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**Goldman-Fristoe Test of Articulation 2
Update: History, Purpose,
Administration, Scoring,
Interpretation, and Standardization**

In Cooperation with Pearson

Presenter: Ronald Goldman, Ph.D.

Moderated by:

Amy Hansen, M.A., CCC-SLP, Managing Editor, SpeechPathology.com

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***Goldman-Fristoe Test of Articulation 2 Update:
History, Purpose, Administration, Scoring,
Interpretation, and Standardization***

December 11, 2014

Ronald Goldman, Ph.D.
Author
Goldman-Fristoe Test of Articulation-2



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**Goldman
Fristoe²**
Test of Articulation™

**Product Evolution: Film
Viewer**

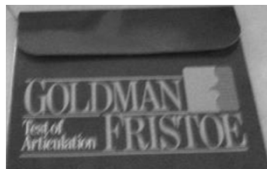
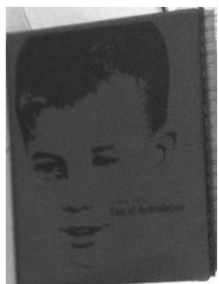


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**Goldman
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Test of Articulation

Product Evolution



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**Goldman
Fristoe 2**
Test of Articulation

Increasing Precision Through Research and Feedback

- 1960s Filmstrip Articulation Test
- 1969 GFTA published (no norms)
- 1972 Norms for ages 6-16+ added to GFTA
(Hull, et al. study)
- 1986 Norms for ages 2-5 added to GFTA
- 1999 Nationwide re-norming (n = 2,350)
- 2000 GFTA-2 published and Supplemental Developmental Norms
- 2012 GFTA-2 Digital Stimulus Book (flash drive)
- 2014 GFTA-2 digital edition on Q-interactive (2 iPads)

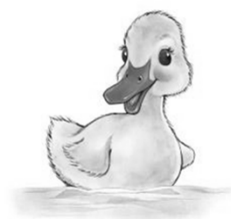
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Leadership Position

From the ASHA Product Survey (2005):

GFTA is the most widely used test in speech-language pathology



Types of Tests

- Conversational Speech (authentic)
- Reading
 - My Grandfather
 - The Rainbow
- Mimicry
- Picture naming
 - Homemade
 - Bryngleson-Glaspey (1951)
 - Hejna (1955)
 - Templin-Darley (1955)



Winitz, H. (1969). Articulatory Acquisition and Behavior

- Articulation tests can be used in a variety of ways:
 - to determine phonetic proficiency
 - for purposes of screening
 - for diagnosis
 - to assess developmental progress
 - for prediction
 - to test for programming
- To this list we added some additional applications:
 - to screen for expressive language difficulties
 - for research studies

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Articulation Test Design for Young Children

Test must be designed to:

- Examine all the necessary phonemes
- Obtain an adequate and accurate sample of the subject's speech production under several conditions, ranging from imitative to conversational speech
- Be presented in a form that would be easy to administer, eliminating loose cards or objects as stimulus material
- Be colorful and interesting to the subject

(continued...)

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Articulation Test Design for Young Children, continued

- Be conducive to the minimizing of distractions and to the focusing of the subject's attention on stimulus materials
- Employ appropriate vocabulary providing spontaneous association of picture and desired verbal response
- Minimize administration time (use fewer stimulus pictures to obtain multiple word and sound responses)
- Provide a form for recording responses which is easy to use and which facilitates a comparative evaluation of the subject's pattern of errors under the various test conditions

Early Decisions in Test Construction

- Sounds to be assessed
- Picture and word selection
- Test format (Film strip or Easel)
- Testing multiple sounds in a single word
 - Studies by Irwin & Musselman (1962) and Fristoe & Goldman (1968)

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GFTA-2 Test Sections

- Measurement of spontaneous production of sounds in words (Sounds-in-Words)
- Measurement of articulation skills in a task closer to authentic speech (Sounds-in-Sentences)
- Measurement of stimulability (Stimulability)

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Summary of Item Changes

Removed from GFTA:

- Bed
- Chicken
- Christmas tree
- Church
- Flag
- Gun
- Matches
- Santa Claus
- Sleeping
- Squirrel
- Stove
- wheel

New in GFTA-2:

- Ball
- Balloons
- Banana
- Chair
- Clown
- Crying
- Five
- Flowers
- Frog
- Girl
- Glasses
- Green
- Monkey
- Quack
- Slide
- Spoon
- Stars
- Swimming
- Watch
- Watches

GFTA Test Norms

- Initial test was criterion referenced
- Funding agencies demanded norm referenced comparisons before approving services
- 1972: normative information for children and adolescents age 6 through 16+
- 1986: added norms for children 2 through 5
- 1999: GFTA-2 new standardization sample provided age based standard scores as well as percentiles for males and females age 2 through 21 years
- 2000: Developmental Norms by Gender and consonant and consonant cluster development based on the nationwide GFTA-2 large, stratified and well-controlled standardization sample. This was computed on ages 2-0 through 8-11.

