



The TEST OF AUDITORY FUNCTIONING (TAF): A Criterion-Based Test for Toddlers Through School-Aged Kiddos Who Are Deaf or Hard of Hearing

Donald M. Goldberg, Ph.D., CCC-SLP/A,
LSLS Cert. AVT

**Educational Audiology Association
Conference**

St. Petersburg, FL

June 2023

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Disclosures

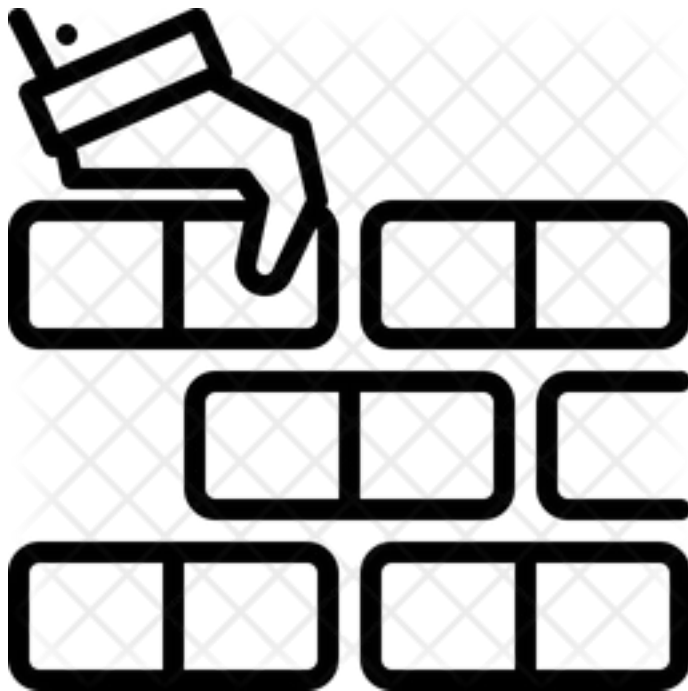
- Receives salary from the College of Wooster (Wooster, OH)
- Receives compensation as a Contract Staff/Professional Staff member of the Cleveland Clinic Foundation's Head and Neck Institute, Section of Audiology, Hearing Implant Program
- Past President, AGBell Association for the Deaf and Hard of Hearing
- AGBell Rep. to the Joint Committee on Infant Hearing (JCIH)
- AGBell Rep. to the Council on Education of the Deaf (CED)
- Past President, AGBell's Academy of Listening and Spoken Language
- Advisory Panel member of *Decibel Therapeutics*
- Author, *Test of Auditory Functioning* – Blue Tree Publishing (Edmonds, WA)

Topics

- Audiology Rocks
- Levels of Auditory Functioning
- Assessment of Speech Perception (SRT, Word Recognition, & Beyond)
- Speech Acoustics
- The *Test of Auditory Functioning* (TAF) (“filling a void” in the assessment of speech perception and audiology)

Audiology:

The Foundation of Auditory Teaching for Listening & Spoken Language Development



Levels of Auditory Functioning

(Auditory Hierarchy / Erber, 1982; Boothroyd, 1978)

Comprehension:

Is there meaning to this sound?

Recognition/Identification:

Is this sound distinct from other sounds?

Discrimination:

Is this sound different from other sound?

Detection:

Was there a sound?



SDT / SAT

Stimuli:

- Child's Name?
- Where's Mommy?
- Raspberries ?

Not Ear-Specific

Behavioral

? Reliability / ? Validity

SRT

Spondee Stimuli

Materials: Picture Plate /
Props

Closed Set vs. Open Set

Threshold? (Acoustics: Low Freq.)

May be non-ear-specific

Word Recognition

- *Varies depending on stimuli
- *Closed or Open set?
- *Varies depending on Presentation Level
- *Varies depending on testing in Quiet or in Noise (at varying SNR/s)



Word Recognition

Vocabulary Level (receptive vocabulary)

Stimuli Acoustics: typically limited high frequency

* NU-CHIPS

* WIPI

* Open Set NU-CHIPS or WIPI

* PB-K

OTHER Measures

NU-CHIPS



WIPI



“Other” Measures

- GASP!
- LittleEARS
- PEACH
- Baby Bio/Pediatric AZ Bio
- SERT
- MAIS
- DIAL
- ELF
- CHILD
- MUSS
- CRISP
- TEACH
- SIFTER (Pediatric/Secondary)
- FAPI
- CASLS
- COW
- CHAPPS
- TAPS-3
- SCAN-3

- Mr. Potato Head Task
- PSI
- COT
- LSSKSI
- CNC
- HINT-C
- LNT
- MLNT
- BKB / BKB in Noise
- LIFE
- Checklist of Auditory

Communication Skills

- APAL
- SPICE
- CHAT
- The Listening Test
- CCT
- Gardner words
- SIN / QuickSIN

Auditory Assessment

- Ling 6/7
Sound Test
- Early Speech
Perception
(ESP)

Ling Six (Seven) Sound Test

ah (/a/)

oo (/u/)

ee (/i/)

sh

s

m


(Ling & Ling, 1978)

Consider
“NO SOUND”
as the
7th Sound


(Rosemarie Drous,
Formerly of the
Helen Beebe Speech & Hearing
Center)

Daniel Ling

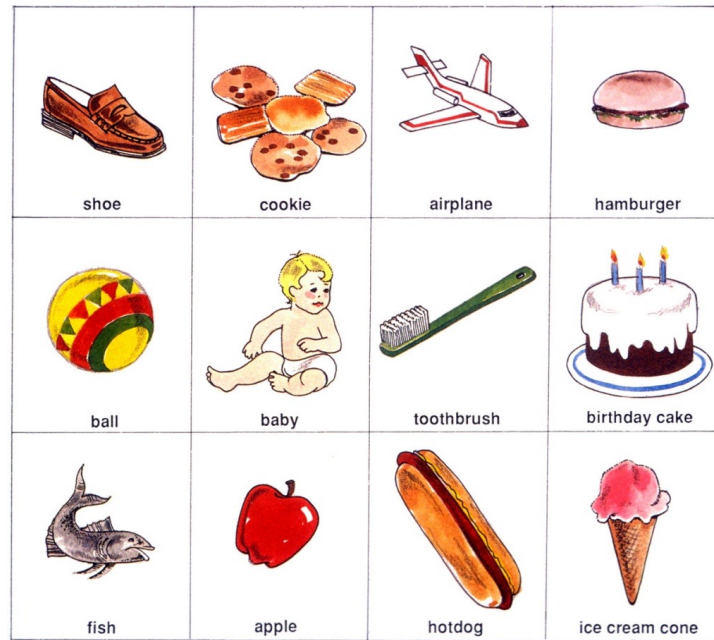




Ling Sound Check

- 
- Clinical Application
 - “Good” Mistakes
 - “Bad” Mistakes
 - Patterns of Error/s ?

Early Speech Perception (ESP)



Central Institute for the Deaf © 1990

ESP Pattern Perception



Central Institute for the Deaf © 1990

ESP Monosyllable Identification

Auditory Assessment

- Infant-Toddler Meaningful Auditory Integration Scale (IT-MAIS)

(Zimmerman-Phillips, Osberger & Robbins, 1997)



Other
“Test
Measures”

**Auditory Perception Test
for the Hearing Impaired**

3rd Edition

By Susan Allen

Plural: **\$299.95**

**Developmental Test of
Auditory Perception**

By Reynolds, Voress, &
Pearson

Pro-Ed: \$222.00

**The Listening
Comprehension Test-2**

Pro-Ed: \$190.00

(there is also LCT-Adolescent)

AUDITORY COMPREHENSION

TEST OF



COMPONENT OF Auditory Skills
Instructional Planning System

DEVELOPED BY THE
Office of the Los Angeles County Superintendent of Schools

FOREWORKS
North Hollywood, Ca.

