1.4 compares the number of items on the DAS and DAS-II and the number of items retained and added. The DAS-II has increased the

Rapid Reference 1.4

DAS to DAS-II Changes

Subtest	Number of Items on DAS	Number of Items on DAS-II	Number of DAS Items Retained on DAS-II	Number of New Items Written or Reworded for DAS-II
Core Cognitive Subtests				
Verbal Comprehension	36	42	28	14
Picture Similarities	32	32	14	18
Naming Vocabulary	26	34	21	13
Block Building*	12	12	8	4
Pattern Construction*	26	26	26	0
Copying	20	20	19	1
Matrices	35	56	25	31
Recall of Designs	21	22	21	1
Word Definitions	42	35	29	6
Verbal Similarities**	34	33	23	10
Seq. & Quantitative Reasoning	39	50	20	30
Diagnostic Cognitive Subtests				
Recall of Digits Forward**	36	38	36	2
Recognition of Pictures	20	20	20	0
Early Number Concepts	26	33	14	19
Recall of Objects	20	20	20	0
Matching Letter-Like Forms	27	27	27	0
Phonological Processing		53		53
Recall of Sequential Order		32		32
Recall of Digits Backward		30		30
Speed of Information Processing	6	6	6	0
Rapid Naming		105		105

(continued)

Subtest	Number of Items on DAS	Number of Items on DAS-II	Number of DAS Items Retained on DAS-II	Number of New Items Written or Reworded for DAS-II
Lower Early Years				
Verbal	62	76	49	27
Nonverbal	44	58	22	18
GCA	132	146	97	49
Upper Early Years				
Verbal	62	76	49	27
Nonverbal	78	88	59	49
Spatial		46		1
GCA	166	210	122	77
School-age				
Verbal	76	68	52	16
Nonverbal Reasoning	74	106	45	61
Spatial	47	48	47	1
GCA	197	222	144	78

Note: Subtests in Italics are new to the DAS-II.

* Block Building and Pattern Construction have been combined into one subtest.

** Similarities was renamed Verbal Similarities, and Recall of Digits was renamed Recall of Digits Forward.

number of items on five of the core tests, and two of the diagnostic tests and decreased the number on two subtests. The greatest increase in items came on the Matrices subtest (35 items to 56 items, a 60 percent increase) while the largest decrease came on Word Definitions (42 items decreased to 35, a 17 percent decrease). The regionally problematic word “wicked” was removed from Word Definitions. Four subtests (Recognition of Pictures, Recall of Objects, Matching Letter-Like Forms, and Speed of Information Processing) remain exactly the same on the DAS-II.

All DAS-II subtests have also been aligned with Cattell-Horn-Carroll (CHC) abilities (see Rapid Reference 1.5). This allows the examiner to use commonly understood and agreed-upon terminology when interpreting what the DAS-II is measuring. CHC theory provides for the interpretation of both Broad and Narrow abilities. The DAS-II provides measures of each of the seven most robust and replicable factors derived from research.

Rapid Reference 1.5

DAS-II Subtests by CHC classification

	Broad Abilities	Narrow Abilities
Verbal Ability		
Verbal Comprehension	*Gc*	Listening Ability
Naming Vocabulary	*Gc*	Lexical Knowledge
Word Definitions	*Gc*	Language Development / Lexical Knowledge
Verbal Similarities	*Gc*	Language Development
Nonverbal Reasoning Ability		
Picture Similarities	*Gf*	Induction
Matrices	*Gf*	Induction
Sequential and Quantitative Reasoning	*Gf*	Induction / Quantitative Reasoning
Spatial Ability		
Pattern Construction	*Gv*	Spatial Relations
Pattern Construction–Alternative	*Gv*	Spatial Relations
Recall of Designs	*Gv*	Visual Memory
Copying	*Gv*	Visualization
Matching Letter-Like Forms	*Gv*	Visualization
Recognition of Pictures	*Gv*	Visual Memory
Retrieval		
Recall of Objects–Immediate	*Glr*	Free-recall Memory
Recall of Objects–Delayed	*Glr*	Free-recall Memory
Memory		
Recall of Digits Forward	*Gsm*	Memory Span
Recall of Digits Backward	*Gsm*	Working Memory
Recall of Sequential Order	*Gsm*	Working Memory
Processing Speed		
Speed of Information Processing	*Gs*	Perceptual Speed: Scanning
Rapid Naming	*Gs*	Perceptual Speed: Complex
Auditory Processing		
Phonological Processing	*Ga*	Phonetic Coding
Additional		
Early Number Concepts	*Gc/Gf*	Lexical Knowledge / General knowledge / Piagetian reasoning

Wider Score Ranges

The DAS-II has a wider range of possible *T* scores for the subtests and Standard Scores for the clusters in comparison with the DAS first edition. In the DAS, *T* scores ranged from 30 to 70 (that is, two standard deviations (SDs) on either side of the mean of 50), whereas in the DAS-II the range is 20 to 80 (three SDs on either side of the mean). Similarly, for the GCA, SNC and the cluster scores, the maximum DAS range was 45 to 165, whereas in the DAS-II the maximum range is 30 to 170 (that is, 4.67 SDs on either side of the mean).