Standardization Plan

Table 5.2

GFTA-2 Standardization Testing Plan, by Gender and Age

Age	Female		Male	
	Target N	Actual N	Target N	Actual N
2-0 to 2-11	100	127	100	138
3-0 to 3-11	100	171	100	157
4-0 to 4-11	125	162	125	233
5-0 to 5-11	125	209	125	238
6-0 to 6-11	125	198	125	211
7-0 to 7-11	100	153	100	152
8-0 to 8-11	100	133	100	136
9-0 to 10-11	100	151	100	154
11-0 to 12-11	100	121	100	118
13-0 to 14-11	100	129	100	121
15-0 to 21-11	100	169	100	140
Total Sample	1,175	1,723	1,175	1,798

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Sample Selection

- Subjects selected to match U.S. 1998 Census data to secure representation of national population
- The female and male samples were stratified within each age group by the following criteria:
 - Race or ethnic group
 - Geographic region
 - Socioeconomic status (mother's educational level)

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Standardization Characteristics

Table 5.11

Representation of the Female Standardization Sample, by Race or Ethnic Group and Geographic Region

Region	Race or Ethnic Group												Total N
	African American			Hispanic			White			Other ^a			
	GFTA-2 Sample		U.S. Pop. ^b	GFTA-2 Sample		U.S. Pop. ^b	GFTA-2 Sample		U.S. Pop. ^b	GFTA-2 Sample		U.S. Pop. ^b	
	N	%	%	N	%	%	N	%	%	N	%	%	
Northeast	31	2.6	2.5	31	2.6	2.4	149	12.7	12.5	8	0.7	0.7	219
North Central	47	4.0	3.0	26	2.2	1.2	199	16.9	18.9	6	0.5	0.7	278
South	91	7.7	8.7	60	5.1	4.5	252	21.4	20.5	11	0.7	1.0	414
West	24	2.0	1.2	67	5.7	6.9	153	13.0	12.7	20	1.7	2.7	264
Total	193	16.4	15.5	184	15.7	14.9	753	64.1	64.5	45	3.8	5.0	1,175

^aIncludes American Indians, Alaska Natives, Asians, Pacific Islanders, and all other groups not classified as African American, Hispanic, or White.^bU.S. population data from *Current Population Survey, March 1998* [machine-readable data file] conducted by the Bureau of the Census for the Bureau of Labor Statistics.

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Reliability Data

- Median reliability (coefficient alpha)
 - Females = .96
 - Males = .94
- Test-Retest reliability (presence of error)
 - Initial, medial, and final positions = 98%
- Inter-rater reliability (presence of error)
 - Initial position = 93%
 - Medial and final positions = 90%

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Validity Data

- Content validity
 - 23 of the 25 Standard American English consonants (excluding /hw/ and /zh/)
- Construct validity
 - Developmental progression of total raw scores

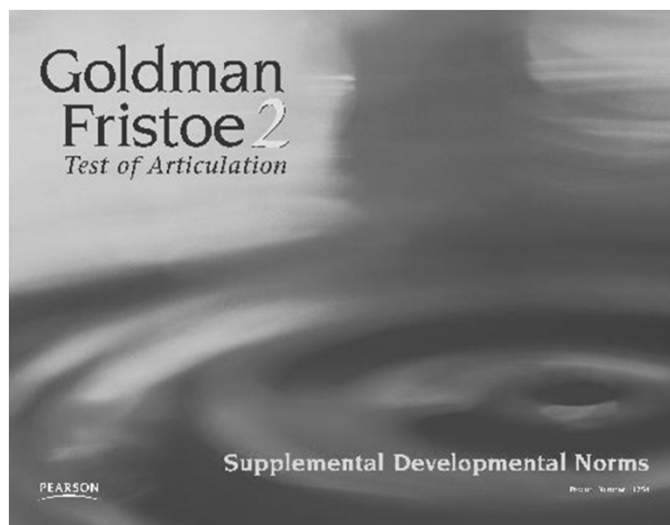
GFTA-2 Table 2.1: Age at which 85% of GFTA Standardization sample correctly produced initial consonant and consonant cluster sounds