TEST OF AUDITORY COMPREHENSION



NAME	SEX <input type="checkbox"/> M <input type="checkbox"/> F	BIRTHDATE	C.A.
SCHOOL	EXAMINER		TEST DATE
TEACHER	CLASS SETTING		

DATE OF MOST RECENT HEARING TEST		TYPE OF LOSS			
RE: 500 Hz	1000 Hz	2000 Hz	PTA:	dB HL	
LE: 500 Hz	1000 Hz	2000 Hz	PTA:	dB HL	
SPEECH AUDIOMETRY					
PREVIOUS TAC RESULTS/DATES					
OTHER TEST RESULTS/DATES					
TYPE OF AMPLIFICATION			SETTING	RE	LE
					BIN
WORN DURING TEST?		COMMENTS			
<input type="checkbox"/> YES <input type="checkbox"/> NO					

TEST CONDITIONS
REASON(S) FOR TESTING
COPY OF REPORT TO

Test of Auditory Comprehension (TAC)

(Trammell, 1981)

(Foreworks Publishers)

The image shows a vast number of empty, red plastic stadium seats arranged in neat rows. The perspective is from a low angle, looking down the length of the seating area, which creates a strong sense of depth. The seats are a deep red color, and the backrests feature small white rectangular labels with black numbers. The numbers visible include 3, 4, and 5, indicating different sections or rows. The lighting is soft and even, highlighting the texture of the plastic and the repetitive pattern of the seating.

TAC “Users” in the
Audience?

TAC & EAA

Critique

Note: Background information provided to DMG from Dr. Karen Anderson / March 2018 – MANY THANKS!)

In May 2011, board members of the Educational Audiology Association were requested to survey their membership “regarding a possible replacement for the TAC.” A survey was developed and completed by 43 EAA members (all familiar with the TAC).

Findings:

- TAC’s screening section needed modifications
- Preferred format of CD vs. audio cassette!
- Test stimuli on a table or app.
- Address the presence of competing messages. (0 SNR – too difficult)



DMG Critique – What to Address

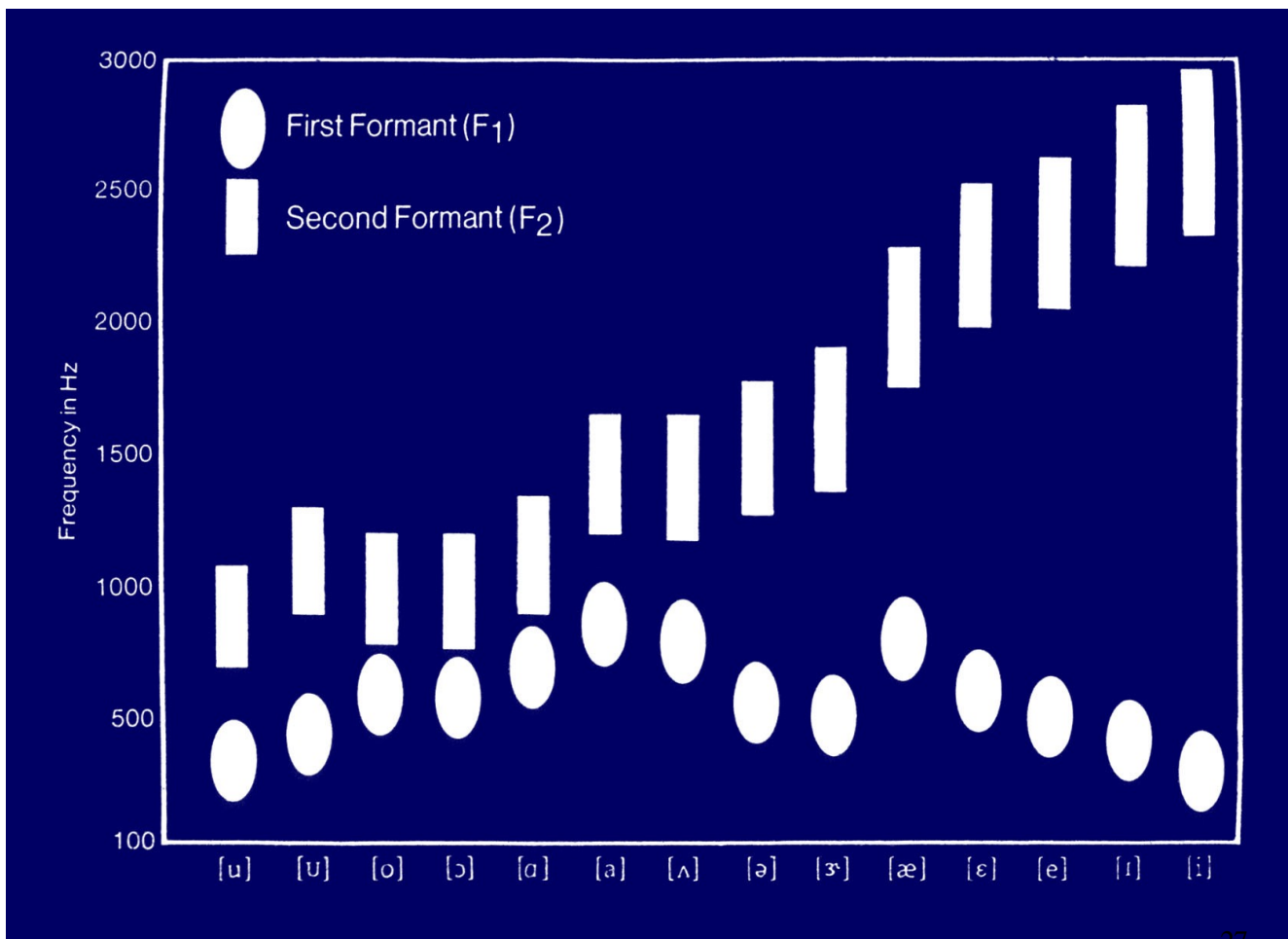
- Cassette to CD
- Images (needed modernization)
- “Sexist” content issues
- DEI (much attention needed)
- Hierarchical order / # of items/ field of responses
- Functionality
- Varying SNR/s (before 0 SNR)!

