

Technical Report



**Test for Auditory Processing Disorders
in Children—Revised
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Overview

The *SCAN-C Test for Auditory Processing Disorders in Children—Revised* is an individually administered test used to identify children between ages 5 years, 0 months and 11 years, 11 months who have auditory processing disorders. A revision of the original SCAN published in 1986, SCAN-C subtests were chosen to obtain information about areas that have been demonstrated to be among the most relevant to understanding auditory processing abilities.

SCAN-C assesses the perception stage of auditory processing, which is pre-cognitive. The test requires that the child repeat stimulus words or sentences, but the child is not required to understand the concept of "same or different," or to understand at a cognitive level the phonetic or phonologic differences that exist among speech sounds. This type of test avoids the cross modality and cognitive aspects of pointing to a picture in response to a word.

Revisions in the New Edition

SCAN-C provides professionals with an auditory test battery that is well-standardized and covers several areas of auditory processing. It can be administered quickly by auditory processing professionals using a portable CD player. The CD technology eliminates noise inherent in audiocassettes and is compatible with diagnostic audiometers.

Improvements have been made to the original SCAN:

- All subtest instructions were reworded to make them easier to follow and more interesting for young children.

- The audiocassette tape was replaced with a compact disc to eliminate noise inherent in audiocassettes.
- The number of test items in the Competing Words subtest was decreased.
- A fourth subtest, Competing Sentences, was added to increase the diagnostic utility of the dichotic test battery.
- Normative data for children 5 years, 0 months to 11 years, 11 months were collected based on current U.S. Census figures.

SCAN-C Subtests

SCAN-C includes four subtests that represent functional auditory abilities in everyday listening situations:

- **Filtered Words Subtest** in which the subject is asked to repeat words that sound muffled. The test stimuli consist of monosyllabic words that have been low-pass filtered at 1000 Hz with a roll-off of 32 dB per octave. The test enables you to assess a child's ability to understand distorted speech, considered effective in identifying central auditory processing disorders.
- **Auditory Figure-Ground Subtest** which evaluates the subject's ability to understand words in the presence of background noise. Monosyllabic words were recorded in the presence of multi-talker speech babble noise at +8 dB signal-to-noise ratio. Poor performance on repeating the stimulus words may indicate a delay in development of the auditory system.
- **Competing Words Subtest** in which the subject hears two words simultaneously—one monosyllabic word presented to each

ear—and is instructed to repeat the words presented in each ear. The test enables you to assess ear advantage. Poor performance may indicate a delay in maturation, underlying neurological disorganization, or damage to auditory pathways. Abnormalities shown by dichotic word test results are related to a wide range of specific disabilities, including CAPD, language disability, learning disability, and reading disorder.

- **Competing Sentences Subtest** in which pairs of sentences unrelated in topic are presented to the right and left ears. The subject is instructed to direct attention to the stimuli presented in one ear while ignoring the other. Like the Competing Words subtest, the results are used to determine levels of auditory maturation, hemispheric dominance for language, and to identify disordered or damaged central auditory pathways. The advantage of testing binaural separation with both word and sentence stimuli is to compare findings obtained with both simple and more complex linguistic levels of auditory stimuli.

Scores Reported

SCAN-C provides several important scores including subtest raw scores, subtest and composite standard scores, percentile ranks, and cumulative prevalence of ear advantage for the Competing Words subtest. Ear advantage scores are powerful indicators of hemispheric dominance for language and neurologically based language/learning disorders. The Competing Words subtest yields two ear advantage

scores—one for the Right-Ear First Task and one for the Left-Ear First Task. The information presented on cumulative prevalence for ear advantage provides you with a means for examining how common or uncommon a particular child's ear advantage score is. The more extreme or atypical the ear advantage score, the greater the possibility of an auditory-based disorder such as a language or learning disability.

SCAN-C Test Design

Auditec™ of St. Louis, Missouri, produced the compact disc according to technical specifications provided by The Psychological Corporation. A male speaker, chosen for his clear articulation and Midwestern U.S. accent, recorded the test instructions and stimulus items. During the recording, the speaker was instructed to say the carrier phrase, "Say the word" or "Say" and the stimulus words in a natural manner and at

the same intensity. Each word was monitored to zero with a VU meter as it was read aloud. Stimuli were recorded at approximately 4-second intervals on subtests 1 through 3 and at 5-second intervals on subtest 4. This rate allows adequate time for children to respond without prolonging the test.

Testing Environment

Standardization examiners had the option of testing in either an audiometric sound-proof test booth or a quiet room. To examine the effect that the test environment might have on a child's performance, a small study was conducted on a matched sample of 27 children.

No significant differences were found on any mean subtest or composite standard scores, providing evidence that the type of testing environment does not affect the SCAN-C scores.

