NNAT3

Naglieri Nonverbal Ability Test® **Third Edition**

Manual

Levels E–G

Pearson

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About the Author

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Dr. Naglieri is the author or coauthor of more than 250 scholarly papers, books, and tests. His scholarly research includes investigations related to exceptionalities such as mental impairment, specific learning disabilities, giftedness, and Attention Deficit Disorder; psychometric studies of tests, such as Wechsler's scales of intelligence, cognitive assessments, and the Kaufman assessments of cognitive abilities; and studies of race, gender, and ethnic differences in cognitive processing; fair assessment using nonverbal and neurocognitive processing tests; identification of gifted minorities, IDEA and identification of specific learning disabilities; and cognitively based mathematics interventions. He has authored various books, including *Essentials of CAS Assessment* (Naglieri, 1999), and coauthored books such as *Assessment of Cognitive Processes: The PASS Theory of Intelligence* (Das, Naglieri, & Kirby, 1994), *Helping Children Learn: Intervention Handouts for Use at School and Home, Second edition* (Naglieri & Pickering, 2010), *Essentials of Wechsler Nonverbal Assessment* (Brunnert, Naglieri, & Hardy-Braz, 2009), and *Helping All Gifted Children Learn: A Teacher's Guide to Using the NNAT2* (Naglieri, Brulles, & Lansdowne, 2009). Dr. Naglieri has also coedited books such as *Handbook of Assessment Psychology* (Graham & Naglieri, 2002), *Assessment of Autism Spectrum Disorders* (Goldstein, Naglieri, & Ozonoff, 2009), *Assessing Impairment: From Theory to Practice* (Goldstein & Naglieri, 2009), *A Practitioner's Guide to Assessment of Intelligence and Achievement* (Naglieri & Goldstein, 2009), and *Handbook of Executive Function* (Goldstein & Naglieri, 2013).

Dr. Naglieri's scholarly efforts also include development and publication of tests and rating scales. He began this work in the mid-1980s with the publication of the *Matrix Analogies Tests* (Naglieri, 1985), which became the *Naglieri Nonverbal Ability Test—Multilevel Form* (Naglieri, 1997), *Naglieri Nonverbal Ability Test—*Second Edition (2008) and now the *Naglieri Nonverbal Ability Test*—Third Edition

(2016). He also published the *Wechsler Nonverbal Scale of Ability* (Wechsler & Naglieri, 2008), the *Devereux Student Strength Assessment* (LeBuffe, Shapiro, & Naglieri, 2009), the *Autism Spectrum Rating Scale* (Goldstein & Naglieri, 2009), the *Comprehensive Executive Functioning Index* (Naglieri & Goldstein, 2013), and the *Cognitive Assessment System*—Second Edition (Naglieri, Das and Goldstein, 2014).

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Chapter 1
Purpose and Design of NNAT3, Levels E–G

The *Naglieri Nonverbal Ability Test*®—Third Edition (NNAT3), Levels E–G, is a brief, nonverbal measure of general ability that can be group administered in online or paper format in about 30 minutes to students aged 9:6 to 17:11. For information about the NNAT3 Levels A–D, refer to the NNAT3 Levels A–D Manual. For information about NNAT3 Levels E–G (grades 5–12), please see the NNAT3 Levels E–G Manual. The purpose of the NNAT3 is to measure general ability using abstract designs which are accessible to a wide variety of students including those with limited educational experiences, those who come from diverse cultural, socioeconomic, or linguistic backgrounds, and those who have language disabilities, autism spectrum disorder, or are deaf or hard of hearing. Because the NNAT3 items consist of geometric shapes that are universal and have no verbal content, and the directions are pictorial with minimal verbal instructions, NNAT3 has great utility as part of the process of identifying students for gifted/talented educational programs, especially for members of groups that have been underrepresented.

The NNAT3, Levels E–G, is a renorming of NNAT2 (Naglieri Nonverbal Ability Test—Second Edition, Naglieri, 2007). That is, the items and content in the NNAT3 are the same as in NNAT2—only the norms are new. The NNAT3 is based on the *Naglieri Nonverbal Ability Test—Multilevel Form* (NNAT-ML; Naglieri, 1997). The original instruments in this series were the *Matrix Analogies Test—Expanded Form* (MAT-EF; Naglieri, 1985a) and *Matrix Analogies Test—Short Form* (MAT-SF; Naglieri, 1985b).

The NNAT3 measures the student's ability to look at a pattern that has a missing section, understand the relationships among the parts, and determine which of the five options correctly fills the gap. An example is shown in Figure 1.1. In this example, the student needs to comprehend the relationships between the two diamonds in the top row and the diamond and triangle in the left column. When the horizontal and vertical relationships are understood, then the answer (option 1) becomes clear.

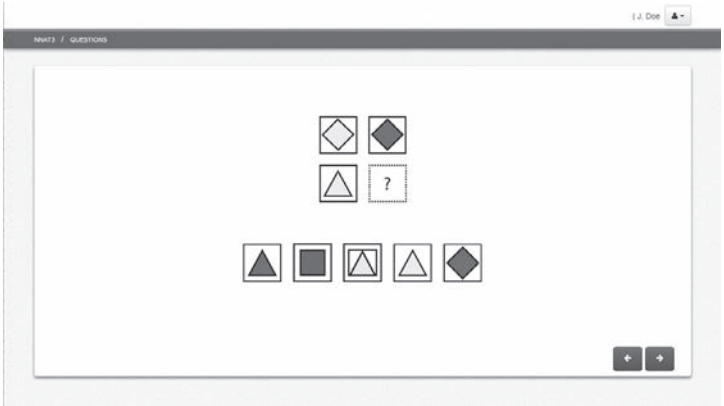

Figure 1.1. Example of an NNAT3 Item

The kind of thinking required to solve a question like this one, made up of shapes and colors, is essentially the same as the thinking required to solve a verbal question such as "Girl is to woman as boy is to . . . ?" In this case the relationships between girl and woman as well as girl and boy must be understood to arrive at the answer "man." Although the thinking is the same whether one is reasoning with words or with shapes, one type requires knowledge of a particular language and, usually, the ability to read, whereas the other type does not require these skills.

The NNAT3 measures general ability—a widely used concept that has been studied since the early 1900s. Naglieri, Brulles, and Lansdowne (2009) described general ability as what enables people to solve a number of different kinds of problems that may involve words, pictures, sounds, or numbers. It may also require verbal, quantitative, or nonverbal reasoning; memory; sequencing; pattern recognition; insights; drawing inferences; and analyzing simple and complex ideas. In modern conceptions of ability, the particular type of thinking that NNAT3 questions require—that is, seeing relationships among components of the question and thinking of rules that can explain those relationships—is considered to be closely related to general ability (Carroll, 1993). Thus, it is not surprising that the various versions of NNAT have been found to be good predictors of academic achievement for students in diverse racial/ethnic groups or from diverse language backgrounds. The power of the concept of general ability makes this a useful approach for large-scale testing.

Design

The NNAT3 Levels E, F, and G are designed specifically for students in the corresponding grades respectively: 5–6, 7–9, and 10–12. Each form consists of 48 items arranged in approximate order of difficulty.

The content of the NNAT3 items vary in difficulty and structure. For example, the easiest items present a large rectangle with a piece missing (see an example in Figure 1.2). The child must choose the option that would complete the larger image, relying on an understanding of how the entire image is organized.

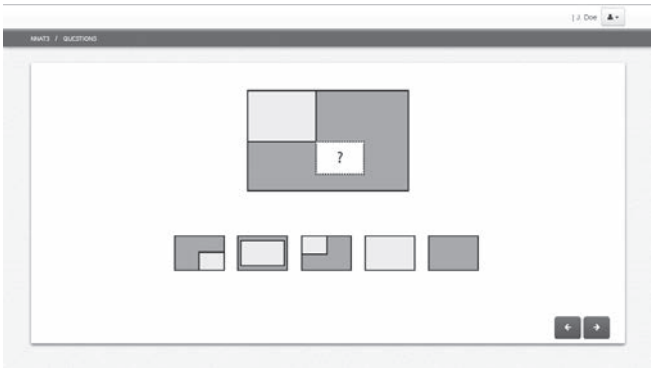

Figure 1.2. Example of an NNAT3 Item with Missing Piece

More difficult items show a set of images in a 2-by-2, 2-by-3, or 3-by-3 array. The elements of a relatively easy item form a simple pattern as shown in Figure 1.3. In this example, the student must recognize changes in shape and color across the horizontal and vertical dimensions to arrive at the correct answer. The items become more complex and difficult when there is an increase in the number of visual features and in the ways in which they can change (e.g., size, rotation, addition, or progression). The structure of the items provides a full range of difficulty necessary to measure ability nonverbally for a wide variety of individuals in the various grade ranges.

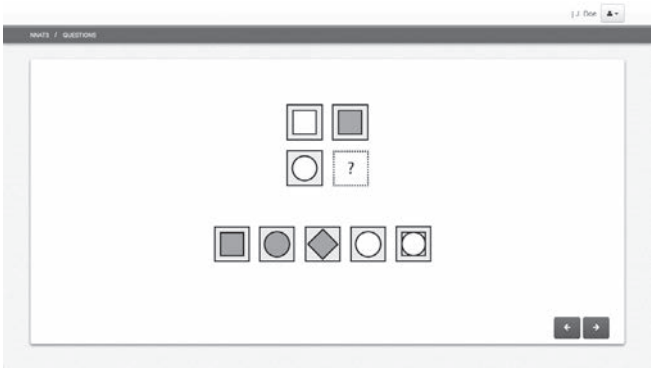

Figure 1.3. Example of an NNAT3 Item with Changes in Color and Shape

Administration

The NNAT3 is designed to be administered to groups of students. The teacher reads the directions (in the language appropriate for the students) and leads the students through sample items, but once the actual test begins, the students work on their own. Students have 30 minutes to work on the test questions, and the overall administration, including directions, takes about 35 to 45 minutes.

The NNAT is considered a power test; that is, it is designed to measure the abilities of the test taker, regardless of his or her speed of performance. Power tests contain items with varying degrees of difficulty and allow enough time for test takers to attempt all items. Based on results from tryout and standardization, most students were able to complete the NNAT3 within 30 minutes. Additionally, a study comparing students who were given additional time to complete the NNAT2 versus those who were not found that students who got additional time did not obtain higher scores. As a result, the 30-minute administration time was deemed appropriate for the NNAT3.

Both the paper-and-pencil and computer-based versions of the NNAT3 are available at all levels. With paper administration students use a nonconsumable (reusable) booklet with a separate machine-scorable answer sheet.

The choice of NNAT3 level to administer is based on the student's grade, although the norms for the NNAT3 are based on age. The items at any given level span a wide range of difficulty so that the level is appropriate for students of different ages at that grade. If necessary, a student may be tested "out of level" (that is, using a level intended for a different grade), as long as the student's age is within the range of valid ages shown in Table 1.1.