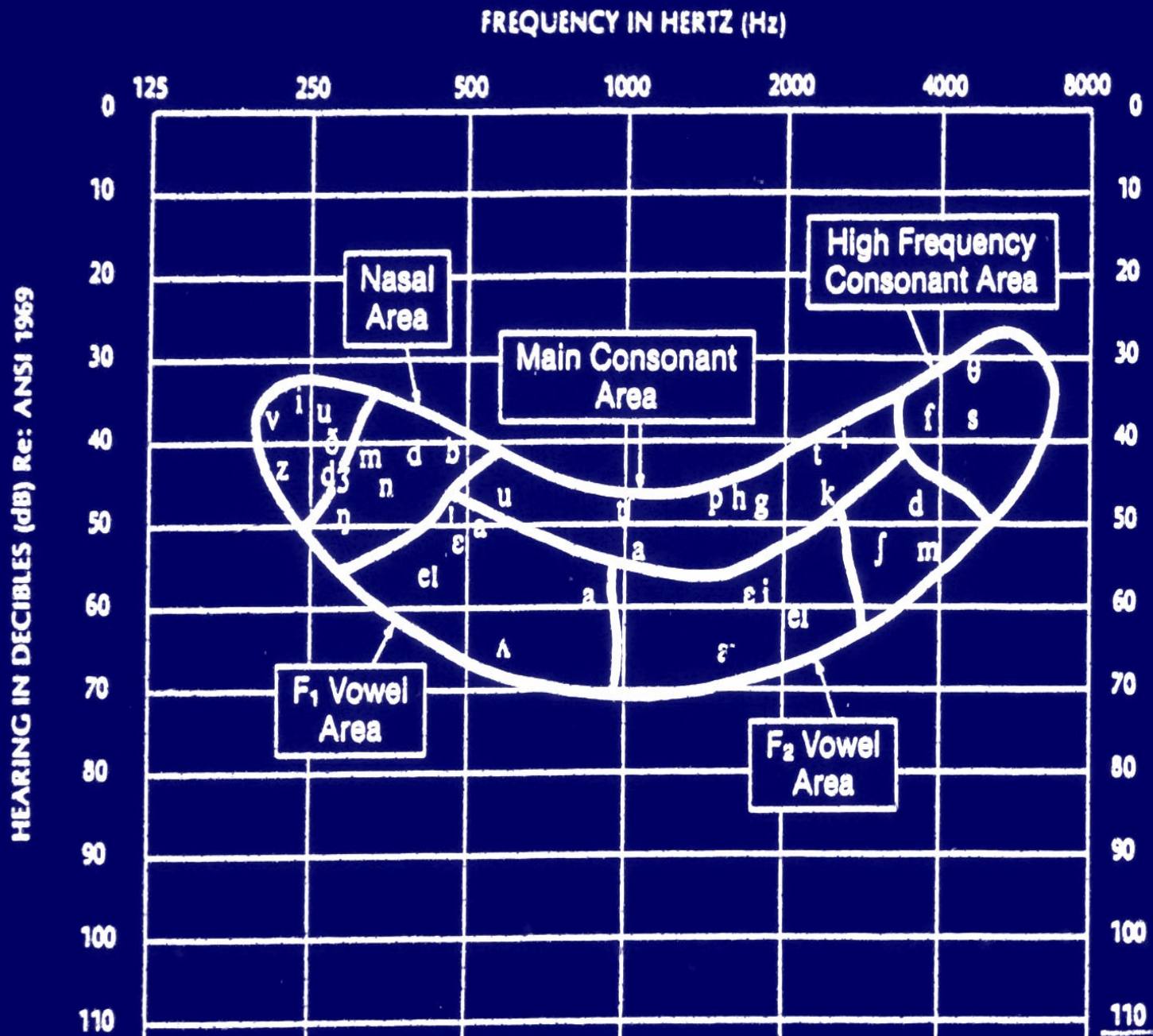
A top-down view of various musical instruments scattered on a light-colored wooden floor. In the top left, a portion of a white piano keyboard is visible, showing black and white keys and control buttons like 'VOLUME', 'OCTAVE', 'ASSIGN', 'DEPTH', 'TEMPO', 'STOP', 'PAUSE', 'PLAY', and 'REC'. To the right of the piano are two wooden maracas with light brown leather heads and black straps. Below the maracas are two wooden drumsticks. In the bottom left corner, there is a brass cymbal and a portion of a white drum head. On the right side, the body of a reddish-brown acoustic guitar is partially visible. The text 'Need to Know Acoustics!' is centered in the middle of the image in a white, sans-serif font.

Need to Know Acoustics!

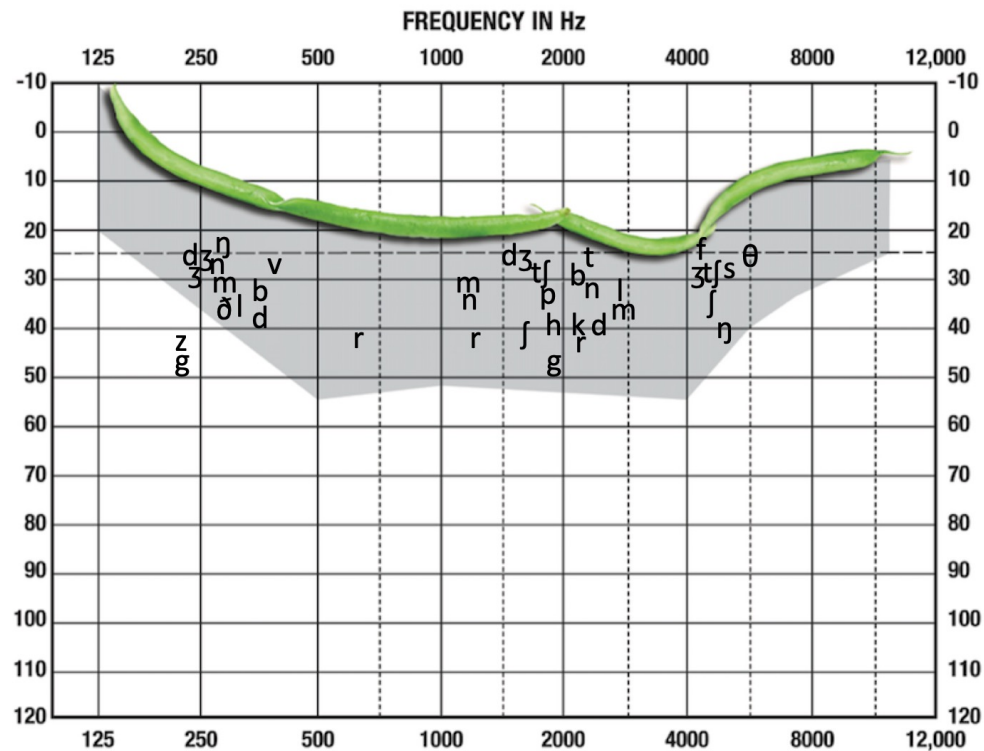
Vowels

- Perception of vowels results from the identification of First Formant (F1) and Second Formant (F2)





Speech String Bean with Consonants





Auditory-Based Teaching Does NOT Merely Mean Putting An Acoustic Hoop In Front of Your Mouth!

CHILDREN: Let's replace the phrase "**AUDITORY TRAINING**" w/ "**Auditory Teaching**" (or Auditory-Based Therapy)

Test of Auditory Functioning



Support from The College of Wooster

- Sophomore
Research
Assistants
- Research Leave
Spring 2015 to
Australia
- Research Leave
Fall 2019 for Field
Testing
- Henry Luce Fund
support



Field Testing: Fall2019 / Spring Break 2020. (and then the Pandemic!)