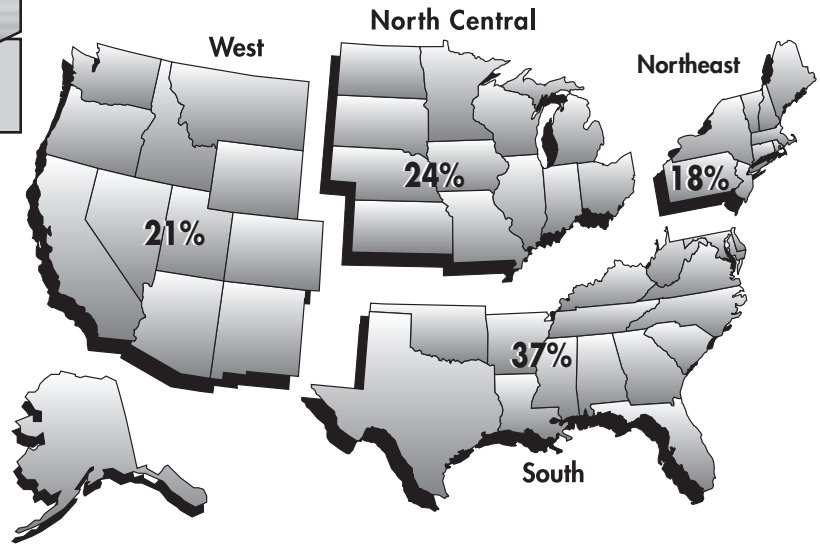
Standardization of SCAN-C

The standardization, validity, and reliability research for SCAN-C took place between June 1998 and March 1999. The test was standardized on 650 children between the ages of 5 years, 0 months and 11 years, 11 months. Data were collected on 3- and 4-year-old children; however, these data were not included in the norms due to inconsistent performance. Qualitative information obtained from 3 and 4 year olds is presented in the manual.

The SCAN-C standardization sample was representative of the general U.S. population, stratified by age, gender, race/ethnicity, region, and parent education level, based on the 1997 U.S. Census update for children ages 5 years, 0 months to 11 years, 11 months.

Age in years and months	5.0 to 5.11	6.0 to 6.11	7.0 to 7.11	8.0 to 8.11	9.0 to 9.11	10.0 to 11.11	Total
Number	100	100	100	100	100	150	650

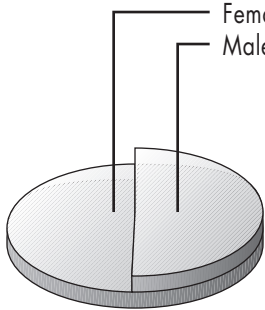
Sample by Geographic Region



Gender

Sample U.S. Population*

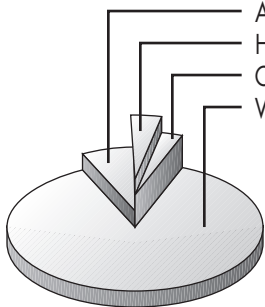
Female	.....48.8%	.....48.7%
Male	.....51.2	.....51.3



Race/Ethnicity

Sample U.S. Population*

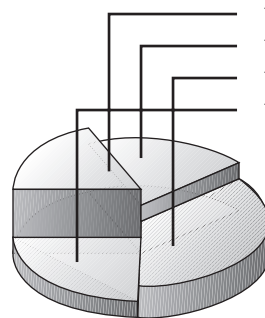
African American	.....15.7%	.....16.0%
Hispanic	.....15.2	.....14.6
Other	.....4.3	.....5.0
White	.....64.8	.....64.5



Parent Years of Education

Sample U.S. Population*

11 or less	.....13.7%	.....14.8%
12	.....30.5	.....30.5
13-15	.....30.8	.....31.7
16 or more	.....25.1	.....23.0



The means and standard deviations of SCAN-A subtest and total raw scores confirm the original hypothesis that the auditory system of normally developing individuals is typically mature by age 12, and

that results of central auditory tests are the same for individuals ages 12 through 50.

*1997 Census of Population Update, U.S. Department of Commerce, Bureau of the Census. Figures are based on the current population survey of March, 1995 for children ages 5 years, 0 months through 11 years, 11 months.

Clinical Sample

The 144 participants in the clinical study conducted during standardization ranged in age from 6 years, 0 months to 11 years, 11 months. They were required to have met the requirements for standardization

as well as having been either diagnosed or suspected of having a diagnosis of Central Auditory Processing Disorder (CAPD).

Reliability

Test reliability is an indication of the degree to which a test provides you with a precise and stable score. The SCAN-C reliability coefficients for the subtests were obtained using Cronbach's coefficient alpha, and the internal consistency coefficients for the composite score were calculated with the formula recommended by Guilford. The SCAN-C composite test reliability coefficients range from .86 to .92. The reliability coefficients for the four SCAN-C subtests range from .56 to .89.

The reliability of each SCAN-C subtest and the composite score were also estimated by retesting a sample of 145 children between the ages of 5 and 11 years. The study was divided into two age groups: 65 children between 5 and 7 years old and 80 children between 8 and 11 years old. Each child was tested twice by the same examiner with a testing interval between 2 days and 6 weeks (mean testing interval was 6.5 days). SCAN-C subtest test-retest reliabilities range from .65 to .82 for the 5 to 7 year olds and from .67 to .78 for the 8 to 11 year olds.

Summary

The *SCAN-C Test for Auditory Processing Disorders in Children-Revised* enables professionals to obtain reliable central auditory test results in children between ages 5 years, 0 months and 11 years, 11 months. The test assesses the perception or pre-cognitive stage of auditory processing.

The careful, thorough procedures utilized in developing and updating this test will allow you to identify children who have auditory processing disorders and who may benefit from intervention. The results are also useful in determining levels of auditory maturation and hemispheric dominance for language.

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