RELATIONSHIPS BETWEEN THE DAS AND THE DAS-II

Rapid Reference 1.6 provides the results of comparisons of scores obtained on the first-edition DAS and the DAS-II. The major study presented in the DAS-II *Introductory and Technical Handbook* gave children the two batteries with a short interval between tests. We also present a clinical study carried out on children identified as ADHD in which the assessments were carried out over a period of years.

Over Short Periods of Time

The relationship between the DAS and the DAS-II was examined in a sample of 313 children aged 2:6 to 17:11 (Elliott, 2007b). Each test was administered in counterbalanced order with 6 to 68 days between testing. The overall correlation coefficients show that the Verbal Ability scores for the DAS and the DAS-II were the most highly related (r = .84) followed by the GCA (r = .81) and the Special Nonverbal composite (r = .78). As shown in Rapid Reference 1.6, the average DAS-II GCA is 2.7 points lower than the GCA of the DAS. The difference between the two tests is small for the Verbal Ability (0.1 points), while the Nonverbal Reasoning and Spatial abilities differ by 4 to 5 points. These differences, both in size and direction, are generally somewhat lower than expected according to the Flynn Effect (Flynn, 1984, 1987, 1998). The results indicate that if examinees continue to be assessed using the first edition of the DAS, their scores may be inflated by up to 4 or 5 standard score points in comparison with the DAS-II.

Over Long Periods of Time

In a small sample (N = 26) of children with ADHD who were administered the DAS first and then, after 3 to 6 years, were given the DAS-II, small changes in test

Rapid Reference 1.6

Comparison of Scores from DAS and DAS-II

	Standardization Sample					ADHD Sample				
	Time interval 6 to 68 days					Time interval 3 to 6 years				
	DAS		DAS-II			DAS		DAS-II		
	Mean	SD	Mean	SD	diff	Mean	SD	Mean	SD	diff
Word Definitions	51.5	9.6	51.4	8.5	–0.1	54.6	8.3	53.8	7.6	–0.8
Verbal Similarities	52.2	11.0	51.7	8.8	–0.5	54.8	10.9	50.0	7.6	–4.8
Matrices	54.9	10.3	51.4	8.5	–3.5	53.2	10.1	53.9	9.5	0.7
Seq. & Quantitative Reasoning	53.9	9.3	51.3	9.4	–2.6	53.8	9.8	53.2	7.2	–0.6
Recall of Designs	54.3	11.7	51.1	8.8	–3.2	54.2	10.0	50.4	11.7	–3.9
Pattern Construction	54.2	9.2	52.1	9.1	–2.1	53.7	10.3	52.7	9.2	–1.0
Recall of Objects–Immediate	53.4	10.6	53.3	11.6	–0.1	50.7	12.9	50.7	9.5	0.1
Recall of Objects–Delayed	52.0	10.6	53.4	10.5	1.4	50.5	13.7	49.8	8.4	–0.6
Recall of Digits Forward	49.8	9.9	51.0	10.2	1.2	50.4	9.8	48.8	10.2	–1.6
Speed of Information Processing	52.7	10.1	50.9	9.0	–1.8	54.2	9.7	52.9	10.1	–1.3
Verbal	102.5	15.0	102.4	12.8	–0.1	105.5	17.8	102.7	10.8	–2.8
Nonverbal Reasoning	107.2	15.0	101.9	13.4	–5.3	107.1	14.1	105.2	11.1	–1.8
Spatial	106.8	14.8	102.5	12.6	–4.3	104.8	15.3	102.3	16.0	–2.4
School-Age GCA	105.4	15.0	102.7	12.6	–2.7	108.0	14.2	104.0	12.6	–3.9

N for Standardization Sampling ranged from 209 to 313; *N* for ADHD Sampling = 26

Time between testing: Standardization Sampling = 6 to 68 days; ADHD Sampling: 3.4 to 6.8 years scores were observed (Schlachter, Dumont, & Willis, unpublished manuscript). In almost all cases, the test scores on the DAS-II were lower than their earlier scores on the original DAS. Only Matrices and Recall of Objects–Immediate were higher on the DAS-II, and in each case by less than 1 point. The smallest mean difference in composite scores was shown by the Nonverbal Reasoning cluster, with a mean score on the DAS-II 1.8 points lower than that on the DAS. The greatest difference in composite scores was shown by the GCA, with the mean score on the DAS-II being 3.9 points lower than that on the DAS. For individual subtests, the largest change between the DAS and the DAS-II was on Verbal Similarities and Recall of Designs (–4.8 and –3.9 points, respectively).

STANDARDIZATION AND PSYCHOMETRIC PROPERTIES

The DAS-II was standardized and normed on 3,480 children selected to be representative of non-institutionalized, English-proficient children aged 2 years 6 months through 17 years 11 months living in the United States during the period of data collection (2005). Although the DAS-II standardization excluded those children with severe disabilities (since for these children the DAS-II would be inappropriate), it did include children with mild perceptual, speech, and motor impairments, if the examiner judged that the impairments did not prevent the valid administration of the test. The demographic characteristics used to obtain a stratified sample were age, sex, race/ethnicity, parental educational level, and geographic region.