Many THANKS to

Sunshine Cottage, Auditory-Verbal Center, AV-UK, AV Israel, Shepherd Centre



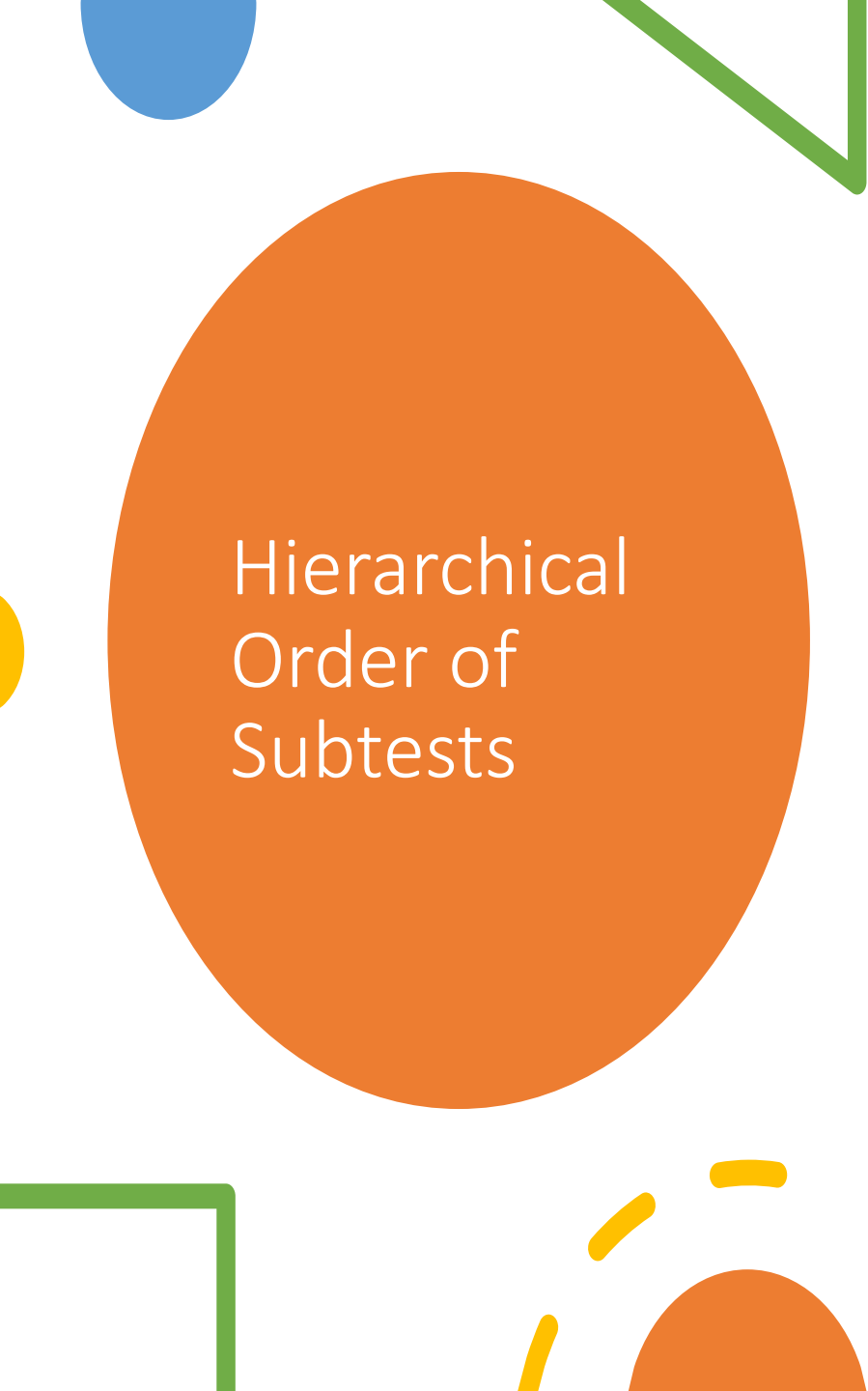


TAF (BlueTree Publishing, 2023)

The *Test of Auditory Functioning* (TAF) is a computer-based **criterion-based measure** for **children who are deaf or hard of hearing, from approximately 2 to 13 years of age, using a range of hearing sensory technology**, including hearing aids (HA/s), cochlear implants (CI/s), bone-anchored devices, or a combination of 1 HA and 1 CI.

Field testing of 100s of images and audio clips, resulted in the finalization of the TAF. Data collected from over 125 English-speaking preschoolers through 13-year-olds, on four continents

Coming!! Easel-based test with audio on computer jump drive & APP to be displayed on a Notepad



Hierarchical Order of Subtests

ST 1 – Duration Discrimination
(Pediatric & Adult)

ST 2 – Pitch Discrimination

ST 3 – Fundamental Frequency
Discrimination (Male/Female)

ST 4 – Fundamental Freq.
Recognition (Male/Female/Child)

ST 5 -- Environmental/Familiar
Sounds Recognition

ST 6 – Ling Six Sound Recognition
(Pediatric & Adult)

ST 7 --- Learning to Listen: Animals

ST 8 – LTL: Vehicles

ST 9 – Pattern Perception (1 v. 3-
syllable words)

ST 10 – Pattern Perception (1- v.
trochees v. spondees v. 3-syllable
words)

ST 11 – Spondee Recognition

ST 12 – 1-Syllable Word Recognition

A large orange circle on the left side of the slide, partially cut off by the edge.

Hierarchical Order of Subtests

ST 13 – One Critical Element

ST 14 – Two Critical Elements

ST 15 – Sequencing Three Events (Quiet)

ST 16 – Listening Comprehension (Quiet)

ST 17 – Sequencing Three Events (+10 Signal-to-Noise Ratio/+10 SNR)

ST 18 – Listening Comprehension (+5 SNR)

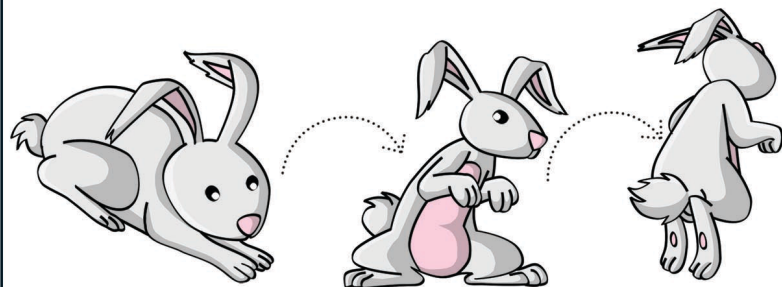
ST 19 – Listening Comprehension (0 SNR)

A yellow dashed line in the bottom right corner, consisting of several short, curved segments.

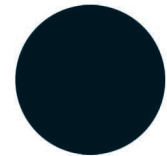
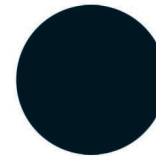
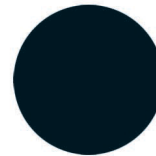
Subtest 1
1A – Pediatric
1B -- Adult