Table 1.1. Grade and Valid Age Range for Each NNAT3 Level

Level	Grade(s)	Valid Age Range (year:month)
E	5–6	9:6 to 14:11
F	7–9	11:0 to 17:11
G	10–12	14:0 to 17:11

Uses of NNAT3

The NNAT3 is well suited to evaluating general ability in a wide variety of children. It is a good predictor of academic achievement and is effective as part of the process of identifying gifted and talented students. In addition, the NNAT3 has several features that make it desirable for assessing diverse populations. The use of nonverbal test questions and pictorial directions enables valid and interpretable results to be obtained for students with varied linguistic or cultural backgrounds, such as English language learners. That is, the NNAT3 is particularly valuable for those who cannot be effectively and fairly assessed using tests with items that require knowledge and use of a particular language. These features are also beneficial for assessing students with developmental delays or challenges, the deaf and hard of hearing, students with autism spectrum disorder, and students with little or no schooling.

The NNAT3, therefore, has two primary uses. The first is to help in the identification of gifted and talented students, especially those from under-represented groups; this use addresses one of the most serious challenges facing educators of gifted and talented students. The second use is to provide a measure of general ability for students of all ability levels for whom a language-free assessment is required.

Chapter 2
Interpretation and Applications

NNAT3 results, like those from any test, should be interpreted in light of the student's background, including classroom performance, social-emotional skills, motivation, and language skills. This chapter provides information designed to assist users in interpreting NNAT3 scores when making decisions about educational placement.

Types of Scores

The various types of scores provided for the NNAT3 have different uses and yield different kinds of information. Therefore, users should focus their interpretation on the particular score types that are most relevant to the purpose for which the test was administered. The score types are described in the following section. Please see the appendices at the end of this manual for score tables.

Raw Scores

The raw score is the number of items answered correctly. Raw scores are the basis for scaled scores (described below), but by themselves they provide little information about the level or quality of student performance. They can be interpreted only in reference to the number of items on the test.

Scaled Scores

The scaled-score system is based on a continuous scale of performance that spans across Levels E to G of the NNAT3. A higher scaled-score value indicates that the student was successful on more difficult items. A raw score on any NNAT3 level has a corresponding scaled-score value. A particular raw score will convert to a higher scaled score on a higher (more difficult) NNAT3 level than on a lower level.

Because the scaled-score system links all levels of the test together, it can be used to compare the performance of students taking different levels of the test. Once a raw score has been converted to its corresponding scaled score, the level that was administered is no longer relevant. This makes scaled scores especially suitable for comparing scores from different levels of the test, for studying growth in performance over time, and for testing out of level. The normative scores described (Naglieri Ability Index [NAI], percentile rank, stanine, and normal curve equivalent) are all based on the scaled score and the age of the examinee, rather than the raw score.

Normative Scores

Normative scores describe how the student's performance (scaled score) compares with the performance of other students of the same age in a nationally representative norm sample. For most purposes, normative scores are the most useful basis for interpretation. Because the NNAT3 is a measure of ability rather than academic achievement, the normative scores are based on age rather than grade.

Naglieri Ability Index (NAI)

The Naglieri Ability Index (NAI) is a score on a scale that ranges from 40 to 160, with an average of 100 and a standard deviation of 16. An NAI of 100 represents the score that is the average for students of the same age. About 68% of students in the norm sample score within one standard deviation of 100 (that is, between NAIs of 84 and 116), and about 95% score within two standard deviations (68 to 132). Because NAIs are normalized standard scores, the relationship of NAIs to percentile ranks and stanines is the same for all ages and all NNAT3 levels.

Percentile Rank

The percentile rank indicates the percentage of students of that age in the norm sample who scored at or below that scaled score. As noted above, there is a constant relationship between NAIs and percentile ranks. For example, an NAI of 116 converts to a percentile rank of 84, meaning that 84 percent of students in the norm sample earned NAIs of 116 or lower. An NAI of 100 corresponds to a percentile rank of 50, representing the average NAI for students in the norm sample.

Percentile ranks are valuable because they are easily interpreted and explained. However, they have certain disadvantages. One is that they are often confused with "percentage correct." Another is that a given size difference between percentile ranks has different meaning at different score levels; for example, the difference in ability between percentile ranks of 90 and 95 is much greater than that between percentile ranks of 50 and 55. This characteristic results from the concentration of most scaled scores near the middle of the distribution, with relatively few scores at the extremes. Thus, although percentile ranks are very useful for describing the relative standing of a student within the reference group, they are less useful in describing differences between scores (such as between the scores of two students, or between a student's scores at different times). Because they are not an equal-interval scale, percentile ranks cannot be averaged or used in arithmetical computations such as addition or subtraction.

Stanine

The stanine scale is a simplified version of the NAI scale. Stanines range from 1 to 9 with an average of 5. The nine units of the stanine scale represent equal differences in ability; for example, the difference in ability between stanines 7 and 9 is the same as the difference in ability between stanines 1 and 3. Therefore, stanines may be averaged or used in other arithmetical computations.

In general, stanines 1, 2, and 3 are considered to reflect below-average performance; stanines 4, 5, and 6 reflect average performance; and stanines 7, 8, and 9 reflect above-average performance. Because stanine units are broader than those of the NAI and percentile rank scales, they possess somewhat greater stability and reduce the likelihood of misinterpretations of small differences in test scores.

Normal Curve Equivalent

The normal curve equivalent (NCE) is another version of the NAI scale, this time with an average of 50 and a standard deviation of 21.06. Like NAIs and stanines, NCE scores can be used in arithmetical calculations such as averaging. The benefit of the NCE scale is that NCE scores of 1, 50, and 99 have percentile ranks of 1, 50, and 99, which may assist in interpretation.

All of the normative scores described in this section have fixed relationships with one another. Appendix C may be used to find the equivalent values on these different scales.

Guidelines for Interpreting Different Types of Scores

Scores describe performance. A score should be selected for reporting based on its intended use. Stanine scores report performance on a very simple scale. Stanines range from a low of 1 to a high of 9, with 5 representing an average score. Percentile ranks are generally familiar to teachers and parents, are fairly easy to interpret, and offer more precision than stanines, enabling differentiation of 99 different points. The NAI score enables even finer distinctions of differences in the performances of students at very high or very low levels. A percentile rank of 99, for example, corresponds to an NAI of 135 through 160. Percentile ranks cannot distinguish among students with NAIs of 135 or higher. In those instances in which a cut-score is used for identification, percentile ranks will usually be sufficient. For example, if a state or district uses a 95th percentile to identify gifted and talented students, then using the percentile score for selection makes sense. But if it is necessary to distinguish students at the very high end of this scale, the NAI enables differentiation among students with percentile ranks at or above 99.

Applications and Uses of NNAT3

The NNAT3 has a variety of educational applications. Like the NNAT2, it is a nonverbal measure of general ability that predicts scholastic achievement and is well suited to assessing groups of students with diverse backgrounds and characteristics.

The NNAT3 has ample ceiling for use in identifying gifted students, but it covers the full range of ability and therefore can also be useful in flagging students with low ability who may face difficulties in schoolwork. Furthermore, when used in conjunction with information about academic achievement, the NNAT3 can provide a broader picture of students who are struggling academically and identify students who may have learning problems, whose academic difficulties may be due to learning problems or limited English proficiency, or who may have had inadequate opportunity to learn. These groups of students are likely to do more poorly on tests that require verbal and quantitative knowledge than one that is nonverbal, making a test like the NNAT3 a good choice for accurate assessment.

The design of the NNAT3 items makes its use fair and appropriate with students who have hearing, language, or motor impairments, or who have impaired color vision.

For all of these reasons, the NNAT3 is particularly helpful when the goal is to find all gifted children, including those from diverse cultural, linguistic, or socioeconomic backgrounds, those who have had limited opportunity to learn, and those with hearing or motor impairments. These students may speak a different language or come from a different culture, but they have the potential to learn given the opportunity.

Using NNAT3 with Other Measures for Gifted/Talented Identification

The NNAT3 can be used with other forms of assessment to help identify children who are gifted and talented and provide them with appropriate educational experiences. School districts often use a variety of measures (e.g., standardized achievement tests, creativity measures, grades, and in-class assignments) to identify students who should receive gifted and talented programming. This method of combining different types of information can affect the extent to which the broad reach of the NNAT3 is reflected in the results. Although the NNAT3 provides a way to measure ability that is particularly appropriate for children with limited English-language skills or those settings where enrichment in the home is limited, simply including the test in a larger group of measures will not automatically ensure that the process will identify children from a wide variety of backgrounds. To obtain the greatest benefit from inclusion of the NNAT3, the following factors should be considered.

1. If the identification process requires a series of tests, the NNAT3 should be administered first, and to all of the students. All students should be given the opportunity to demonstrate their abilities, not only those nominated for possible gifted/talented programs. For example, gifted students with limited English skills, learning problems, or inadequate learning opportunities will most likely not be identified if a verbal or quantitative test is administered first.

2. The manner in which information from different sources is combined makes a difference. For example, if students are required to obtain high scores on the NNAT3 and on a verbal or quantitative test, students whose academic achievement has been limited will tend to be excluded. Combining scores from very different tests can yield a misleading conclusion for students in diverse populations and mask a high score on the nonverbal measure of general ability.

The identification of gifted children who may not excel in academics despite high ability presents a challenge to teachers in gifted/talented education (see Winebrenner & Brulles, 2008). In such a situation, high scores on this nonverbal test of general ability enable us to identify those children who have great potential for academic attainment, and those students should be given the opportunity to get additional educational services (Naglieri, Brulles, & Lansdowne, 2009). Addressing the needs of these diverse populations can be accomplished with a variety of educational methods. Differentiated instruction, enrichment clusters, and part-time pull-out classes are common approaches; however, districts vary greatly in the gifted/talented services and programming they provide. Once a student has been found to have high general ability using the NNAT3, the instruction that is delivered must be tailored to the academic needs of the gifted child (Naglieri, Brulles, & Lansdowne, 2009). This will help students from a wide variety of cultural and linguistic groups receive the education they deserve.

What does the NNAT3 Measure?