Additional samples of children, ranging in size from 54 to 313, were tested during standardization with three additional cognitive measures, three achievement measures, and two measures of school readiness, to provide evidence of validity. These additional children were not included in the norms calculation.

For the category of race/ethnicity, individuals were classified as White (N = 2,176), African American (N = 538), Hispanic American (N = 595), Asian (N = 137) and Other (N = 34). The five parental education categories ranged from one to eight years of education to 16 or more years of education. The four geographic regions sampled were Northeast, Midwest, South, and West. Demographic characteristics were compared to the October 2005 U.S. Census populations and were matched in three-way tables across categories and not just within single categories (i.e., age × race × parent education; age × sex × parent education; age × sex × race; and age × race × region). Total sample percentages of these categories and subcategories were very close to the Bureau of the Census data and seldom different by more than 1 percentage point.

In the standardization sample, there were 18 age groups: 2:6–2:11, 3:0–3:5, 3:6–3:11, 4:0–4:5, 4:6–4:11, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, and 17 years. In each six-month age group between 2 years 6 months and 4 years 11 months, there was a total of 176 children, while from ages 5 through 17 there were 200 children in each one-year age group. In each six-month age group between 2 years 6 months and 4 years 11 months, there were approximately equal numbers of males and females, while for all remaining age groups there were 100 males and 100 females per group. In our opinion, this sampling methodology was excellent.

RELIABILITY OF THE DAS-II

The DAS-II has excellent reliability (see Rapid Reference 1.7 for the average internal consistency reliability and standard error of measurement (SEm) for each Composite and Cluster). Average internal consistency reliability coefficients for the GCA and the Special Nonverbal Composites are above .90 for the Lower Early Years, Upper Early Years, and School-Age level. For the clusters, average internal consistency reliability coefficients for the Lower Early Years, Upper Early Years, and School-Age level are (a) .93, .89, and .89 for Verbal Ability (b) .87, .89,

Rapid Reference 1.7

Average DAS-II Cluster Reliabilities

Composites / Cluster	Average internal consistency r_{xx}	SEm
GCA (Early Years, Lower)	.94	3.82
GCA (Early Years, Upper)	.96	3.10
GCA (School-Age)	.96	2.91
SNC (Early Years, Upper)	.95	3.45
SNC (School-Age)	.96	3.00
Verbal Ability (Early Years, Lower)	.93	4.11
Verbal Ability (Early Years, Upper)	.89	4.94
Verbal Ability (School-Age)	.89	5.04
Nonverbal Ability (Early Years, Lower)	.87	5.41
Nonverbal Reasoning Ability (Early Years, Upper)	.89	5.07
Nonverbal Reasoning Ability	.92	4.22
Spatial Ability (Early Years, Upper)	.95	3.40
Spatial Ability (School-Age)	.95	3.45
Working Memory (5–0 to 17–11)	.95	3.53
Processing Speed (5–0 to 17–11)	.90	4.80
School Readiness (5–0 to 8–11)	.90	5.09

and .92 for Nonverbal Reasoning Ability, (c) .95 for Spatial Ability, (d) .95 for Working Memory, (e) .90 for Processing Speed, and (f) .90 for School Readiness. These numbers indicate that all of these overall cluster scores are "reliable," the term "reliable" being defined by Sattler (2008) as a reliability coefficient with a value between .80 and .99.

Subtest Reliabilities

The internal consistency reliabilities for the subtests are lower than those for the GCA and the clusters, as would be expected (see Rapid Reference 1.8 for the average internal consistency reliability and SEm for each DAS-II subtest). Across all ages, the average internal consistency reliabilities range from a low of .77 for Picture Recognition to a high of .95 for Pattern Construction. Core

Rapid Reference 1.8

Average DAS-II Subtest Reliabilities

Subtest, cluster, and GCA	Average internal consistency r_{xx}	Average SEm
Core		
Verbal Comprehension	.86	3.57
Picture Similarities	.83	4.25
Naming Vocabulary	.81	4.44
Pattern Construction	.95	2.38
Pattern Construction–Alternative	.94	2.63
Matrices	.84	4.09
Copying	.89	3.34
Recall of Designs	.86	3.79
Word Definitions	.81	4.44
Verbal Similarities	.81	4.36
Sequential and Quantitative Reasoning	.92	2.97
Diagnostic		
Recall of Objects–Immediate	.82	4.34
Recall of Digits Forward	.92	2.98
Recognition of Pictures	.77	4.84
Early Number Concepts	.88	3.49
Matching Letter-Like Forms	.87	3.68
Recall of Sequential Order	.92	2.86
Speed of Information Processing	.91	3.05
Recall of Digits Backward	.90	3.20
Phonological Processing	.91	2.82
Rapid Naming	.81	4.38

subtests ranged from .81 (Naming Vocabulary, Word Definitions and Verbal Similarities) to .95 (Pattern Construction). Reliability of the Diagnostic subtests was also generally high, ranging from a low of .77 for Recognition of Pictures to a high of .92 for Recall of Digits Forward. Subtest reliabilities therefore range from "relatively reliable" (that is, between .70 and .79) to "reliable" (over .80; Sattler, 2008).