Duration Discrimination

Pediatrics



Adults



1B

Subtest 2

Pitch Discrimination



Subtest 3

Male versus Female

Fundamental Frequency Discrimination



Subtest 4

**Male versus Female versus Child
Fundamental Frequency Recognition**





AUDIO



Subtest 5

Environmental/Familiar Sounds Recognition



5



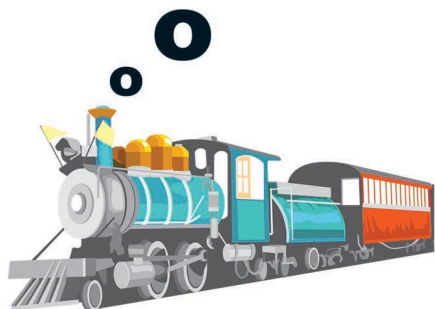


AUDIO

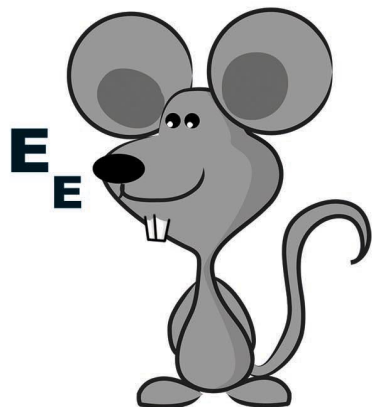
Subtest 6
6A – Pediatric
6B -- Adult

Ling Six Sounds

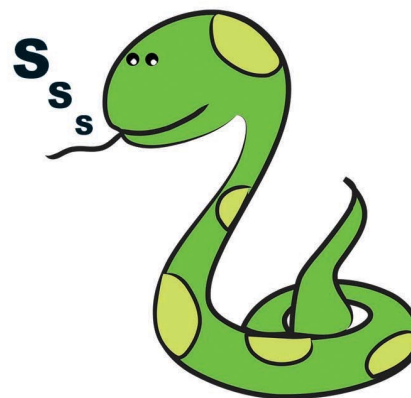
Pediatrics



6A



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37

Adults

OO

Mmm

AH

EE

SH

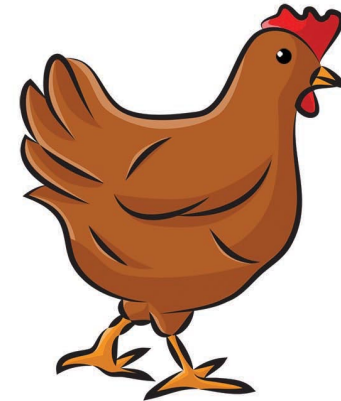
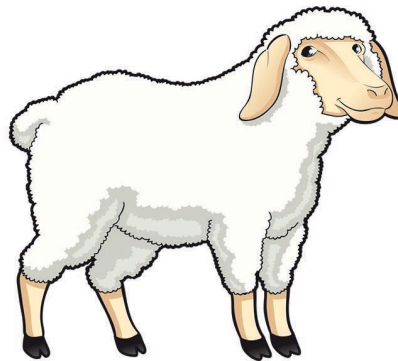
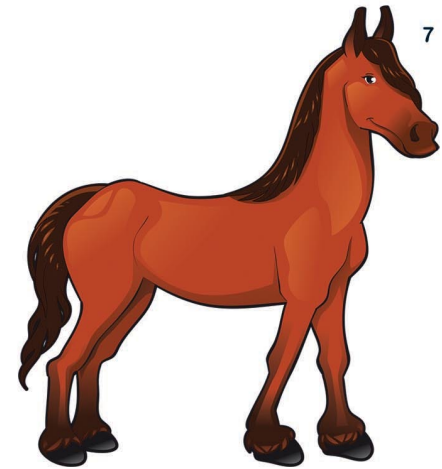
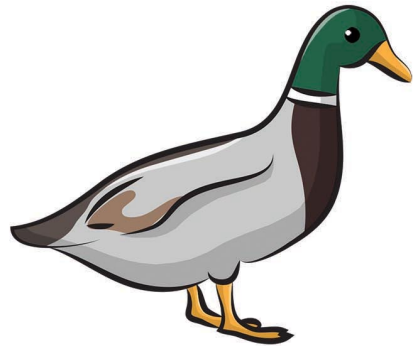
Sss

6B

Subtest 7

Learning to Listen Associated Sounds

Animals



Subtest 8

Learning to Listen Associated Sounds

Vehicles



8



Subtest 9

Pattern Perception

1-Syllable versus 3-Syllable Words



9



49

Subtest 10

Pattern Perception

1-Syllable / Trochees / Spondees / 3-Syllable Words



10



52

Subtest 11

Spondee Recognition



11



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55

Subtest 12

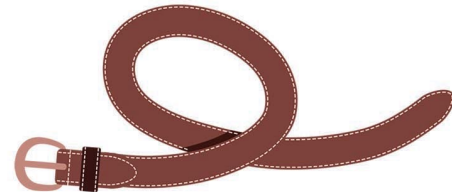
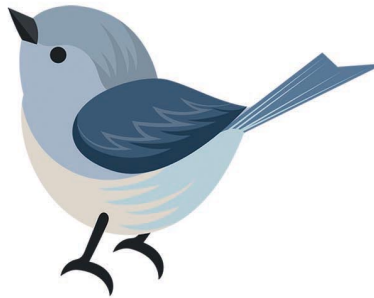
1-Syllable Word Recognition



12



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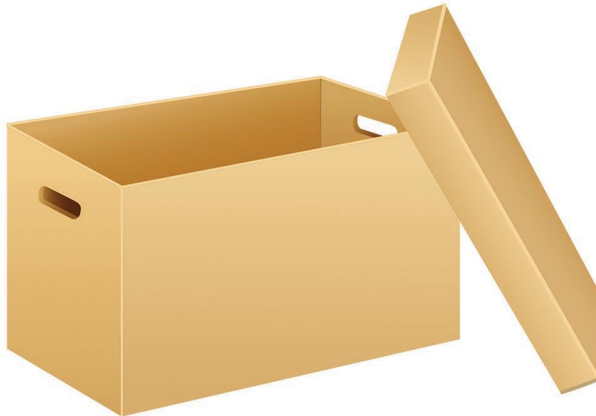
58

Subtest 13

One Critical Element:
Word Recognition

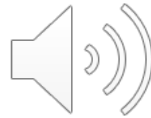


13.P





AUDIO



Subtest 15

Two Critical Elements:
Phrase Recognition



14.1



76

AUDIO



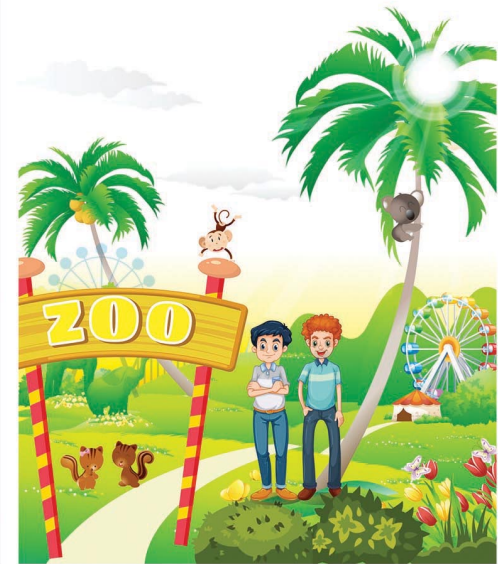
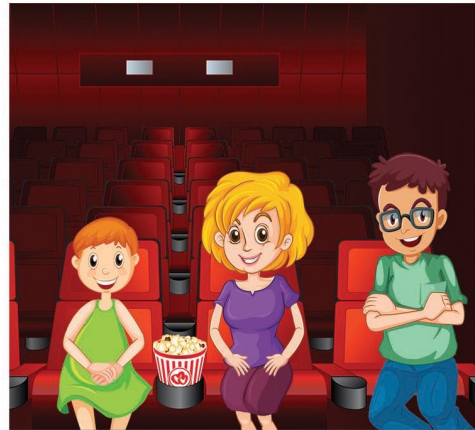
Subtest 15

Sequencing Three Events (Quiet)

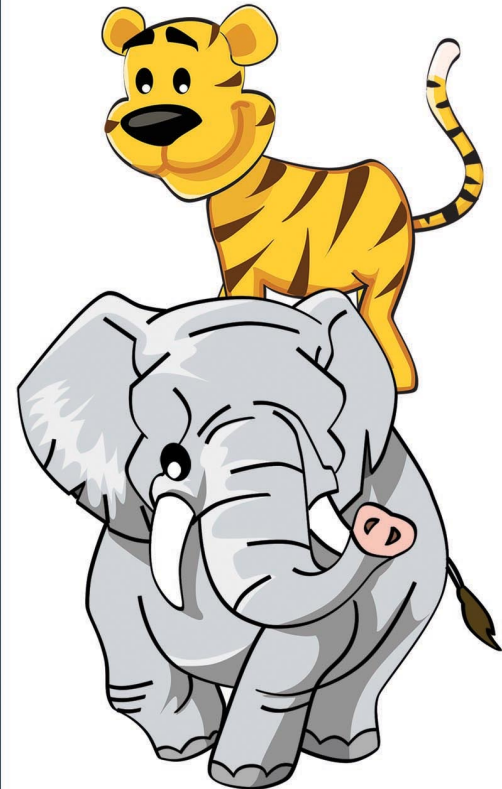
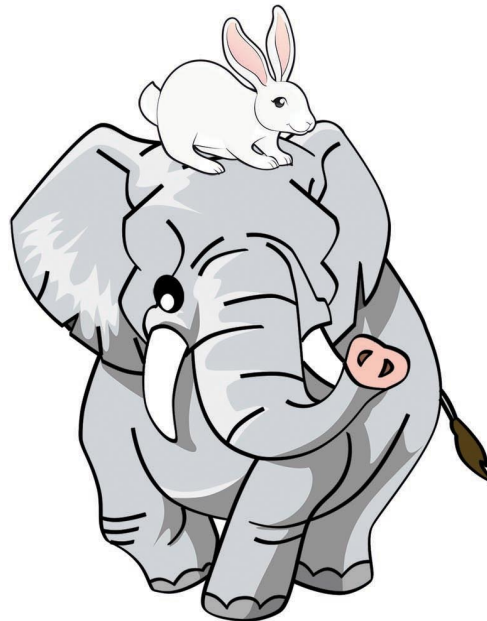
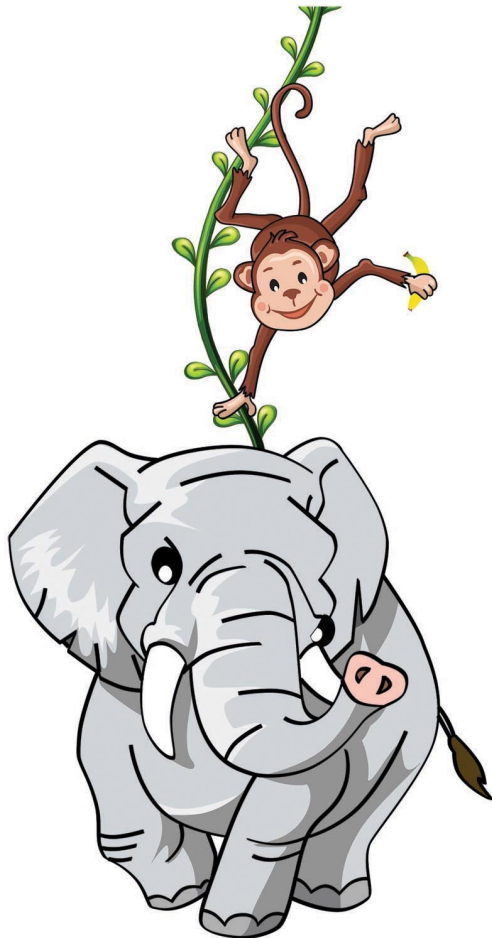
LISTEN!