Age	Initial Sound
2	/b/, /d/, /h/, /m/, /n/, /p/
3	/f/, /g/, /k/, /t/, /w/
4	/kw/
5	ch, sh, /l/, /s/, sh, dj, /bl/
6	/r/, /v/, /br/, /dr/, /fl/, /fr/, /gl/, /gr/, /kl/, /kr/, /pl/, /st/, /tr/
7	/z/, /sl/, /sp/, /sw/, voiced and voiceless th

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Supplemental Developmental Norms



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Supplemental Developmental Norms Example from page 10 (Females)

P-values of items by age, for Female sample—according to Sound Number on the GFTA-2 Response Form

Sound Number	Sound	I M F	2-0 to 2-5	2-6 to 2-11	3-0 to 3-6
1	p	I	0.88	0.91	1.00
1	p	M	0.81	0.93	0.97
1	p	F	0.86	0.90	0.95
2	m	I	0.91	0.93	1.00

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Administration & Interpretation

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Administration

Test Administration can be completed on 1 or 2 levels:

- 1) Presence of error
- 2) Presence and type of error

Original GFTA Manual— Notations

	Correct	Incorrect	No Response	Omission	Distortion	Substitution	Addition
Sounds-in-Words	(leave cell blank)	X	/	—	2 or 3	Sound Substituted	Sound Plus Addition
Sounds-in-Sentences	(leave cell blank)	X	/	—	2 or 3	Sound Substituted	Sound Plus Addition
Stimulability	✓	X	/	—	2 or 3	Sound Substituted	Sound Plus Addition
	Level 1 Notation			Level 2 Error Notation			

Administration Time

Table 1.2

Sounds-in-Words Administration Time in Minutes, by Age

Age	Mean	SD	Median	Mode
2	16.8	8.8	15	15
3	12.3	6.8	10	10
4	9.2	4.2	8	10
5	7.8	4.4	7	5
6	6.6	3.4	6	5
7	6.1	2.9	5	4
8	5.8	2.4	5	5
9–10	5.9	3.6	5	5
11–12	5.1	2.9	4	4
13–14	6.0	3.2	5	5
15–21	5.1	2.2	5	5

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Multiple Words/Sounds per Picture

Point to the house and say: What do you call this?

5 21

house

Prompt: If the examinee responds with *home*, say:

Yes, but what else can you call it?

Point to the tree and say: What is this?

39

tree

Point to the window and say: What is this?

4 10

window

Suggested Cues

- This is a house. It's where some people live. What is this?
- This is a tree. It has green leaves. What is this?
- This is a window. It lets in light. What is this?



Target Words:

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Point to the clown and say: What do you call this?

31 3

clown

Point to the balloons and say: What is he holding?

16

balloons



Suggested Cues

- ◆ This is a clown. He makes people laugh. What is this?
- ◆ The clown is holding balloons. They are pretty colors. What is he holding?

Plate 30

Target Words: clown, balloons

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Goldman Fristoe 2

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Recording Responses

Point to the house and say: What do you call this?

5 21

house

Prompt: If the examinee responds with *home*, say:

Yes, but what else can you call it?

Point to the tree and say: What is this?

39

tree

Point to the window and say: What is this?

4 10

window

Suggested Cues

- ◆ This is a house. It's where some people live. What is this?
- ◆ This is a tree. It has green leaves. What is this?
- ◆ This is a window. It lets in light. What is this?

Figure 3.5

Rows 1 to 10 of the recording grids for Sounds-in-Words and Stimulability.

SOUNDS-IN-WORDS	Sound	Word		
		Initial	Medial	Final
1	p	21	7	3
2	m	6	13	28
3	n	3	6	30
4	w	1		
5	h	1		
6	b	4	17	22
7	g	4	5	29
8	k	3	6	9
9	f	18	2	3
10	d	9	1	33

STIMULABILITY	Sound	Syllable			Word			Sentence		
		Initial	Medial	Final	Initial	Medial	Final	Initial	Medial	Final
1	p									
2	m									
3	n									
4	w									
5	h									
6	b									
7	g									
8	k									
9	f									
10	d									

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Sounds-in-Words

Point to the house and say: What do you call this?