Standard Errors of Measurement

The average standard errors of measurement (SEm) in standard score points (that is, with a mean of 100 and standard deviation (SD) of 15) for the Early Years and School-Age batteries (respectively) were 3.82 and 2.91 for the GCA, 3.45 and 3.00 for the SNC, 5.04 and 4.11 for the Verbal clusters, 5.41 and 4.22 for the Nonverbal clusters, and 3.53 and 3.45 for the Spatial clusters. Diagnostic clusters had SEms that ranged from 3.53 (Working Memory) to 5.09 (School Readiness).

Across the 13 whole-age groups (5 to 17), the average standard errors of measurement for the subtests in *T* score units (that is, with a mean of 50 and a SD of 10) range from 2.38 (Pattern Construction) to 4.84 (Recognition of Pictures).

Test-Retest Reliability

In the standardization sample, the stability of the DAS-II was assessed by having 369 individuals retested after an interval ranging from 1 to 9 weeks. The results of the test-retest study showed that for the age groups (3:6–4:11, 5:0–8:11, 10:0–10:11, 11:0–11:11, 14:0–14:11, and 15:0–15:11), reliability coefficients ranged from .92 for the GCA; .89 for the Verbal and Spatial Clusters; .88 for the School Readiness Cluster; .87 for Working Memory Cluster .83 for Processing Speed; and .81 for the Nonverbal Reasoning Cluster. Thus, the DAS-II provides reliable GCA and Cluster scores.

Stability coefficients for the DAS-II subtests ranged from a low of .63 for Matching Letter-Like Forms and Recognition of to a high of .91 for Naming Vocabulary. Subtest stability coefficients are therefore classified according to Sattler's (2008) system as ranging from "marginally reliable" (that is, between .60 and .69) to "reliable."

Changes in Composite and Subtest Scores

An examination of the mean test-retest scores and standard deviations for the Verbal, Nonverbal, Spatial, and GCA for the age groups found the following.

CAUTION

It would generally not be good practice to re-administer the DAS-II to a child after a short period of time.

On average, from the first to the second testing, the GCA increased by 5.1 points, the Verbal cluster by 3.7 points, the Nonverbal Reasoning 5.8 points, and the Spatial 3.3 points. Working Memory and Processing Speed had the lowest test-retest score gains of all the composites (2.4 and 2.1 respectively) while the School Readiness cluster showed the greatest increase of 5.2 points.

As with the Composite and cluster scores, each of the DAS-II subtests showed modest gains on retest, ranging from a low of .5 (Rapid Naming) to 6.8 (Recall of Objects-Immediate) *T* score points. In general, test-retest gains are smallest for the subtests that contribute to the Working Memory and Processing Speed clusters.

When the DAS-II is administered a second time, within 1 to 9 weeks, children are likely to have greater gains on the Nonverbal Reasoning Ability subtests than on the Verbal or Spatial subtests. The magnitude of the gains from first testing to second testing appears to account for the relative instability of the scores as well as the fact that children may be able to recall the types of items they were administered the first time and the strategies they used to solve the problems. Unless there was an imperative reason for doing so, it would generally not be good practice to re-administer the DAS-II to a child after a short period of time. If such re-administration were needed for some reason, the examiner should take into account the average gains cited above.

VALIDITY OF THE DAS-II

Criterion Validity

The degree to which a test is related to an established criterion measure, when both instruments are administered at approximately the same time, reflects concurrent validity. The DAS-II *Introductory and Technical Handbook* (Elliott, 2007b), pp. 163–207, reports the findings of a series of studies in which the DAS-II was given along with the original DAS, the Wechsler Preschool and Primary Scale of Intelligence–Third Edition (WPPSI-III; Wechsler, 2002), Wechsler Intelligence Scale for Children–Fourth Edition (WISC-IV; Wechsler, 2003), and the Bayley Scales of Infant and Toddler Development–Third Edition (Bayley-III; Bayley, 2006). The validity studies in these tables are based on samples that ranged in size from 42 to 313 and included samples of both nonclinical and clinical populations. Below is a summary of some of those studies.

Rapid References 1.9 and 1.10 indicate that the DAS-II has satisfactory concurrent validity. The GCA correlates with other global measures of intelligence developed and published by PsychCorp, ranging from moderate (.59 with the Bayley-III) to high (.88 with the original DAS). Overall, the mean correlation was high (Mr = .80).

For measures of academic achievement, the DAS-II GCA correlated well with the Total scores of tests of academic achievement, ranging from .79 with the Wechsler Individual Achievement Test, 2nd ed. (WIAT-II; Psychological Corporation, 2001) for a sample of children identified with ADHD and LD, to .82 with the WIAT-II for a non-clinical sample.