Concept of General Ability

Group and individually administered intelligence tests that are popular today have been used in educational settings to measure *general ability* for 100 years. The origin of these tests was the Army Alpha and Army Beta tests devised by the U.S. Armed Forces in the early 1900s (Naglieri, 2015). These two tests differed on the basis of the content of the items. The Alpha battery included tests of general information (e.g., how many months are there in a year?), common sense (e.g., why do we use stoves?), verbal knowledge (synonyms/antonyms, verbal analogies), and quantitative skills like completing math word problems (e.g., how many are 40 plus 6 men?). Tests in the Beta battery were nonverbal and included tasks such as completing a maze, constructing a design using blocks,

remembering number-symbol associations, identifying what is missing in a picture, and copying geometric shapes. The Alpha test was viewed as an appropriate measure for literate men who could read and write English, while the Beta tests were intended for those with poor skills in written or spoken English (Yoakum & Yerkes, 1920). The testing procedures ensured that men "who fail in alpha are sent to beta in order that injustice by reason of relative unfamiliarity with English may be avoided" (Yoakum & Yerkes, 1920, p. 19). Thus, the Alpha and Beta tests were considered to be alternative methods of assessing general ability. These tests made a significant and long-lasting contribution to our understanding of how to measure and conceptualize general ability.

The initial thinking about the concept of general ability as a broad, general trait was described by Pintner (1923) when he wrote that "we did not start with a clear definition of general intelligence . . . [but] borrowed from every-day life a vague term implying all-round ability and . . . we [are] still attempting to define it more sharply and endow it with a stricter scientific connotation" (p. 53). Some years later Wechsler (1958) stated that even though his test of general ability was organized into verbal and performance scales, it did not measure two types of intelligence; rather, "the subtests are different measures of intelligence, not measures of different kinds of intelligence" (p. 64), and he viewed both types as equally valid (Boake, 2002). Similarly, the term "nonverbal" refers to the content of the test, not a type of ability (Naglieri, 2008). Thus, tests may differ in their content or specific demands but still measure the concept of general ability—what Spearman referred to as the "indifference of the indicator" (1927, p. 197).

The diversity of tasks and content that may be utilized to measure general ability was highlighted by Naglieri, Brulles, and Lansdowne (2009, p. 5): "General ability is what enables people to solve a number of different kinds of problems that may involve words, pictures, sounds, or numbers. The test questions may also involve verbal, quantitative, or nonverbal reasoning, memory, sequencing, verbal and math skills, patterning, connecting ideas across and within content areas, insights, making connections, drawing inferences, and analyzing simple and complex ideas."

There is considerable research support for the concept of general ability as measured by individually administered tests such as the Wechsler and Stanford-Binet (see Jensen, 1998, for a review) and by group tests such as the NNAT3. Among the most important sources of validity evidence for general ability tests is the fact that the scores the tests yield are good predictors of school achievement (Naglieri & Bornstein, 2003; Ramsey & Reynolds, 2004).

Verbal, Quantitative, and Nonverbal Ways of Measuring General Ability

General ability can be measured using verbal, quantitative, or nonverbal test questions because of the similarity in the thinking required to answer these questions. In all three test types, the student must understand the relationships among the stimuli and must formulate and evaluate hypotheses about the rule that governs the pattern of relationships. Verbal tests (such as analogies) require the student to understand relationships among words and the concepts they represent, quantitative test questions require the student to understand relationships among numbers, and nonverbal test questions require the student to understand relationships among shapes. Examples of the three question types are shown in Figure 2.1.

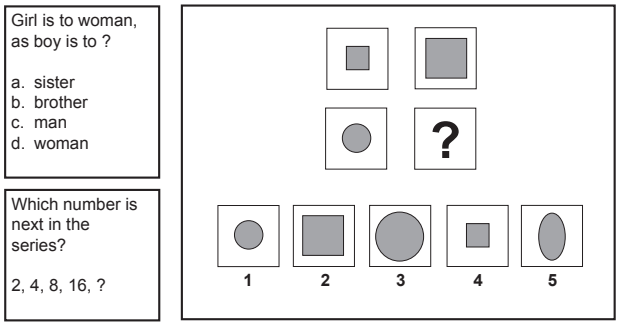

Figure 2.1. Examples of Verbal, Quantitative, and Nonverbal Questions

Each of the questions illustrated in Figure 2.1 can only be solved if the examinee can understand the relationships among all the parts of the problem. The verbal analogy "Girl is to woman as boy is to ____?" requires that the examinee understand the way in which the words "girl" and "woman" are related and how "girl" and "boy" are related so that the answer (man) can be determined. Each of these pieces of information has meaning in relation to the others. The same is true for the quantitative reasoning item. In order to arrive at the answer, the student must infer the relationship between the first two numbers, 2 and 4 (the rule could be "add 2" or "multiply by 2"), then see if this relationship applies to the next pair of numbers, 4 and 8 ("add 2" does not work, but "multiply by 2" does), and then test the hypothesized rule by applying it to the last pair of numbers. These verbal and quantitative problems clearly require understanding of the relationships among the stimuli, which depends on knowledge (words and verbal concepts; numbers and arithmetic).

The nonverbal question also requires the student to understand the relationships among the shapes organized in the two-by-two matrix. To solve the problem, the relationships between the two shapes in the top row (change in size—little square becomes big square) and the two shapes in the left column (change in shape—little square becomes little circle) have to be understood and

applied to arrive at the answer (big circle). The relationships can be determined even if the shapes are not labeled as big and little or square and circle. Verbal and quantitative reasoning tests require both knowledge *and* thinking, whereas nonverbal reasoning tests require minimal knowledge but certainly demand thinking. Thus, general ability can be measured using verbal and quantitative tests that require knowledge *and* thinking, but nonverbal tests just require thinking.

Chapter 3
Standardization, Norms Development, and Reliability

This chapter documents the standardization of NNAT3 Levels E through G, including data-collection procedures, the demographic characteristics of the norm sample, and the method used to construct the norms. It also reports the reliability of scores in the standardization sample.

Standardization and Norms Development

The norm sample for NNAT3 Levels E–G consists of more than 9,500 students drawn from 59 schools in 23 states. Schools were chosen to be representative of the national school population with respect to ethnicity, socioeconomic status, geographical region, urbanicity, and type of school (public or private). Socioeconomic status was measured at the school level by the percentage of students receiving free/reduced lunch, grouped into three levels that each correspond to about one-third of schools in the United States. A list of the participating schools is included in Appendix D.

Testing took place between February and May of 2016. All tests were administered on computer using a mouse and students were tested in groups.

Table 3.1 shows the number of students in the norm sample at each year of age, both before and after weighting (described in the following paragraph). In order to provide data for norms starting at age 9:6 (9 years 6 months), which is the low end of the age range of students in the fall of Grade 5, sampling started at Grade 4. Students at that grade took the grade-appropriate level of NNAT2 (Level D), which provided scaled scores on the same scale as is used for NNAT3 Levels E through G. Cases from students aged 18 were not included in the norming process because the sampling method was not designed to collect a fully representative sample of individuals of that age.

Table 3.1. Number of Cases in the NNAT3 Levels E–G Norm Sample, by Age

	Number of Cases	
Age	Actual	Weighted
9	476	404
10	1277	1095
11	1239	1101
12	1137	997
13	1116	995
14	1174	1101
15	1238	1101
16	1038	993
17	888	792
Total	9583	8579

Although schools were selected according to the demographic criteria described above, statistical weighting was applied after testing in order to improve the match of the norm sample to the national population. The weighting procedure involved random deletion or duplication of cases until the desired sample characteristics were obtained. Table 3.2 presents the demographic characteristics of the weighted norm sample.

Table 3.2. Demographic Characteristics of the NNAT3 Levels E–G Norm Sample

		Percentage of Total U.S. School Enrollment, Ages 9–17	Percentage of Students in Norm Sample
Gender	Female	48.9	49.3
	Male	51.1	50.7
Ethnicity	African American	13.8	14.2
	Asian	4.7	4.5
	Hispanic	23.2	22.7
	White	53.3	54.1
	Other	5.0	4.6
SES[a]	Low	32.6	31.7
	Middle	31.2	32.7
	High	36.3	35.6
Geographic Region	Northeast	16.6	18.0
	Midwest	21.5	22.0
	South	37.8	35.5
	West	24.1	24.6
Urbanicity[a]	Urban	20.9	26.5
	Suburban	49.9	51.6
	Rural	29.2	21.9
School Type	Public	90.1	90.1
	Private/Catholic	9.9	9.9

[a]SES and urbanicity are reported for public school students only.

Source: National Center for Educational Statistics 2013–2014 Common Core Data; United States Census Bureau, American Community Survey 2014

Equating Paper-and-Pencil-Based Tests With Computer-Based Tests

A sample of more than 9,800 students was collected during the original NNAT2 standardization to evaluate the comparability of test scores obtained from computer administration with scores from paper-and-pencil administration. Students who participated in this study took both the NNAT2 paper-and-pencil-based and computer-based tests. The order in which students took the two versions was counter-balanced with half of the students taking the paper-and-pencil-based test first and the other half taking the computer-based test first. Results of the

study revealed some differences in students' raw scores between the two versions, similar to the differences later found for NNAT3 Levels A–D. Because Levels E through G content and administration are the same on NNAT2 and NNAT3, the results of the NNAT2 study for these levels apply to NNAT3.

The same method was used to adjust for mode differences on all NNAT3 levels. For each level (and for each form at Levels A–D), separate raw-score-to-scaled-score conversion tables were developed for the two administration modes, making scaled scores from online and paper administrations comparable. (See Appendix A.) All other scoring tables, including those converting scaled score to NAI and converting NAI to percentile, stanine, and NCE, are the same for both versions.

Norms Construction

The NNAT3 age norms are based on scaled scores rather than raw scores. The scaled score system for NNAT3 Levels E–G links all three levels together, yielding a continuous scale that makes it possible to compare the performance of students taking different levels. Once a raw score is converted to its corresponding scaled score, the level that was administered is no longer relevant, because the NAI, percentile rank, stanine, and Normal Curve Equivalent (NCE) are all based on the scaled score and the age of the examinee rather than the raw score.

NNAT3 scaled scores for Levels E through G, which range from approximately 400 to 850, are the same as those for NNAT2 because the content of NNAT2 and NNAT3 is the same at these levels. Scaled scores are based on a linear transformation of Rasch ability scores from a single joint calibration of all NNAT2 levels, based on common items at adjacent levels. The range of scaled scores for Levels E–G does not overlap with the range for Levels A–D in order to prevent accidental misuse of scaled scores from Levels E–G with norms for Levels A–D (or vice-versa).

The percentile-smoothing method was used to construct the age-norm tables that convert scaled scores to NAI scores. In the initial phase, the frequency distribution of scaled scores was smoothed within each year of age. To do this, mid-interval percentile values of scaled scores were calculated at each year of age. These percentiles were converted to the NAI scale ($M = 100$, $SD = 16$) using a normal-curve area transformation. Scaled scores were plotted against these preliminary NAI scores, and the resulting trend was smoothed by fitting a simple polynomial curve. From this curve, scaled scores corresponding to every fourth NAI value from 64 to 136 were obtained.