AUDIO





WHAT HAPPENED FIRST?



15.P2

WHAT HAPPENED NEXT? / WHAT HAPPENED SECOND?



15.P3

WHAT HAPPENED LAST?

Subtest 16

Listening Comprehension **(Quiet)**

LISTEN!



AUDIO



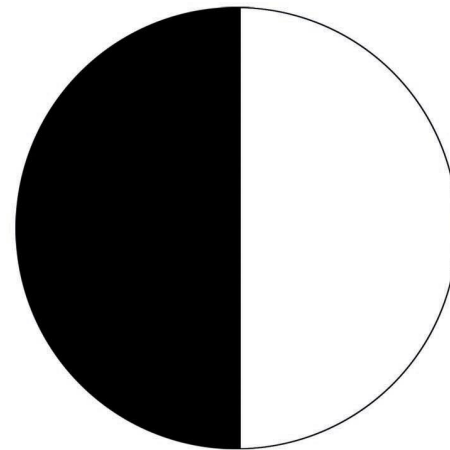
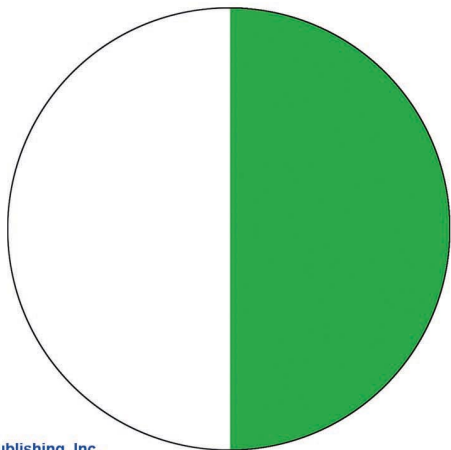
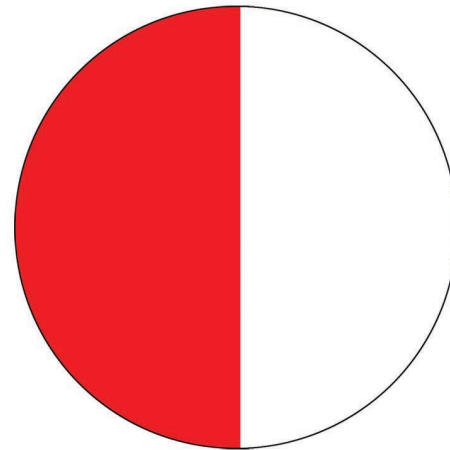
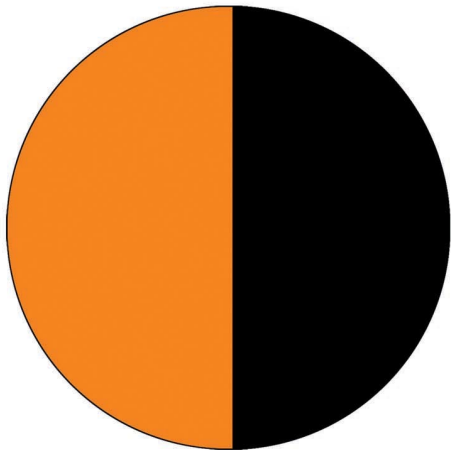


16.P1



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16.P2



16.P3





Happy



Frightened

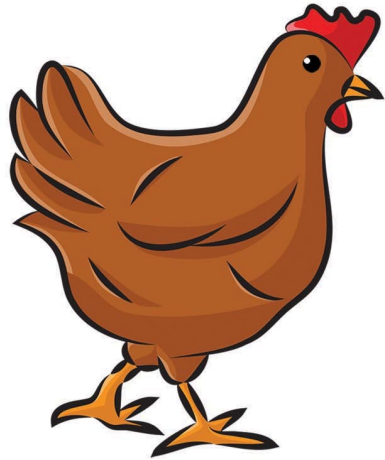


Angry

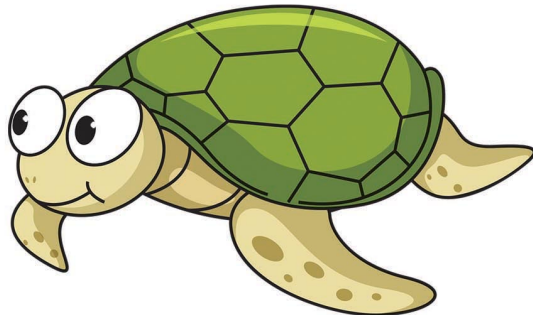


Sad

16.P4



16.P5



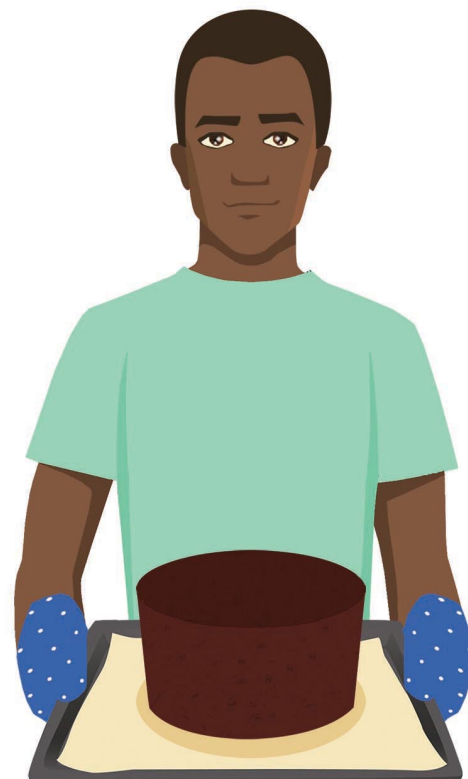
Subtest 17

Sequencing Three Events
(+10 SNR)

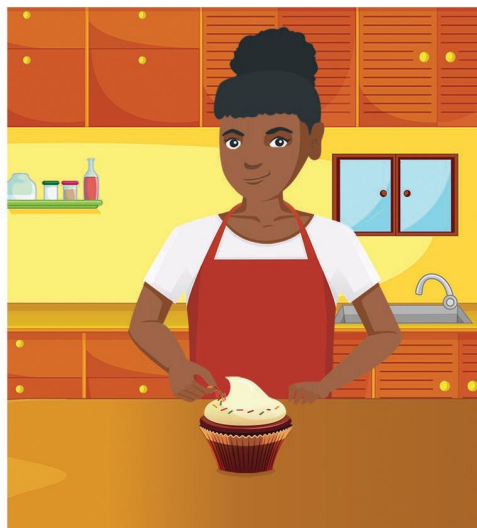
LISTEN!