Rapid Reference 1.9

Summary of DAS-II Correlations With Other Measures of Intelligence

Criterion		GCA
DAS		
	GCA	.88
WPPSI–III		
	Full Scale	.87
WISC–IV		
	Full Scale	.84
Bayley–III		
	Cognitive	.59

Special Groups

The DAS-II *Introductory and Technical Handbook* presents 12 special group studies, summarized in Rapid Reference 1.11. Following are highlights of those tables:

Rapid Reference 1.10

Summary of DAS-II GCA Correlations with Measures of Achievement

	Reading	Math	Written Language	Total Achievement
WIAT-II (Nonclinical)	.72	.77	.66	.82
WIAT-II (ADHD-LD)	.62	.84	.30	.79
WIAT-II (LD-R)	.67			
WIAT-II (LD-M)		.73		
KTEA-II	.67	.74	.65	.81
WJ III	.70	.82	.71	.80

Rapid Reference 1.11

DAS-II Special Group Study Results

Special group	Verbal	Nonverbal Reasoning	Spatial	Working Memory	Processing Speed	School Readiness	GCA
Intellectually gifted	125.4	121.4	117.8	116.7	112.0	114.6	125.4
Mental retardation	54.1	60.7	58.8	57.3	67.8	49.9	51.0
Reading disorder	92.1	91.2	93.0	91.4	89.8	92.9	90.6
Reading and written expression dis.	93.1	90.4	89.6	90.2	87.7	87.8	89.5
Mathematics disorder	95.5	87.8	90.2	89.5	85.5	87.0	89.3
Learning disorder & ADHD	94.2	93.9	92.7	88.5	90.3	90.7	92.5
Attention-deficit/hyperactivity dis.	102.1	99.7	98.9	98.1	95.5	97.9	100.2
Expressive language disorder	85.7	91.3	85.9	85.7	89.3	83.8	85.7
Mixed receptive-expressive lan. dis.	80.8	81.7	81.4	76.2	86.2	79.2	78.5
Deaf/Hard of Hearing		98.5	101.3				100.0*
Limited English Proficiency	85.6	97.6	104.8	91.2	93.2	95.4	94.8
Developmental Disorder	94.0	92.8	95.8				92.5

*For the Deaf/Hard of Hearing, the SNC is used.

- Intellectually gifted: The sample obtained a mean GCA score of 125.4. The individual Cluster scores ranged from 112.0 (Processing Speed) to 125.4 (Verbal).
- Mental retardation—mild or moderate: The sample obtained a General Conceptual Ability score of 51.0. The individual Cluster scores ranged from 49.9 (School Readiness) to 67.8 (Processing Speed).
- Reading disorder: The sample obtained a mean General Conceptual Ability score of 90.6. The individual mean Cluster scores ranged from 89.8 (Processing Speed) to 93.0 (Spatial).
- Reading and written expression disorders: The sample obtained a mean General Conceptual Ability score of 89.5. The individual mean Cluster scores ranged from 87.7 (Processing Speed) to 93.1 (Verbal).
- Mathematics disorder: The sample obtained a mean General Conceptual Ability score of 89.3. The individual mean Cluster scores ranged from 85.5 (Processing Speed) to 95.5 (Verbal).
- Attention-deficit/hyperactivity disorder: The sample obtained a mean General Conceptual Ability score of 100.2. The individual mean Cluster scores ranged from 97.5 (Processing Speed) to 102.1 (Verbal).
- Attention-deficit/hyperactivity disorder and Learning disorder: The sample obtained a mean General Conceptual Ability score of 92.5. The individual mean Cluster scores ranged from 88.5 (Working Memory) to 94.2 (Verbal).
- Expressive language disorder: The sample obtained a mean General Conceptual Ability score of 85.7. The individual mean Cluster scores ranged from 83.8 (School Readiness) to 91.3 (Nonverbal Reasoning).
- Mixed receptive-expressive language disorder: The sample obtained a mean General Conceptual Ability score of 78.5. The individual mean Cluster scores ranged from 76.2 (Working Memory) to 86.2 (Processing Speed).
- Limited English Proficiency: The sample obtained a mean General Conceptual Ability score of 94.8. The individual mean Cluster scores ranged from 85.6 (Verbal) to 104.8 (Spatial).
- Developmentally At Risk: The sample obtained a mean General Conceptual Ability score of 92.5. The individual mean Cluster scores ranged from 92.8 (Nonverbal Reasoning) to 95.8 (Spatial).
- Deaf/Hard of Hearing: The sample obtained a mean Special Nonverbal Composite score of 100.0. The individual mean Cluster scores ranged from 98.5 (Nonverbal Reasoning) to 101.3 (Spatial).