The second phase was to fit an Age–Growth curve to the trend of scaled scores corresponding to each of the NAI values mentioned above. For example, a curve was fitted to the trend of scaled scores for an NAI of 100 (50th percentile) across

the range from ages 9 to 17. This was accomplished using CurveExpert Pro (Hyams, 2014) and Microsoft Excel. Finally, at the midpoint of each three-month age range, the scaled score value for each NAI level was read from the growth curves. The within-age plot of NAI against scaled score was smoothed using simple polynomial curves, yielding smoothed scaled-score-to-NAI conversions over the range of NAI scores from 60 to 140. Values down to 40 and up to 160 were obtained through linear extrapolation.

When the final norm table was applied to the full standardization sample, the mean NAI score was 100.2 and the standard deviation was 15.8.

Reliability

Test-score reliability refers to the consistency of examinees' scores when they are tested on different occasions close together in time, or using parallel forms. It indicates the precision of test scores, that is, their freedom from the effects of measurement error.

Reliability can be assessed in various ways that are sensitive to different types of measurement error. "Internal-consistency" reliability, a frequently used method, is based on a single administration of the test. It uses the consistency of performance on different sections of the test as the basis for estimating how consistent performance would be if the examinee were given a parallel form during the same test session. For Levels E through G of NNAT3, two types of internal-consistency reliability have been calculated, coefficient alpha and split-half (odd-even). The odd-even reliability has the advantage of being based on the correlation between two test halves (odd-numbered items and even-numbered items) that are quite parallel in difficulty and item type, whereas alpha is based on the average of all possible splits including ones which are very non-parallel (e.g., first half and second half).

Because NNAT3 Levels E through G have the same content and administration as the corresponding NNAT2 levels, their reliabilities are expected to be unchanged. Table 3.3 reports internal-consistency reliabilities (coefficient alpha and odd-even) by test level and grade. Grade, rather than age, is used to group the data because NNAT3 levels are assigned by grade. A grade-based sample shows how the full range of students in a grade performs on the same NNAT3 level, whereas in a full age-based sample different students would take different levels. The sample at each level is the unweighted norm sample.

Table 3.3 also reports the standard error of measurement (*SEM*) of NAI scores by grade, based on the odd-even reliabilities. The *SEM* may be thought of as, roughly, the average amount by which an observed score differs from the true score (i.e., the score that would be obtained if the test were perfectly accurate). *SEM*s are useful in constructing confidence intervals.

Table 3.3. Reliability and *SEM* by Level and Grade

Level	Grade	*N*	Reliability		*SEM* of NAI
			Alpha	Odd-Even	
E	5	1230	.81	.82	6.7
	6	1164	.85	.85	6.1
F	7	1122	.84	.85	6.1
	8	1113	.86	.86	5.9
	9	1318	.88	.89	5.3
G	10	1037	.87	.88	5.6
	11	965	.89	.90	5.0
	12	779	.89	.90	4.9

Appendix A: Scaled Scores Corresponding to Raw Scores by Level and Administration Mode

Table 1. Computer-Based Testing

Level E		Level F		Level G	
Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score
48	821	48	829	48	849
47	796	47	804	47	824
46	769	46	778	46	797
45	752	45	762	45	780
44	740	44	750	44	768
43	729	43	740	43	757
42	721	42	731	42	748
41	713	41	724	41	741
40	706	40	717	40	733
39	699	39	711	39	727
38	693	38	705	38	721
37	688	37	700	37	715
36	682	36	694	36	710
35	677	35	690	35	704
34	672	34	685	34	699
33	667	33	680	33	694
32	663	32	675	32	690
31	658	31	671	31	685
30	653	30	667	30	681
29	649	29	662	29	676
28	644	28	658	28	672
27	640	27	654	27	668
26	636	26	650	26	663
25	631	25	645	25	659
24	627	24	641	24	655
23	623	23	637	23	651
22	619	22	633	22	647
21	614	21	628	21	643
20	610	20	624	20	638
19	605	19	620	19	634
18	601	18	615	18	630
17	596	17	610	17	625
16	592	16	606	16	621
15	587	15	601	15	616
14	582	14	595	14	611
13	577	13	590	13	606
12	572	12	584	12	601
11	566	11	578	11	596
10	560	10	571	10	590
9	554	9	564	9	584
8	547	8	556	8	577
7	539	7	547	7	570
6	530	6	537	6	562
5	520	5	525	5	554
4	508	4	511	4	544
3	494	3	493	3	531
2	474	2	469	2	514
1	443	1	434	1	488
0	403	0	403	0	446

Appendix A, Continued

Table 2. Paper-and-Pencil-Based Testing

Level E		Level F		Level G	
Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score
48	821	48	829	48	849
47	792	47	803	47	816
46	765	46	777	46	790
45	748	45	760	45	773
44	736	44	748	44	760
43	725	43	738	43	750
42	716	42	730	42	741
41	709	41	722	41	733
40	701	40	715	40	726
39	695	39	709	39	719
38	689	38	703	38	713
37	683	37	697	37	707
36	677	36	692	36	702
35	672	35	687	35	696
34	667	34	682	34	691
33	662	33	678	33	687
32	658	32	673	32	682
31	653	31	668	31	677
30	648	30	664	30	673
29	644	29	660	29	668
28	640	28	656	28	664
27	635	27	651	27	660
26	631	26	647	26	655
25	627	25	643	25	651
24	622	24	639	24	647
23	618	23	635	23	643
22	614	22	630	22	638
21	610	21	626	21	634
20	605	20	622	20	630
19	601	19	618	19	625
18	597	18	613	18	621
17	592	17	609	17	616
16	588	16	604	16	612
15	583	15	599	15	607
14	578	14	594	14	602
13	573	13	589	13	597
12	568	12	584	12	592
11	563	11	578	11	586
10	557	10	572	10	580
9	551	9	565	9	574
8	544	8	558	8	567
7	537	7	551	7	560
6	529	6	542	6	552
5	519	5	532	5	542
4	509	4	521	4	531
3	495	3	507	3	518
2	477	2	489	2	501
1	449	1	460	1	473
0	403	0	403	0	446

Appendix B: Naglieri Ability Indexes Corresponding to Scaled Scores by Age

NAI	SCALED SCORES									
	9-Year-Olds		10-Year-Olds				11-Year-Olds			
	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.
160	Above 759	Above 762	Above 764	Above 767	Above 769	Above 771	Above 773	Above 775	Above 778	Above 781
159	757–759	760–762	763–764	765–767	767–769	769–771	772–773	774–775	776–778	779–781
158	755–756	757–759	760–762	763–764	765–766	767–768	769–771	771–773	774–775	776–778
157	753–754	755–756	757–759	760–762	763–764	765–766	767–768	769–770	772–773	774–775
156	751–752	753–754	755–756	758–759	760–762	763–764	765–766	767–768	770–771	772–773
155	749–750	751–752	753–754	755–757	758–759	760–762	763–764	765–766	767–769	770–771
154	747–748	749–750	751–752	753–754	756–757	758–759	760–762	763–764	765–766	768–769
153	745–746	747–748	749–750	751–752	753–755	756–757	758–759	761–762	763–764	766–767
152	742–744	745–746	747–748	749–750	751–752	754–755	756–757	759–760	761–762	764–765
151	740–741	742–744	745–746	747–748	749–750	752–753	754–755	756–758	759–760	761–763
150	738–739	740–741	743–744	745–746	747–748	749–751	752–753	754–755	757–758	759–760
149	736–737	738–739	741–742	743–744	745–746	747–748	750–751	752–753	755–756	757–758
148	734–735	736–737	738–740	741–742	743–744	745–746	748–749	750–751	753–754	755–756
147	732–733	734–735	736–737	738–740	741–742	743–744	746–747	748–749	750–752	753–754
146	730–731	732–733	734–735	736–737	739–740	741–742	743–745	746–747	748–749	751–752
145	728–729	730–731	732–733	734–735	737–738	739–740	741–742	744–745	746–747	749–750
144	725–727	728–729	730–731	732–733	734–736	737–738	739–740	742–743	744–745	746–748
143	723–724	725–727	728–729	730–731	732–733	735–736	737–738	739–741	742–743	744–745
142	721–722	723–724	726–727	728–729	730–731	733–734	735–736	737–738	740–741	742–743
141	719–720	721–722	724–725	726–727	728–729	731–732	733–734	735–736	738–739	740–741
140	717–718	719–720	721–723	724–725	726–727	728–730	731–732	733–734	736–737	738–739
139	715–716	717–718	719–720	722–723	724–725	726–727	729–730	731–732	733–735	736–737
138	713–714	715–716	717–718	720–721	722–723	724–725	727–728	729–730	731–732	734–735
137	710–712	713–714	715–716	717–719	720–721	722–723	724–726	727–728	729–730	731–733
136	708–709	711–712	713–714	715–716	718–719	720–721	722–723	725–726	727–728	729–730
135	706–707	709–710	711–712	713–714	716–717	718–719	720–721	723–724	725–726	727–728
134	704–705	706–708	709–710	711–712	713–715	716–717	718–719	720–722	723–724	725–726
133	702–703	704–705	707–708	709–710	711–712	714–715	716–717	718–719	721–722	723–724
132	700–701	702–703	705–706	707–708	709–710	712–713	714–715	716–717	718–720	721–722
131	698–699	700–701	702–704	705–706	707–708	709–711	712–713	714–715	716–717	719–720
130	696–697	698–699	700–701	703–704	705–706	707–708	710–711	712–713	714–715	716–718