AUDIO



WHAT HAPPENED FIRST?



WHAT HAPPENED NEXT? / WHAT HAPPENED SECOND?



WHAT HAPPENED LAST?

Subtest 18

Listening Comprehension

(+5 SNR)

LISTEN!



AUDIO



18.1



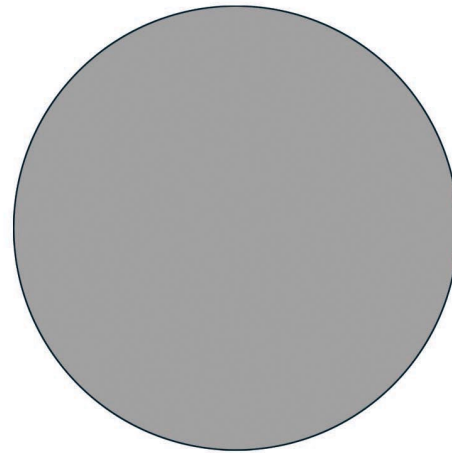
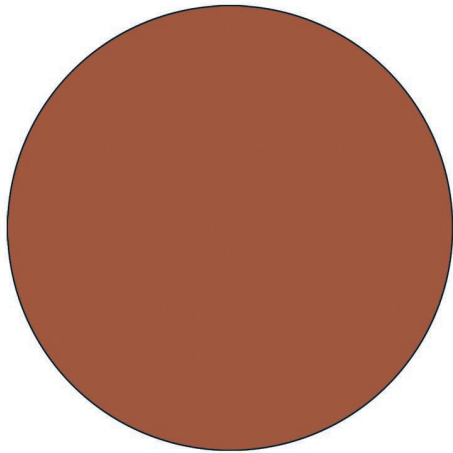
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50

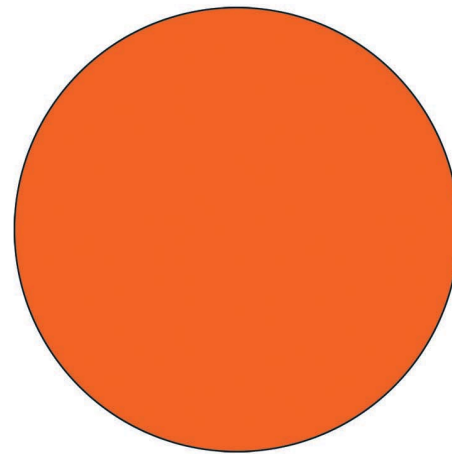
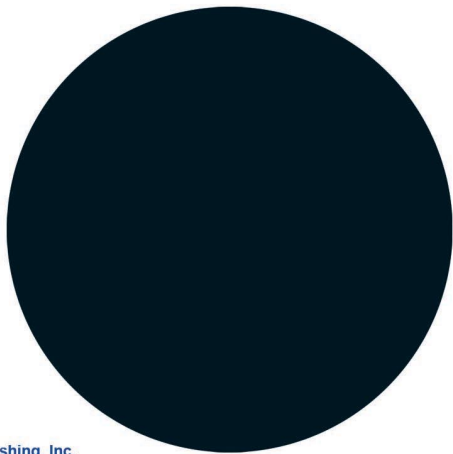
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100

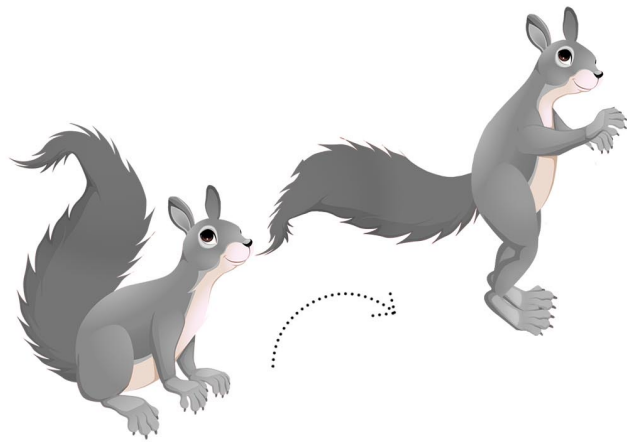
18.2



18.3



150





18.5



152

Subtest 19

Listening Comprehension
(0 SNR)

LISTEN!