DAS-II SUBTESTS AS MEASURE OF *g*

Examination of the loadings of subtests on the general factor allows one to determine the extent to which the DAS-II subtests measure this general factor, which is often referred to as psychometric *g*. The factor is also often—and misleadingly—referred to as general, global, or overall intelligence. As long ago as 1927, Charles Spearman, one of the great pioneers of the study and measurement of human abilities, observed that "in truth, 'intelligence' has become a mere vocal sound, a word with so many meanings that finally it has none" (p. 14). He went on, "For scientific purposes, then, 'intelligence' can best be thrown out altogether" (p. 196).

So what is the nature of psychometric *g*? Elliott (2007b, p. 17) states, "Psychometric *g* is the general ability of an individual to perform complex mental processing that involves conceptualization and the transformation of information."

The DAS-II *Introductory and Technical Handbook* provides *g* loadings for all subtests for four age groups. These are derived from the confirmatory factor analyses that were conducted on the DAS-II standardization data, and are arguably the best method of estimating *g* loadings. The traditional way of doing this has been by taking the first unrotated loadings from either a principal components analysis or a factor analysis. This is the method favored by Sattler, and estimates using this method may be found in Sattler, Dumont, Willis, and Salerno (2008).

Across all ages for which each subtest is normed, the 20 DAS-II subtests had *g* loadings ranging from a low of .38 (Speed of Information Processing) to a high of .81 (Early Number Concepts). The best measures of *g* includes five Core (Naming Vocabulary, Sequential and Quantitative Reasoning, Verbal Comprehension, Pattern Construction, and Matrices) and two Diagnostic (Early Number Concepts and Recall of Sequential Order) subtests. The poorest measures of *g* are Recall of Objects, Rapid Naming, and Speed of Information Processing, each a Diagnostic subtest (see Figure 1.2).

SUBTEST SPECIFICITY

Subtest specificity refers to the proportion of a subtest's variance that is both reliable (that is, not due to errors of measurement) and distinct to the subtest (that is, not overlapping with other subtests). Although individual subtests on the DAS-II overlap in their measurement properties (that is, one of the components of the reliable variance for most subtests is common factor variance), all

Good measure of g		*Fair measure of g*		*Poor measure of g*	
Subtest	*Average loading of g*	*Subtest*	*Average loading of g*	*Subtest*	*Average loading of g*
ENC[a]	.81	PC[d]	.70	RObjI[c]	.51
NVoc[a]	.81	PhP[c]	.70	RObjI[d]	.49
SQR[d]	.78	PSim[b]	.68	RObjI[b]	.44
ENC[b]	.76	VSim[d]	.68	RN[c, d]	.43
SQR[c]	.76	RDigB[c]	.68	RPic[b]	.42
VComp[a]	.75	PC[b]	.67	SIP[c]	.41
PC[c]	.72	WD[c, d]	.67	SIP[d]	.38
Mat[c, d]	.72	VSim[c]	.67		
RSO[c]	.72	RDes[c]	.66		
		RDigB[d]	.66		
		RSO[d]	.66		
		NVoc[b]	.65		
		RDes[d]	.65		
		MLLF[b]	.64		
		Copying[b]	.62		
		RDigF[b]	.62		
		VComp[b]	.61		
		PSim[a]	.60		
		RDigF[a, c]	.60		
		PC[a]	.59		
		RPic[a]	.59		
		RPic[b]	.57		
		Mat[b]	.57		
		RDigF[d]	.57		
		RPic[c]	.53		
		PSim[a]	.53		

[a] Ages 2:6 to 3:5.

[b] Ages 4:0 to 5:11.

[c] Ages 6:0 to 12:11.

[d] Ages 6:0 to 17:11.

ENC = Early Number Concepts; MLLF = Matching Letter-Like Forms; NVoc = Naming Vocabulary; PC = Pattern Construction; PhP = Phonological Processing; PSim = Picture Similarities; RDes = Recall of Designs; RDigB = Recall of Digits Backward; RDigF = Recall of Digits Forward; RN = Rapid Naming, RObjI = Recall of Objects-Immediate; RPic = Recognition of Pictures; RSO = Re call of Sequential Order; SIP = Speed of Information Processing; SQR = Sequential & Quantitative Reasoning; VComp. = Verbal Comprehension; VSim = Verbal Similarities; WD = Word Definitions

Figure 1.2 DAS-II Subtests as Measures of *g* at the Early Years and School-Age Levels

Source: Adapted from Elliott (2007b, p. 162). Differential Ability Scales–Second Edition. Adapted by permission. Reproduced by permission of the Publisher, The Psychological Corporation. All rights reserved. "Differential Ability Scales–Second Edition" and "DAS-II" are trademarks of The Psychological Corporation.