NAI	SCALED SCORES									
	9-Year-Olds		10-Year-Olds				11-Year-Olds			
	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.
129	693–695	696–697	698–699	701–702	703–704	705–706	708–709	710–711	712–713	714–715
128	691–692	694–695	696–697	698–700	701–702	703–704	705–707	708–709	710–711	712–713
127	689–690	692–693	694–695	696–697	699–700	701–702	703–704	706–707	708–709	710–711
126	687–688	689–691	692–693	694–695	697–698	699–700	701–702	703–705	706–707	708–709
125	685–686	687–688	690–691	692–693	695–696	697–698	699–700	701–702	703–705	706–707
124	683–684	685–686	688–689	690–691	693–694	695–696	697–698	699–700	701–702	703–705
123	680–682	683–684	686–687	688–689	690–692	693–694	695–696	697–698	699–700	701–702
122	678–679	681–682	683–685	686–687	688–689	690–692	693–694	695–696	697–698	699–700
121	676–677	679–680	681–682	684–685	686–687	688–689	690–692	693–694	695–696	697–698
120	674–675	676–678	679–680	681–683	684–685	686–687	688–689	690–692	693–694	695–696
119	671–673	674–675	677–678	679–680	681–683	684–685	686–687	688–689	690–692	693–694
118	669–670	672–673	674–676	677–678	679–680	682–683	684–685	686–687	688–689	690–692
117	667–668	670–671	672–673	675–676	677–678	679–681	682–683	684–685	686–687	688–689
116	665–666	667–669	670–671	672–674	675–676	677–678	679–681	682–683	684–685	686–687
115	662–664	665–666	668–669	670–671	673–674	675–676	677–678	679–681	682–683	684–685
114	660–661	663–664	666–667	668–669	671–672	673–674	675–676	677–678	679–681	681–683
113	658–659	661–662	663–665	666–667	668–670	671–672	673–674	675–676	677–678	679–680
112	656–657	659–660	661–662	664–665	666–667	669–670	671–672	673–674	675–676	677–678
111	653–655	656–658	659–660	662–663	664–665	666–668	669–670	671–672	673–674	675–676
110	651–652	654–655	657–658	659–661	662–663	664–665	666–668	669–670	671–672	673–674
109	649–650	652–653	655–656	657–658	660–661	662–663	664–665	666–668	669–670	671–672
108	647–648	650–651	653–654	655–656	658–659	660–661	662–663	664–665	666–668	668–670
107	645–646	648–649	650–652	653–654	656–657	658–659	660–661	662–663	664–665	666–667
106	643–644	646–647	648–649	651–652	653–655	656–657	658–659	660–661	662–663	664–665
105	640–642	643–645	646–647	649–650	651–652	654–655	656–657	658–659	660–661	662–663
104	638–639	641–642	644–645	647–648	649–650	652–653	654–655	656–657	658–659	660–661
103	636–637	639–640	642–643	645–646	647–648	649–651	652–653	654–655	656–657	658–659
102	634–635	637–638	640–641	642–644	645–646	647–648	649–651	652–653	654–655	655–657
101	632–633	635–636	638–639	640–641	643–644	645–646	647–648	649–651	651–653	653–654
100	630–631	633–634	636–637	638–639	641–642	643–644	645–646	647–648	649–650	651–652
99	627–629	631–632	634–635	636–637	639–640	641–642	643–644	645–646	647–648	649–650
98	625–626	629–630	631–633	634–635	637–638	639–640	641–642	643–644	644–646	647–648

Appendix B, Continued

NAI	SCALED SCORES									
	9-Year-Olds		10-Year-Olds				11-Year-Olds			
	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.
97	622–624	626–628	629–630	632–633	635–636	637–638	639–640	641–642	642–643	644–646
96	620–621	624–625	627–628	630–631	632–634	635–636	637–638	638–640	640–641	641–643
95	618–619	622–623	625–626	627–629	630–631	632–634	635–636	636–637	638–639	639–640
94	616–617	619–621	622–624	625–626	627–629	630–631	632–634	634–635	635–637	636–638
93	613–615	617–618	620–621	622–624	625–626	627–629	630–631	632–633	633–634	634–635
92	611–612	615–616	618–619	620–621	622–624	625–626	627–629	629–631	630–632	632–633
91	609–610	612–614	615–617	618–619	620–621	622–624	625–626	627–628	628–629	630–631
90	607–608	610–611	613–614	616–617	618–619	620–621	622–624	624–626	626–627	628–629
89	605–606	608–609	611–612	614–615	616–617	618–619	620–621	622–623	624–625	626–627
88	603–604	606–607	609–610	612–613	614–615	616–617	618–619	620–621	622–623	624–625
87	601–602	604–605	607–608	610–611	612–613	614–615	616–617	618–619	620–621	622–623
86	599–600	602–603	605–606	608–609	610–611	612–613	614–615	616–617	618–619	620–621
85	597–598	600–601	603–604	605–607	608–609	610–611	612–613	614–615	616–617	618–619
84	595–596	598–599	601–602	603–604	606–607	608–609	610–611	612–613	614–615	616–617
83	592–594	595–597	599–600	601–602	604–605	606–607	608–609	610–611	612–613	613–615
82	590–591	593–594	596–598	599–600	601–603	604–605	606–607	608–609	610–611	611–612
81	588–589	591–592	594–595	596–598	599–600	601–603	604–605	606–607	608–609	609–610
80	586–587	588–590	592–593	594–595	596–598	599–600	601–603	604–605	606–607	607–608
79	584–585	586–587	589–591	592–593	594–595	596–598	599–600	601–603	604–605	605–606
78	582–583	584–585	587–588	589–591	592–593	594–595	596–598	599–600	601–603	603–604
77	580–581	582–583	585–586	587–588	590–591	592–593	594–595	596–598	599–600	600–602
76	577–579	580–581	582–584	585–586	588–589	590–591	592–593	594–595	596–598	598–599
75	575–576	577–579	580–581	583–584	585–587	588–589	590–591	592–593	594–595	596–597
74	573–574	575–576	578–579	581–582	583–584	585–587	588–589	590–591	592–593	594–595
73	570–572	573–574	576–577	579–580	581–582	583–584	585–587	588–589	590–591	592–593
72	568–569	571–572	574–575	577–578	579–580	581–582	583–584	585–587	588–589	589–591
71	565–567	569–570	572–573	575–576	577–578	579–580	581–582	583–584	585–587	587–588
70	563–564	567–568	570–571	572–574	575–576	577–578	579–580	581–582	583–584	585–586
69	561–562	565–566	568–569	570–571	573–574	575–576	577–578	579–580	581–582	583–584
68	559–560	562–564	565–567	568–569	571–572	573–574	575–576	577–578	579–580	581–582
67	557–558	560–561	563–564	566–567	569–570	571–572	573–574	575–576	577–578	579–580
66	555–556	558–559	561–562	564–565	566–568	569–570	571–572	573–574	575–576	576–578

NAI	SCALED SCORES									
	9-Year-Olds		10-Year-Olds				11-Year-Olds			
	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.
65	553–554	556–557	559–560	562–563	564–565	566–568	569–570	571–572	573–574	574–575
64	551–552	554–555	557–558	560–561	562–563	564–565	566–568	569–570	571–572	572–573
63	548–550	552–553	555–556	558–559	560–561	562–563	564–565	566–568	569–570	570–571
62	546–547	550–551	553–554	556–557	558–559	560–561	562–563	564–565	566–568	568–569
61	544–545	548–549	551–552	553–555	556–557	558–559	560–561	562–563	564–565	566–567
60	542–543	545–547	549–550	551–552	554–555	556–557	558–559	560–561	562–563	564–565
59	540–541	543–544	546–548	549–550	552–553	554–555	556–557	558–559	560–561	561–563
58	538–539	541–542	544–545	547–548	549–551	552–553	554–555	556–557	558–559	559–560
57	536–537	539–540	542–543	545–546	547–548	549–551	552–553	554–555	556–557	557–558
56	533–535	537–538	540–541	543–544	545–546	547–548	549–551	552–553	554–555	555–556
55	531–532	535–536	538–539	541–542	543–544	545–546	547–548	549–551	552–553	553–554
54	529–530	533–534	536–537	539–540	541–542	543–544	545–546	547–548	549–551	551–552
53	527–528	531–532	534–535	537–538	539–540	541–542	543–544	545–546	547–548	549–550
52	525–526	528–530	532–533	535–536	537–538	539–540	541–542	543–544	545–546	546–548
51	523–524	526–527	530–531	532–534	535–536	537–538	539–540	541–542	543–544	544–545
50	521–522	524–525	527–529	530–531	532–534	535–536	537–538	539–540	541–542	542–543
49	518–520	522–523	525–526	528–529	530–531	532–534	535–536	537–538	539–540	540–541
48	516–517	520–521	523–524	526–527	528–529	530–531	532–534	535–536	537–538	538–539
47	514–515	518–519	521–522	524–525	526–527	528–529	530–531	532–534	535–536	536–537
46	512–513	516–517	519–520	522–523	524–525	526–527	528–529	530–531	532–534	534–535
45	510–511	514–515	517–518	520–521	522–523	524–525	526–527	528–529	530–531	531–533
44	508–509	512–513	515–516	518–519	520–521	522–523	524–525	526–527	528–529	529–530
43	506–507	509–511	512–514	515–517	518–519	520–521	522–523	524–525	526–527	527–528
42	504–505	506–508	509–511	512–514	515–517	518–519	520–521	522–523	524–525	525–526
41	501–503	504–505	506–508	509–511	512–514	515–517	517–519	519–521	521–523	523–524
40	Below 501	Below 504	Below 506	Below 509	Below 512	Below 515	Below 517	Below 519	Below 521	Below 523

Appendix B, Continued

NAI	SCALED SCORES											
	12-Year-Olds				13-Year-Olds				14-Year-Olds			
	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.
160	Above 784	Above 786	Above 788	Above 791	Above 794	Above 797	Above 800	Above 803	Above 805	Above 808	Above 810	Above 812
159	782–784	785–786	787–788	789–791	792–794	795–797	798–800	801–803	804–805	806–808	809–810	811–812
158	779–781	782–784	785–786	787–788	790–791	793–794	796–797	798–800	801–803	804–805	806–808	808–810
157	777–778	780–781	782–784	785–786	788–789	791–792	793–795	796–797	799–800	801–803	804–805	806–807
156	775–776	777–779	780–781	782–784	786–787	788–790	791–792	794–795	797–798	799–800	801–803	804–805
155	773–774	775–776	778–779	780–781	783–785	786–787	789–790	791–793	794–796	797–798	799–800	801–803
154	770–772	773–774	776–777	778–779	781–782	784–785	786–788	789–790	792–793	794–796	797–798	799–800
153	768–769	771–772	774–775	776–777	779–780	782–783	784–785	787–788	789–791	792–793	794–796	797–798
152	766–767	769–770	771–773	774–775	777–778	779–781	782–783	785–786	787–788	789–791	792–793	794–796
151	764–765	767–768	769–770	772–773	774–776	777–778	780–781	782–784	785–786	787–788	789–791	792–793
150	762–763	764–766	767–768	770–771	772–773	775–776	777–779	780–781	783–784	785–786	787–788	789–791
149	760–761	762–763	765–766	768–769	770–771	773–774	775–776	778–779	780–782	783–784	785–786	787–788
148	758–759	760–761	763–764	765–767	767–769	770–772	773–774	775–777	778–779	780–782	783–784	784–786
147	755–757	758–759	760–762	763–764	765–766	768–769	770–772	773–774	776–777	778–779	780–782	782–783
146	753–754	756–757	758–759	760–762	763–764	766–767	768–769	771–772	773–775	776–777	778–779	780–781
145	751–752	754–755	756–757	758–759	761–762	763–765	766–767	768–770	771–772	773–775	776–777	777–779
144	749–750	751–753	754–755	756–757	759–760	761–762	764–765	766–767	769–770	771–772	773–775	775–776
143	747–748	749–750	752–753	754–755	756–758	759–760	761–763	764–765	766–768	769–770	771–772	772–774
142	745–746	747–748	749–751	752–753	754–755	757–758	759–760	761–763	764–765	766–768	769–770	770–771
141	742–744	745–746	747–748	749–751	752–753	754–756	757–758	759–760	762–763	764–765	766–768	768–769
140	740–741	743–744	745–746	747–748	750–751	752–753	755–756	757–758	759–761	762–763	764–765	765–767
139	738–739	740–742	743–744	745–746	748–749	750–751	752–754	755–756	757–758	759–761	762–763	763–764
138	736–737	738–739	741–742	743–744	745–747	748–749	750–751	752–754	755–756	757–758	759–761	760–762
137	734–735	736–737	738–740	741–742	743–744	745–747	748–749	750–751	752–754	755–756	757–758	758–759
136	732–733	734–735	736–737	738–740	741–742	743–744	745–747	748–749	750–751	752–754	754–756	756–757
135	729–731	732–733	734–735	736–737	738–740	741–742	743–744	745–747	748–749	750–751	752–753	753–755
134	727–728	729–731	732–733	734–735	736–737	738–740	741–742	743–744	745–747	747–749	750–751	751–752
133	725–726	727–728	729–731	732–733	734–735	736–737	738–740	741–742	743–744	745–746	747–749	748–750
132	723–724	725–726	727–728	729–731	732–733	734–735	736–737	738–740	741–742	743–744	745–746	746–747
131	721–722	723–724	725–726	727–728	729–731	732–733	734–735	736–737	738–740	740–742	743–744	744–745
130	719–720	721–722	723–724	725–726	727–728	729–731	732–733	734–735	736–737	738–739	740–742	741–743
129	716–718	719–720	721–722	723–724	725–726	727–728	729–731	732–733	734–735	736–737	738–739	739–740