Story in background noise



Question 1



Question 2



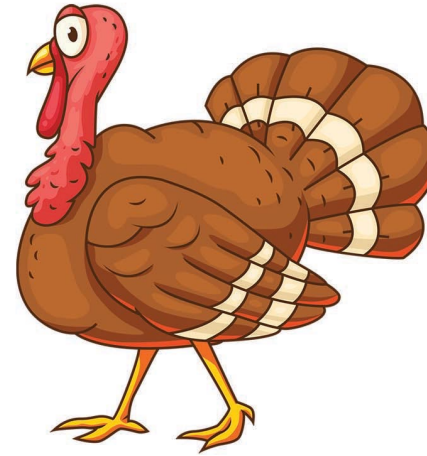
Question 3



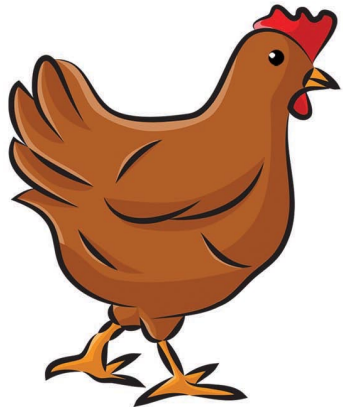
Question 4



Question 5

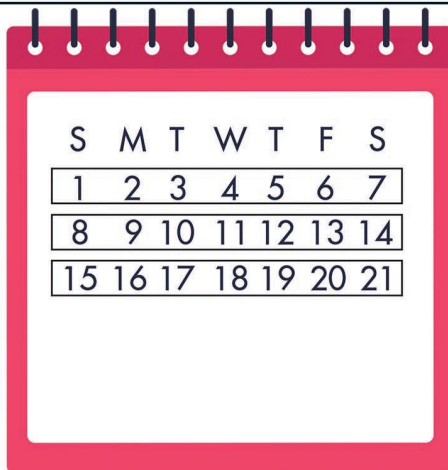


19.1

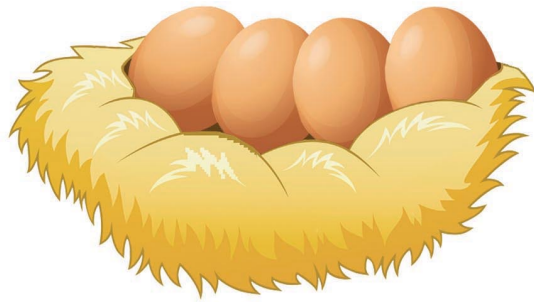




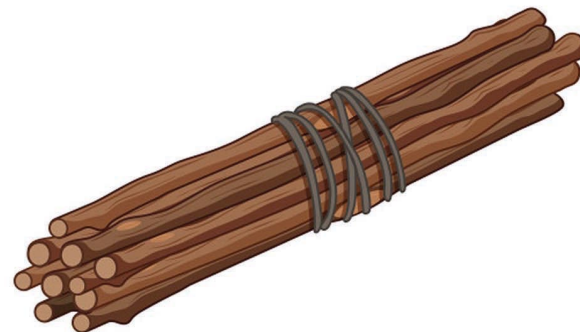
19.2



163

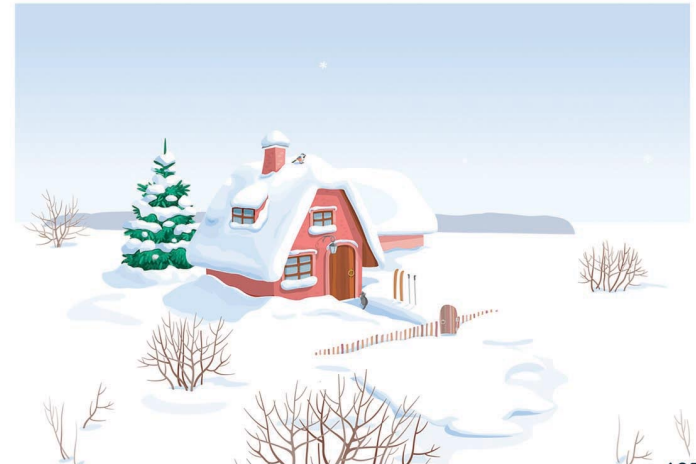
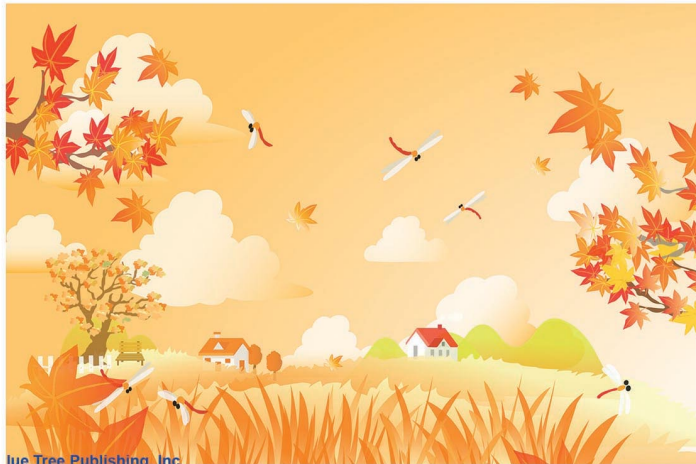


19.3

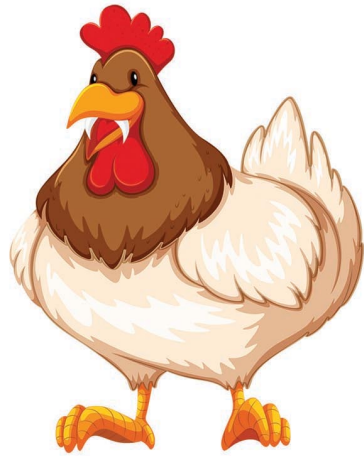




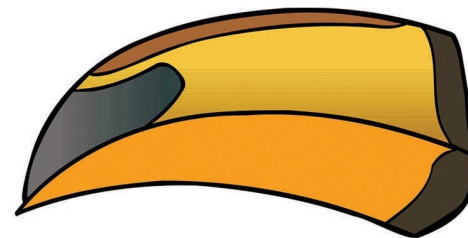
19.4



165



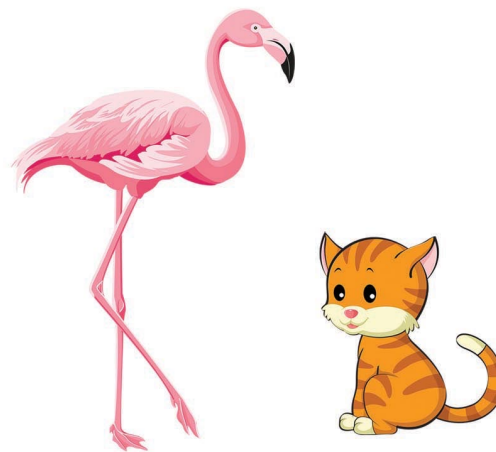
19.5



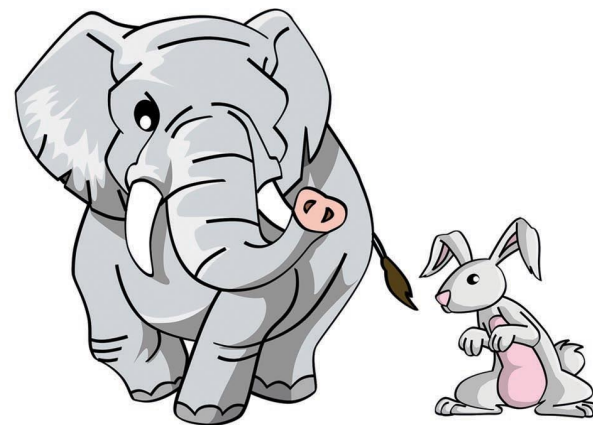
LISTEN!



AUDIO



19.6



168

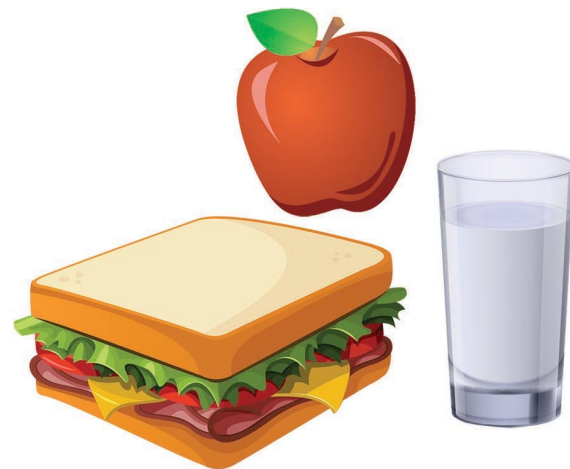
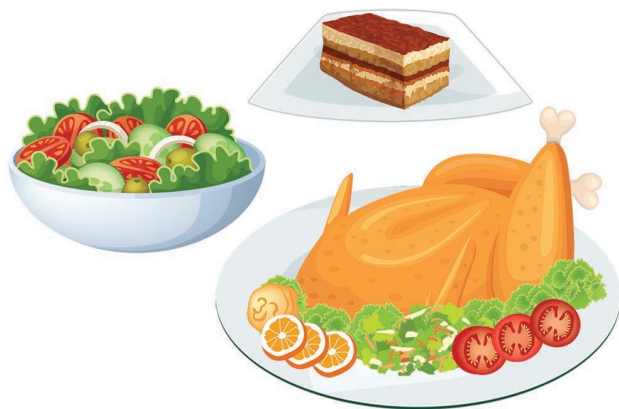
1st

2nd

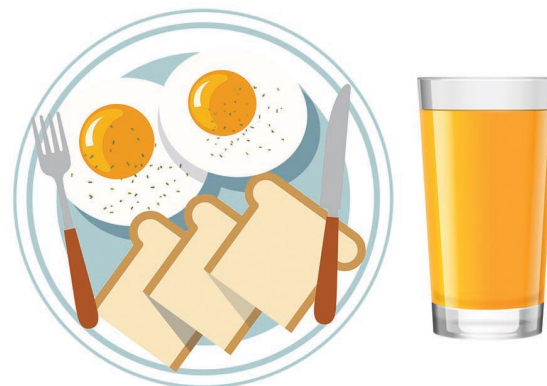
3rd

4th

19.7



19.8



170



Happy



19.9
Nervous



Frightened



Sick



19.10

Administration / Scoring

Transfer from Dx to Treatment: Let's Talk!

The TAF: A Criterion-Based Assessment Measure

Will include:

- Administration Manual (downloadable)
- Picture Plates / Easel
- Score Sheet (downloadable)
- Score Sheet Compilation (downloadable)

Also:

- YouTube Test administration video
(Ella demo of ALL Subtests)

Upcoming: Treatment “Guide”



The Sky Is *Truly* The Limit!