Battery	Mean *s*	Range of *s*
DAS-II Early Years	.43	.25 to .68
DAS-II School-Age	.41	.17 to .75
WPPSI-III	.34	.16 to .51
WISC-IV	.38	.18 to .60
KABC-II	.41	.11 to .70
SB5 (ages 3-5)	.28	.14 to .47
SB5 (ages 6-10)	.24	.09 to .37
SB5 (ages 11-16)	.25	.11 to .41
WJ III COG (ages 6-13)	.43	.11 to .63
WJ III COG (ages 4-5)	.44	.00 to.76

Figure 1.3 Specificity of Various Cognitive Batteries

Note: s, specificity (proportion of reliable specific variance)

These figures are adapted from Table 18.5 in Contemporary Intellectual Assessment, Flanagan and Harrison (2005)

DAS-II subtests possess sufficient (ample or adequate) specificity to justify the interpretation of specific subtest functions. This important characteristic is not true of all tests of cognitive ability. In many tests of cognitive abilities, some or all of the subtests lack sufficient specificity to be interpreted individually. Those subtests do not stand alone, but only contribute to their scale or factor within the test or only to the total test score. Figure 1.3 shows the mean specificity and ranges for various cognitive batteries. As noted, the DAS-II mean specificities of .43 for the Early Years battery and .41 for the School-Age battery are high. These mean specificities are similar to those of the KABC-II and the WJ III COG, but greater than those of the Wechsler scales or the Stanford-Binet 5.

RANGE OF GCAs, SNCs, CLUSTER STANDARD SCORES

The GCAs and SNCs can range from 30 to 170. Although this range is not available at all ages (Sattler, Dumont, Willis, & Salerno, 2008, pp. 623–624), the DAS-II does provide, at all ages, GCA and SNC scores that are between 48 and 170. For the Verbal, Nonverbal, Nonverbal Reasoning, and Spatial Clusters, at all ages the scores fall between 52 and 157. Across all ages, the Working Memory Composite scores ranges from 69 to 150; the Processing Speed Composite from 57 to 170; and the School Readiness Composite from 42 to 108. Although there appears to be some ceiling effect on the School Readiness Composite, this restriction is mainly at the upper ages for which the composite can be administered. As you would expect, the School Readiness Composite was designed primarily for use with children between the ages of five and six, and at these ages the Composite scores range from 42 to 138. As far as the other composite scores are concerned, the restriction of range that is found is always at the extremes of the age range for the composite. For most ages, the full range of standard scores is available.

RANGE OF SUBTEST *T* SCORES

The DAS-II provides *T* scores that can range from 10 to 90 (–4 to +4 standard deviations from the mean, percentile ranks 0.01 to 99.99), but this range is not available for all subtests at all ages of the test (Sattler, Dumont, Willis, & Salerno, 2008, pp. 623–624). None of the 20 cognitive subtests provides a *T* score of 10 at the lowest ages administered, and only seven of the 20 cognitive subtests provide a *T* score of 90 at the highest ages administered. Although the score range limitations must be viewed carefully, you should remember that many subtests can be administered at either a typical age, an extended age, or at an out-of-level age. Examination of Core and Diagnostic subtest score range finds that when subtests are administered at the ages for which they are primarily intended, adequate floor and ceiling exists. Only a few Diagnostic subtests have range restrictions that must be viewed carefully. See Rapid Reference 1.12 and 1.13 for details of the range of subtest *T* scores by age.

On the Core subtests at the lower Early Years (Verbal Comprehension, Picture Similarities, Naming Vocabulary, and Pattern Construction), all have adequate ceiling. Each has some minor limits to their lowest *T* score (19 to 23, percentile ranks 0.1 to 0.3). On the Core subtests at the Upper Early Years (Verbal Comprehension, Picture Similarities, Naming Vocabulary, Copying, Matrices, and Pattern Construction), all have adequate ceiling. All but Verbal Comprehension have some minor limits to their lowest *T* score (11 to 23, percentile ranks 0.01 to 0.3).

On the Core subtests of the School-Age level, four subtests (Pattern Construction, Matrices, Recall of Designs, and Verbal Similarities) provide the full range of subtest *T* scores at all ages. Word Definitions has some minor limitation of floor (minimum *T* score of 17, percentile rank 0.06 at age 7:0) and Sequential and Quantitative Reasoning has minor limitations to its floor and ceiling *T* scores (minimum and maximum *T* scores 18 to 81, percentile ranks 0.07 to 99.9).

Range of Lower and Upper Early Years Subtest *T* Scores by Age

Ages by Year and Month

	2		3				4				5				6			
	6	**9**	**0**	**3**	**6**	**9**	**0**	**3**	**6**	**9**	**0**	**3**	**6**	**9**	**0**	**3**	**6**	**9**
VComp	19	17	15	12	10-90													
PSim	23	21	19	17	15	11	10-90											
NVoc	19	17	15	13	11	10-90												
PC	20	18	16	14	12	10-90												
Copy					23	20	17	14	11	10-90								
Mat					23	21	19	17	16	15	14	13	11	10-90				
RDf	30	27	24	22	19	17	15	13	10-90									
RPic	30	27	25	23	21	19	17	15	13	11	10-90							
ENC	22	21	20	19	18	17	16	15	13	11	10-90				85	80	75	70
ROi							20	18	14	12	11	10-90						
MLLF							32	28	25-89	22-88	18-85	15-82	13-79	11-76	10-74	72	70	67
PhP											16	11	10-89	87	86	84	82	81
RSO											26	25	24	23	22	21	20	19
RDb											34	31	29	26	24	22	20	18
SIP											37	35	33	31	29	27	26	24
RN											14	12	10-90					

Note: Cells marked 10-90 show ages at which full range of scores is available. Cells with *T* scores less than 50 show lowest score available at that age. Cells with *T* scores greater than 50 show highest score available at that age.