NAI	SCALED SCORES											
	12-Year-Olds				13-Year-Olds				14-Year-Olds			
	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.
128	714–715	716–718	719–720	721–722	723–724	725–726	727–728	729–731	731–733	733–735	735–737	736–738
127	712–713	714–715	716–718	718–720	721–722	723–724	725–726	727–728	729–730	731–732	733–734	734–735
126	710–711	712–713	714–715	716–717	718–720	721–722	723–724	725–726	727–728	729–730	731–732	732–733
125	708–709	710–711	712–713	714–715	716–717	718–720	720–722	722–724	724–726	726–728	728–730	729–731
124	706–707	708–709	710–711	712–713	714–715	716–717	718–719	720–721	722–723	724–725	726–727	727–728
123	703–705	706–707	708–709	709–711	712–713	714–715	716–717	718–719	720–721	722–723	723–725	724–726
122	701–702	703–705	705–707	707–708	709–711	711–713	713–715	715–717	717–719	719–721	721–722	722–723
121	699–700	701–702	703–704	705–706	707–708	709–710	711–712	713–714	715–716	716–718	718–720	719–721
120	697–698	699–700	701–702	702–704	705–706	707–708	708–710	710–712	712–714	714–715	716–717	717–718
119	695–696	697–698	699–700	700–701	702–704	704–706	706–707	708–709	710–711	711–713	713–715	714–716
118	692–694	694–696	696–698	697–699	700–701	702–703	704–705	705–707	707–709	709–710	711–712	711–713
117	690–691	692–693	694–695	695–696	697–699	699–701	701–703	703–704	705–706	706–708	708–710	709–710
116	688–689	690–691	692–693	693–694	695–696	697–698	699–700	701–702	702–704	704–705	706–707	707–708
115	686–687	688–689	689–691	691–692	693–694	695–696	696–698	698–700	700–701	702–703	703–705	704–706
114	683–685	685–687	687–688	688–690	691–692	692–694	694–695	696–697	697–699	699–701	701–702	701–703
113	681–682	683–684	685–686	686–687	688–690	690–691	692–693	693–695	695–696	697–698	698–700	699–700
112	679–680	681–682	683–684	684–685	686–687	688–689	689–691	691–692	693–694	694–696	696–697	696–698
111	677–678	679–680	680–682	681–683	684–685	685–687	687–688	689–690	690–692	692–693	693–695	694–695
110	675–676	676–678	678–679	679–680	681–683	683–684	685–686	686–688	688–689	689–691	691–692	691–693
109	672–674	674–675	676–677	677–678	679–680	681–682	682–684	684–685	685–687	687–688	688–690	689–690
108	670–671	672–673	674–675	675–676	677–678	678–680	680–681	682–683	683–684	685–686	686–687	687–688
107	668–669	670–671	671–673	672–674	675–676	676–677	678–679	679–681	681–682	682–684	684–685	684–686
106	666–667	668–669	669–670	670–671	672–674	674–675	675–677	677–678	678–680	680–681	681–683	682–683
105	664–665	665–667	667–668	668–669	670–671	672–673	673–674	675–676	676–677	677–679	679–680	679–681
104	662–663	663–664	665–666	666–667	668–669	669–671	671–672	672–674	674–675	675–676	676–678	677–678
103	659–661	661–662	663–664	663–665	666–667	667–668	668–670	670–671	671–673	673–674	674–675	674–676
102	657–658	659–660	660–662	661–662	663–665	665–666	666–667	668–669	669–670	670–672	672–673	672–673
101	655–656	657–658	658–659	659–660	661–662	663–664	664–665	665–667	666–668	668–669	669–671	670–671
100	653–654	655–656	656–657	657–658	659–660	661–662	662–663	663–664	664–665	666–667	667–668	668–669
99	651–652	652–654	654–655	654–656	656–658	658–660	659–661	661–662	662–663	663–665	665–666	665–667
98	649–650	650–651	652–653	652–653	654–655	656–657	657–658	658–660	660–661	661–662	662–664	662–664
97	646–648	647–649	650–651	650–651	652–653	654–655	655–656	655–657	657–659	659–660	660–661	660–661

Appendix B, Continued

NAI	SCALED SCORES											
	12-Year-Olds				13-Year-Olds				14-Year-Olds			
	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.
96	644–645	645–646	647–649	648–649	650–651	651–653	653–654	653–654	655–656	656–658	658–659	658–659
95	641–643	642–644	645–646	645–647	647–649	649–650	650–652	651–652	652–654	654–655	655–657	655–657
94	639–640	640–641	642–644	642–644	645–646	647–648	647–649	648–650	650–651	652–653	652–654	653–654
93	636–638	637–639	640–641	640–641	642–644	644–646	645–646	646–647	647–649	649–651	650–651	651–652
92	634–635	635–636	637–639	638–639	640–641	642–643	643–644	644–645	645–646	647–648	647–649	649–650
91	632–633	633–634	635–636	636–637	638–639	639–641	640–642	642–643	643–644	645–646	645–646	646–648
90	630–631	631–632	633–634	634–635	636–637	637–638	638–639	639–641	641–642	642–644	643–644	644–645
89	627–629	629–630	631–632	632–633	634–635	635–636	636–637	637–638	638–640	639–641	640–642	642–643
88	625–626	627–628	629–630	629–631	632–633	633–634	634–635	635–636	636–637	637–638	638–639	639–641
87	623–624	625–626	627–628	627–628	629–631	631–632	632–633	633–634	634–635	635–636	636–637	637–638
86	621–622	623–624	625–626	625–626	627–628	628–630	629–631	631–632	632–633	633–634	634–635	635–636
85	619–620	621–622	622–624	623–624	625–626	626–627	627–628	628–630	629–631	630–632	631–633	633–634
84	617–618	618–620	620–621	621–622	623–624	624–625	625–626	626–627	627–628	628–629	629–630	630–632
83	615–616	616–617	618–619	619–620	621–622	622–623	623–624	624–625	625–626	626–627	627–628	628–629
82	613–614	614–615	615–617	617–618	619–620	620–621	621–622	622–623	623–624	624–625	625–626	626–627
81	611–612	612–613	613–614	615–616	617–618	618–619	619–620	620–621	621–622	622–623	623–624	624–625
80	609–610	610–611	611–612	612–614	615–616	616–617	616–618	617–619	618–620	619–621	620–622	621–623
79	607–608	608–609	609–610	610–611	612–614	613–615	614–615	615–616	616–617	617–618	618–619	619–620
78	605–606	606–607	607–608	608–609	609–611	611–612	612–613	613–614	614–615	615–616	616–617	617–618
77	603–604	604–605	605–606	606–607	607–608	609–610	610–611	611–612	612–613	613–614	614–615	615–616
76	600–602	601–603	603–604	604–605	605–606	607–608	607–609	608–610	609–611	610–612	611–613	612–614
75	598–599	599–600	600–602	601–603	602–604	604–606	605–606	606–607	607–608	608–609	609–610	609–611
74	596–597	597–598	598–599	599–600	600–601	602–603	603–604	604–605	604–606	605–607	606–608	607–608
73	594–595	595–596	596–597	597–598	598–599	600–601	601–602	601–603	602–603	603–604	604–605	605–606
72	592–593	593–594	594–595	595–596	596–597	598–599	598–600	599–600	600–601	601–602	601–603	602–604
71	589–591	591–592	592–593	593–594	593–595	595–597	596–597	597–598	598–599	598–600	599–600	600–601
70	587–588	588–590	589–591	590–592	591–592	592–594	594–595	594–596	595–597	596–597	597–598	597–599
69	585–586	586–587	587–588	588–589	589–590	590–591	591–593	592–593	593–594	593–595	594–596	595–596
68	583–584	584–585	585–586	586–587	587–588	588–589	589–590	590–591	591–592	591–592	592–593	593–594
67	581–582	582–583	583–584	584–585	584–586	585–587	587–588	588–589	588–590	589–590	590–591	590–592
66	579–580	580–581	581–582	581–583	582–583	583–584	584–586	585–587	586–587	586–588	587–589	588–589
65	576–578	578–579	578–580	579–580	580–581	581–582	581–583	583–584	584–585	584–585	585–586	585–587

NAI	SCALED SCORES											
	12-Year-Olds				13-Year-Olds				14-Year-Olds			
	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.
64	574–575	575–577	576–577	577–578	578–579	578–580	579–580	580–582	581–583	582–583	582–584	583–584
63	572–573	573–574	574–575	575–576	576–577	576–577	577–578	577–579	579–580	579–581	580–581	581–582
62	570–571	571–572	572–573	573–574	573–575	574–575	574–576	575–576	576–578	577–578	578–579	578–580
61	568–569	569–570	570–571	570–572	571–572	572–573	572–573	573–574	573–575	575–576	575–577	576–577
60	566–567	567–568	567–569	568–569	569–570	569–571	570–571	570–572	571–572	572–574	573–574	573–575
59	564–565	564–566	565–566	566–567	567–568	567–568	568–569	568–569	569–570	570–571	571–572	571–572
58	561–563	562–563	563–564	564–565	564–566	565–566	565–567	566–567	566–568	568–569	568–570	569–570
57	559–560	560–561	561–562	562–563	562–563	563–564	563–564	563–565	564–565	565–567	566–567	566–568
56	557–558	558–559	559–560	559–561	560–561	560–562	561–562	561–562	562–563	563–564	563–565	564–565
55	555–556	556–557	556–558	557–558	558–559	558–559	558–560	559–560	559–561	560–562	561–562	562–563
54	553–554	554–555	554–555	555–556	555–557	556–557	556–557	557–558	557–558	557–559	558–560	559–561
53	550–552	551–553	552–553	553–554	553–554	554–555	554–555	555–556	555–556	555–556	556–557	557–558
52	548–549	549–550	550–551	550–552	551–552	551–553	552–553	552–554	553–554	553–554	554–555	554–556
51	546–547	547–548	548–549	548–549	549–550	549–550	549–551	550–551	550–552	550–552	551–553	552–553
50	544–545	545–546	546–547	546–547	546–548	547–548	547–548	547–549	548–549	548–549	548–550	549–551
49	542–543	543–544	543–545	544–545	544–545	545–546	545–546	545–546	545–547	545–547	546–547	546–548
48	540–541	541–542	541–542	542–543	542–543	542–544	543–544	543–544	543–544	543–544	543–545	544–545
47	538–539	538–540	539–540	539–541	540–541	540–541	540–542	540–542	541–542	541–542	541–542	541–543
46	535–537	536–537	537–538	537–538	538–539	538–539	538–539	538–539	538–540	538–540	539–540	539–540
45	533–534	534–535	535–536	535–536	535–537	536–537	536–537	536–537	536–537	536–537	536–538	537–538
44	531–532	532–533	532–534	533–534	533–534	533–535	533–535	534–535	534–535	534–535	534–535	534–536
43	529–530	530–531	530–531	531–532	531–532	531–532	531–532	531–533	531–533	531–533	532–533	532–533
42	527–528	527–529	528–529	528–530	529–530	529–530	529–530	529–530	529–530	529–530	530–531	530–531
41	524–526	525–526	526–527	526–527	526–528	526–528	527–528	527–528	527–528	527–528	528–529	528–529
40	Below 524	Below 525	Below 526	Below 526	Below 526	Below 526	Below 527	Below 527	Below 527	Below 527	Below 528	Below 528

Appendix B, Continued

NAI	SCALED SCORES											
	15-Year-Olds				16-Year-Olds				17-Year-Olds			
	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.
160	Above 815	Above 817	Above 819	Above 822	Above 824	Above 826	Above 828	Above 831	Above 834	Above 836	Above 838	Above 840
159	813–815	815–817	818–819	820–822	823–824	825–826	827–828	829–831	832–834	834–836	836–838	838–840
158	811–812	813–814	815–817	818–819	820–822	823–824	825–826	827–828	829–831	832–833	834–835	836–837
157	808–810	810–812	813–814	815–817	818–819	820–822	823–824	825–826	827–828	829–831	831–833	833–835
156	806–807	808–809	810–812	813–814	815–817	818–819	820–822	822–824	825–826	827–828	829–830	831–832
155	804–805	806–807	808–809	810–812	813–814	815–817	818–819	820–821	822–824	824–826	826–828	828–830
154	801–803	803–805	806–807	808–809	810–812	813–814	815–817	817–819	820–821	822–823	824–825	826–827
153	799–800	801–802	803–805	806–807	808–809	810–812	813–814	815–816	817–819	819–821	821–823	823–825
152	797–798	798–800	801–802	803–805	805–807	808–809	810–812	812–814	815–816	817–818	819–820	821–822
151	794–796	796–797	798–800	801–802	803–804	805–807	808–809	810–811	812–814	814–816	816–818	818–820
150	792–793	794–795	796–797	798–800	801–802	803–804	805–807	807–809	810–811	812–813	814–815	816–817
149	789–791	791–793	794–795	796–797	798–800	800–802	803–804	805–806	807–809	809–811	811–813	813–815
148	787–788	788–790	791–793	794–795	796–797	798–799	800–802	802–804	805–806	807–808	809–810	811–812
147	784–786	786–787	788–790	791–793	793–795	795–797	798–799	800–801	802–804	804–806	806–808	808–810
146	782–783	783–785	786–787	788–790	791–792	793–794	795–797	797–799	800–801	802–803	804–805	806–807
145	780–781	781–782	783–785	786–787	788–790	790–792	793–794	795–796	797–799	799–801	801–803	803–805
144	777–779	779–780	781–782	783–785	786–787	788–789	790–792	792–794	795–796	797–798	799–800	801–802
143	775–776	776–778	779–780	781–782	783–785	785–787	788–789	790–791	792–794	794–796	796–798	798–800
142	772–774	774–775	776–778	778–780	781–782	783–784	785–787	787–789	790–791	792–793	794–795	796–797
141	770–771	771–773	774–775	776–777	778–780	780–782	783–784	785–786	787–789	789–791	791–793	793–795
140	768–769	769–770	771–773	774–775	776–777	778–779	780–782	782–784	785–786	787–788	789–790	791–792
139	765–767	766–768	769–770	771–773	773–775	775–777	778–779	780–781	782–784	784–786	786–788	788–790
138	763–764	764–765	766–768	769–770	771–772	773–774	775–777	777–779	780–781	782–783	784–785	786–787
137	760–762	762–763	764–765	766–768	768–770	770–772	773–774	775–776	777–779	779–781	781–783	783–785
136	758–759	759–761	761–763	764–765	766–767	768–769	770–772	772–774	774–776	777–778	779–780	781–782
135	755–757	757–758	759–760	761–763	763–765	765–767	768–769	770–771	772–773	774–776	776–778	779–780
134	753–754	754–756	756–758	759–760	761–762	763–764	765–767	767–769	769–771	772–773	774–775	776–778
133	751–752	752–753	754–755	756–758	758–760	760–762	763–764	765–766	767–768	769–771	771–773	774–775
132	748–750	749–751	752–753	754–755	756–757	758–759	760–762	762–764	764–766	767–768	769–770	771–773
131	746–747	747–748	749–751	752–753	753–755	755–757	758–759	760–761	762–763	764–766	766–768	769–770
130	743–745	744–746	747–748	749–751	751–752	753–754	755–757	757–759	759–761	762–763	764–765	766–768
129	741–742	742–743	744–746	747–748	748–750	750–752	753–754	755–756	757–758	759–761	761–763	764–765

NAI	SCALED SCORES											
	15-Year-Olds				16-Year-Olds				17-Year-Olds			
	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.
128	739–740	740–741	742–743	744–746	746–747	748–749	750–752	752–754	754–756	757–758	759–760	761–763
127	736–738	737–739	739–741	742–743	743–745	745–747	748–749	750–751	752–753	754–756	756–758	759–760
126	734–735	735–736	737–738	739–741	741–742	743–744	745–747	747–749	749–751	752–753	754–755	756–758
125	731–733	732–734	734–736	737–738	738–740	741–742	743–744	745–746	747–748	749–751	751–753	754–755
124	729–730	730–731	732–733	734–736	736–737	738–740	740–742	742–744	744–746	747–748	749–750	751–753
123	726–728	727–729	729–731	732–733	733–735	735–737	737–739	739–741	742–743	744–746	746–748	748–750
122	724–725	725–726	727–728	729–731	731–732	733–734	735–736	737–738	739–741	741–743	743–745	745–747
121	721–723	722–724	724–726	727–728	728–730	730–732	732–734	734–736	736–738	738–740	740–742	743–744
120	718–720	719–721	721–723	724–726	725–727	727–729	729–731	731–733	733–735	735–737	738–739	740–742
119	716–717	717–718	719–720	721–723	722–724	724–726	726–728	728–730	730–732	733–734	735–737	737–739
118	713–715	714–716	716–718	719–720	720–721	722–723	724–725	726–727	728–729	730–732	732–734	734–736
117	710–712	712–713	714–715	716–718	717–719	719–721	721–723	723–725	725–727	727–729	729–731	732–733
116	708–709	709–711	711–713	713–715	715–716	716–718	718–720	720–722	722–724	724–726	727–728	729–731
115	706–707	707–708	708–710	711–712	712–714	714–715	716–717	718–719	720–721	722–723	724–726	726–728
114	703–705	705–706	706–707	708–710	709–711	711–713	713–715	715–717	717–719	719–721	721–723	724–725
113	701–702	702–704	703–705	706–707	706–708	708–710	710–712	712–714	714–716	716–718	719–720	721–723
112	698–700	700–701	701–702	703–705	704–705	706–707	708–709	710–711	712–713	714–715	716–718	718–720
111	696–697	697–699	698–700	701–702	701–703	703–705	705–707	707–709	709–711	711–713	713–715	716–717
110	693–695	695–696	695–697	698–700	699–700	701–702	702–704	704–706	706–708	709–710	711–712	713–715
109	691–692	692–694	693–694	695–697	696–698	698–700	700–701	702–703	704–705	706–708	708–710	711–712
108	688–690	690–691	690–692	693–694	694–695	695–697	697–699	699–701	701–703	703–705	706–707	708–710
107	686–687	687–689	688–689	690–692	691–693	693–694	695–696	697–698	699–700	701–702	703–705	705–707
106	683–685	685–686	685–687	688–689	689–690	690–692	692–694	694–696	696–698	698–700	701–702	703–704
105	681–682	682–684	683–684	685–687	686–688	688–689	690–691	692–693	694–695	696–697	698–700	700–702
104	678–680	680–681	680–682	683–684	684–685	685–687	687–689	689–691	691–693	693–695	695–697	698–699
103	676–677	677–679	678–679	680–682	681–683	683–684	685–686	687–688	689–690	691–692	693–694	695–697
102	673–675	675–676	675–677	678–679	679–680	680–682	682–684	684–686	686–688	688–690	690–692	693–694
101	671–672	672–674	673–674	675–677	676–678	678–679	680–681	682–683	684–685	686–687	688–689	690–692
100	669–670	670–671	671–672	673–674	674–675	675–677	677–679	679–681	681–683	683–685	686–687	688–689
99	666–668	668–669	668–670	671–672	671–673	673–674	675–676	677–678	679–680	681–682	683–685	686–687
98	664–665	665–667	666–667	668–670	669–670	670–672	672–674	674–676	676–678	678–680	681–682	683–685
97	661–663	663–664	663–665	666–667	666–668	668–669	670–671	672–673	674–675	676–677	678–680	681–682