VComp = Verbal Comprehension; PSim = Picture Similarities; NVoc = Naming Vocabulary; PC = Pattern Construction; Copy = Copying; Mat = Matrices; RDf = Recall of Digits–Forward; RPic = Recognition of Pictures; ENC = Early Number Concepts; ROi = Recall of Objects – Immediate; MLLF = Matching Letter-Like Forms; PhP = Phonological Processing; RSO = Recall of Seq. Order; RDb = Recall of Digits – Backward; SIP = Speed of Information Processing; RN = Rapid Naming

Range of School-age Subtest *T* Scores by Age

Ages by Year and Month

	7				8				9		10		11		12		13		14		15		16		17	
	0	3	6	9	0	3	6	9	0	6	0	6	0	6	0	6	0	6	0	6	0	6	0	6	0	6
PC	10-90																									
Mat	10-90																									
RDes	10-90																									
WDef	17	15	14	13	11	10-90																				
VSim	10-90																									
SQR	18	17	16	15	14	13	12		11	10-90														87	84	81
RDf	10-90																						89	88	87	
RPic	10-90						88	86	84	82	80	78	74			72	70	68	66	64	62		61		60	
ROi	10-90																									
PhP	80	79	78		77	76			75				74		73											
RSO	18	17	16	15	14	13	12		11	10-90														86	83	81
RDb	17	15	14	12	11	10-90								89	88	87	86	85	84	83	82	81	80		79	78
SIP	23	22	21	20	18	17	16	15	15	14	13	12	10-90						90	87	86	85			84	
RN	10-90																									

Note: Cells marked 10-90 show ages at which full range of scores is available. Cells with *T* scores less than 50 show lowest score available at that age. Cells with *T* scores greater than 50 show highest score available at that age.

PC = Pattern Construction; Mat = Matrices; RDes = Recall of Designs; WDef = Word Definitions; VSim = Verbal Similarities; SQR =Sequential & Quantitative Reasoning; RDf = Recall of Digits Forward; RPic = Recognition of Pictures; ROi = Recall of Objects–Immediate; PhP = Phonological Processing; RSO = Recall of Seq. Order; RDb = Recall of Digits Backward; SIP = Speed of Information Processing; RN = Rapid Naming

The range limitations at each level are, as you would expect, usually associated with the youngest and/or the oldest ages at which the subtests are administered.

Diagnostic subtests generally have more restriction in *T* score range than do the Core battery subtests. On the three Diagnostic subtests at the Lower Early Years level, each has a maximum *T* score of 90 and they have minimum *T* scores that range from 22 to 30 (percentile ranks 0.3 to 2). Of the 10 Diagnostic subtests at the Upper Early Years level, seven have a maximum *T* score of 90 (Early Number Concepts, Matching Letter-Like Forms, and Phonological Processing have maximum *T* scores of 70, 67, and 81, percentile ranks 98, 96, and 99.9, respectively, at the upper age of the battery), and none has a minimum *T* score of 10, although the minimum *T* score for each does range from 14 to 37 (percentile ranks 0.02 to 10). Of the eight Diagnostic subtests at the School-Age level, two (Recall of Objects and Rapid Naming) have a full range of subtest *T* scores. Of the remaining six subtests, three have a minimum *T* score of 10, while three have a minimum *T* score range of 17 to 23 (percentile ranks 0.06 to 0.3). These six subtests also have maximum *T* scores that range from 60 (percentile rank 84; Recognition of Pictures) to 87 (percentile rank 99.98; Recall of Digits–Forward).

TEST YOURSELF

1. Which of the following clusters are included in the computation of the GCA for an 8-year-old child?

(a) Working Memory
(b) Processing Speed
(c) Spatial Ability
(d) Verbal Ability
(e) School Readiness
(f) Nonverbal Reasoning Ability

2. If you had to re-administer the DAS-II to the same child over a short period of time, on which Cluster would you expect the least amount of change to occur?

(a) Working Memory
(b) Processing Speed
(c) Spatial Ability
(d) Verbal Ability
(e) School Readiness
(f) Nonverbal Reasoning Ability

3. The proportion of a subtest's variance that is both reliable and distinct to the subtest is known as:
   (a) Reliability
   (b) Specificity
   (c) *g* loading
   (d) Standard Error of Measurement

4. You are testing a 7-year-old child believed to have below average intelligence, who is also suspected of having a language disorder. As you test, the child is having little success on the subtests and tasks you are administering. Is it acceptable to administer the battery or subtests from a lower level of the test? Yes or No?

5. What is the typical age range for the DAS-II School-Age battery?

Answers: 1. c, d, and f; 2. b; 3. b; 4. Yes; 5. Ages 7 years 0 months to 17 years 11 months