Appendix B, Continued

NAI	SCALED SCORES											
	15-Year-Olds				16-Year-Olds				17-Year-Olds			
	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.
96	659–660	660–662	661–662	663–665	664–665	666–667	667–669	669–671	671–673	674–675	676–677	678–680
95	657–658	658–659	659–660	661–662	662–663	663–665	665–666	667–668	669–670	671–673	674–675	676–677
94	654–656	656–657	656–658	659–660	659–661	661–662	663–664	664–666	666–668	669–670	671–673	674–675
93	652–653	653–655	654–655	656–658	657–658	658–660	660–662	662–663	664–665	666–668	669–670	671–673
92	650–651	651–652	651–653	654–655	654–656	656–657	658–659	660–661	662–663	664–665	666–668	669–670
91	647–649	649–650	649–650	651–653	652–653	654–655	655–657	657–659	659–661	662–663	664–665	666–668
90	645–646	646–648	647–648	649–650	650–651	651–653	653–654	655–656	657–658	659–661	662–663	664–665
89	643–644	644–645	644–646	647–648	647–649	649–650	651–652	653–654	655–656	657–658	659–661	662–663
88	641–642	642–643	642–643	644–646	645–646	647–648	648–650	650–652	653–654	655–656	657–658	659–661
87	638–640	639–641	640–641	642–643	643–644	644–646	646–647	648–649	650–652	653–654	655–656	657–658
86	636–637	637–638	637–639	640–641	640–642	642–643	644–645	646–647	648–649	650–652	653–654	655–656
85	634–635	635–636	635–636	637–639	638–639	640–641	641–643	644–645	646–647	648–649	650–652	653–654
84	631–633	632–634	633–634	635–636	636–637	637–639	639–640	641–643	644–645	646–647	648–649	650–652
83	629–630	630–631	631–632	633–634	633–635	635–636	637–638	639–640	641–643	644–645	646–647	648–649
82	627–628	628–629	628–630	631–632	631–632	633–634	634–636	637–638	639–640	641–643	644–645	646–647
81	625–626	626–627	626–627	628–630	629–630	630–632	632–633	634–636	637–638	639–640	641–643	644–645
80	622–624	624–625	624–625	626–627	627–628	628–629	630–631	632–633	634–636	637–638	639–640	641–643
79	620–621	621–623	622–623	623–625	624–626	626–627	628–629	630–631	632–633	634–636	637–638	639–640
78	618–619	619–620	619–621	621–622	622–623	624–625	625–627	627–629	629–631	632–633	634–636	637–638
77	616–617	617–618	617–618	618–620	620–621	621–623	623–624	625–626	627–628	629–631	632–633	634–636
76	613–615	614–616	614–616	615–617	617–619	618–620	620–622	622–624	624–626	626–628	629–631	631–633
75	610–612	611–613	612–613	613–614	614–616	616–617	617–619	619–621	621–623	624–625	626–628	629–630
74	608–609	609–610	609–611	610–612	612–613	613–615	615–616	617–618	619–620	621–623	624–625	626–628
73	606–607	607–608	607–608	608–609	609–611	611–612	612–614	614–616	616–618	619–620	621–623	624–625
72	603–605	604–606	604–606	605–607	607–608	608–610	610–611	612–613	614–615	616–618	619–620	621–623
71	601–602	602–603	602–603	603–604	604–606	606–607	607–609	609–611	611–613	614–615	616–618	619–620
70	598–600	599–601	599–601	601–602	602–603	603–605	605–606	607–608	609–610	611–613	614–615	616–618
69	596–597	597–598	597–598	598–600	599–601	601–602	602–604	604–606	606–608	609–610	611–613	614–615
68	593–595	594–596	595–596	596–597	597–598	598–600	600–601	602–603	604–605	606–608	609–610	611–613
67	591–592	592–593	592–594	593–595	594–596	596–597	597–599	599–601	601–603	604–605	606–608	609–610
66	589–590	590–591	590–591	591–592	592–593	593–595	595–596	597–598	599–600	601–603	604–605	606–608
65	586–588	587–589	587–589	588–590	589–591	591–592	592–594	594–596	596–598	599–600	601–603	604–605

NAI	SCALED SCORES											
	15-Year-Olds				16-Year-Olds				17-Year-Olds			
	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.	0–2 mos.	3–5 mos.	6–8 mos.	9–11 mos.
64	584–585	585–586	585–586	586–587	587–588	588–590	590–591	592–593	594–595	596–598	599–600	601–603
63	581–583	582–584	582–584	583–585	584–586	586–587	587–589	589–591	591–593	594–595	596–598	599–600
62	579–580	580–581	580–581	581–582	582–583	583–585	585–586	587–588	589–590	591–593	594–595	596–598
61	577–578	577–579	577–579	578–580	579–581	581–582	582–584	584–586	586–588	589–590	591–593	594–595
60	574–576	575–576	575–576	576–577	577–578	578–580	580–581	582–583	584–585	586–588	589–590	591–593
59	572–573	572–574	572–574	573–575	574–576	576–577	577–579	579–581	581–583	584–585	586–588	589–590
58	569–571	570–571	570–571	571–572	572–573	573–575	575–576	577–578	579–580	581–583	584–585	586–588
57	567–568	568–569	568–569	568–570	570–571	571–572	572–574	574–576	576–578	579–580	581–583	584–585
56	564–566	565–567	565–567	566–567	567–569	568–570	570–571	572–573	574–575	576–578	579–580	581–583
55	562–563	563–564	563–564	563–565	565–566	566–567	567–569	569–571	571–573	573–575	576–578	579–580
54	560–561	560–562	560–562	561–562	562–564	563–565	565–566	567–568	569–570	571–572	573–575	576–578
53	557–559	558–559	558–559	559–560	560–561	561–562	562–564	564–566	566–568	569–570	571–572	573–575
52	555–556	556–557	556–557	557–558	558–559	559–560	560–561	562–563	564–565	566–568	569–570	571–572
51	552–554	553–555	553–555	554–556	555–557	556–558	557–559	559–561	561–563	564–565	566–568	569–570
50	550–551	550–552	550–552	551–553	552–554	553–555	555–556	557–558	559–560	561–563	564–565	566–568
49	548–549	548–549	548–549	549–550	550–551	551–552	552–554	554–556	556–558	559–560	561–563	564–565
48	545–547	546–547	546–547	546–548	547–549	548–550	550–551	552–553	554–555	556–558	559–560	561–563
47	543–544	543–545	543–545	544–545	545–546	546–547	547–549	549–551	551–553	554–555	556–558	559–560
46	540–542	541–542	541–542	541–543	542–544	543–545	545–546	547–548	549–550	551–553	554–555	556–558
45	538–539	538–540	538–540	539–540	540–541	541–542	542–544	544–546	546–548	549–550	551–553	554–555
44	535–537	536–537	536–537	536–538	537–539	538–540	540–541	542–543	544–545	546–548	549–550	551–553
43	533–534	533–535	533–535	534–535	535–536	536–537	537–539	539–541	541–543	544–545	546–548	549–550
42	531–532	531–532	531–532	531–533	532–534	533–535	535–536	537–538	538–540	541–543	544–545	546–548
41	528–530	529–530	529–530	529–530	530–531	531–532	532–534	534–536	536–537	538–540	541–543	544–545
40	Below 528	Below 529	Below 529	Below 529	Below 530	Below 531	Below 532	Below 534	Below 536	Below 538	Below 541	Below 544

Appendix C: Naglieri Ability Index (NAI) Scores with Corresponding Percentile Ranks, Stanines, and Normal Curve Equivalents (NCES)

Naglieri Ability Index	Percentile Rank	Stanine	Normal Curve Equivalent
135–160	99	9	99
132–134	98	9	93
130–131	97	9	90
128–129	96	9	87
126–127	95	8	85
125	94	8	83
124	93	8	81
123	92	8	80
122	91	8	78
121	90	8	77
120	89	8	76
119	88	7	75
118	87	7	74
117	86	7	73
116	84	7	71
115	83	7	70
114	81	7	68
113	79	7	67
112	77	7	66
111	75	6	64
110	73	6	63
109	71	6	62
108	69	6	60
107	67	6	59
106	65	6	58
105	62	6	56
104	60	6	55
103	57	5	54
102	55	5	53
101	52	5	51
100	50	5	50
99	48	5	49

Appendix C, Continued

Naglieri Ability Index	Percentile Rank	Stanine	Normal Curve Equivalent
98	45	5	47
97	43	5	46
96	40	5	45
95	38	4	44
94	35	4	42
93	33	4	41
92	31	4	40
91	29	4	38
90	27	4	37
89	25	4	36
88	23	4	34
87	21	3	33
86	19	3	32
85	17	3	30
84	16	3	29
83	14	3	27
82	13	3	26
81	12	3	25
80	11	3	24
79	10	2	23
78	9	2	22
77	8	2	20
76	7	2	19
75	6	2	17
73–74	5	2	15
71–72	4	2	13
69–70	3	1	10
66–68	2	1	7
40–65	1	1	1

Appendix D: List of Participating Schools

Alabama
Boaz Middle School

California
Blackstock Junior High School
Butterfield Ranch Elementary School
International Polytechnic High School

Connecticut
Regional Multicultural Magnet School

Florida
Bridgeprep Academy South
Divine Savior Academy
Groveland Elementary
Lion of Judah Academy

Georgia
Berean Christian Academy

Hawaii
Holy Family Catholic Academy

Iowa
Dike-New Hartford Junior High School
Lourdes Catholic School
New Hartford Elementary
St. Ansgar Elementary

Illinois
Wilson Elementary School

Indiana
Lutheran South Unity School

Kansas
Basehor Intermediate School
Basehor-Linwood High School
Genesis Christian Academy
Thomas More Prep-Marian High

Kentucky
Ersil P.Ward Elementary
Menifee County High School

Massachusetts
New Beginnings Academy

Michigan
Holton Public High School

Minnesota
Brimhall Elem School

New Jersey
Soaring Heights Charter School
West Cape May Elementary

New York
Merrick Academy

Ohio
Crestwood Middle School

Oklahoma
Elgin Middle School
Grandfield Elementary
Grandfield High School
Hugo High School
Washington Grade Center

Oregon
John F. Kennedy High School
Monroe Grade School
Monroe High School
St. Mary's Elementary School

Pennsylvania
Blue Mountain Academy
Helen Thackston Charter School
International Christian High School

Merion Mercy Academy
Trinity Area High School
Wyoming Valley Montessori School

Rhode Island
Alan Shawn Feinstein Middle School
West Warwick High School
Winman Junior High

Texas
Academy of Dallas Charter School
Chinquapin Preparatory School
Galena Park Elementary
Hillcrest Elementary
Jacinto City Elementary
John Drugan Elementary
Marathon Independent School District
Sweetwater High School
Sweetwater Middle School
Woodland Acres Elementary

Washington
Ingraham High School

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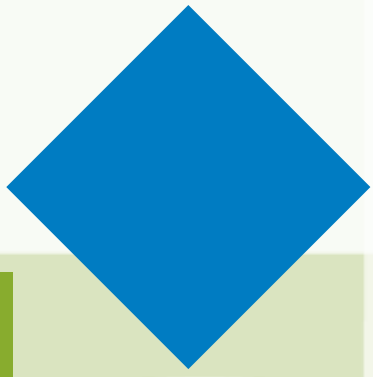

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