5 21
house

Prompt: If the examinee responds with *home*, say:

Yes, but what else can you call it?

Point to the tree and say: What is this?

39
tree

Point to the window and say: What is this?

4 10
window

Suggested Cues

- ♦ This is a house. It's where some people live. What is this?
- ♦ This is a tree. It has green leaves. What is this?
- ♦ This is a window. It lets in light. What is this?



Plate 1

Target Words: house, tree, window

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Sounds-in-Words—Scoring

Plate

1 house h a u s _____ tree t r i _____ window w i n d o _____
13 9
2 telephone t e l ə f o n _____
8 1 3 9 36
3 cup k ʌ p _____ knife n aɪ f _____ spoon s p u n _____
7 6 16
4 girl g ɜ l _____ ball b ɔ l _____
7 14 20
5 wagon w æ g ə n _____ shovel s ʌ v ə l _____
2 8

Sound	Word		
	Initial	Medial	Final
1 p	21	7	3
2 m	6	13	28
3 n	3	6	30
4 w	1		
5 h	1		

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Sounds-in-Sentences #1

Story 1:

A Bad Night for Jerry

Jerry is playing with his drum, ball, and wagon.

(Point to the drum, ball, and wagon.)

He is making too much noise.

His mother makes him stop.

It is time to take a bath.



Plate 35

Target Words: Jerry, playing, drum, ball, wagon, much, noise

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Sounds-in-Sentences #2

Jerry is taking a bath.

Oh, no! He loses the soap.

He cannot find it because it is outside the bathtub.

See the soap. (Point to the soap.)

It is on the floor.

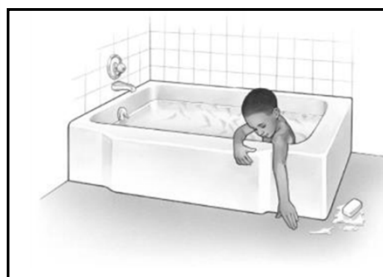


Plate 36

Target Words: taking, bath, loses, soap, floor

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Sounds in Sentences—Scoring

Story 1: A Bad Night for Jerry	
(Plate 35) Jerry is playing with his drum, ball, and wagon. He is making too much noise. His mother makes him stop. It is time to take a bath.	18 17 Jerry ɔ̃ ɛ r i _____
	7 wagon w æ ɡ ə n _____
	34 playing pl e j ɪ ŋ _____
	15 much m ʌ tʃ _____
(Plate 36) Jerry is taking a bath. Oh, no! He loses the soap. He cannot find it because it is outside the bathtub. See the soap. It is on the floor.	26 drum dr ʌ m _____
	22 noise n ɔɪ z _____
	16 ball b ɔ l _____
	13 8 taking t e k ɪ ŋ _____
	21 soap s o p _____
	19 bath b æ θ _____
	27 17 floor fl o r _____
	22 loses l u z ɪ z _____

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Stimulability

Sound	Syllable	Word	Sentence
1 p	pih [pt]	pig	The pig is eating.
	a-puh [æpə]	apple	The apple is cut.
	oop [up]	soup	My soup is ready.
2 m	mih [mi]	milk	Put the milk away.
	uh-nee [ami]	yummy	This is a yummy treat.
	oom [um]	room	Your room is big.
3 n	nee [ni]	knee	My knee doesn't hurt.
	ee-nuh [ina]	peanuts	Some peanuts are salty.
	an [æn]	can	I can ride a bike.
4 w	weh [wɛ]	wet	He has wet feet.
5 h	hah [hə]	hot	It is hot in here.
6 b	beh [be]	bell	The bell is ringing.
	ay-bee [ebi]	baby	The baby is cute.
	ahb [ab]	job	This job is easy.
7 g	gih [gi]	give	She will give me a cookie.
	a-gee [ægi]	baggy	I like baggy pants.
	awg [ɔ̃g]	dog	The dog is noisy.
8 k	ka [kæ]	cat	The cat is hiding.
	uh-kee [aki]	yucky	That's a yucky one!
	ayk [ek]	make	Let's make some bread.
9 f	fay [fe]	face	My face is clean.
	aw-fee [ɔ̃fi]	coffee	That coffee is hot!
	af [æf]	laugh	I laugh a lot.
10 d	dih [di]	deer	The deer is running.
	a-duh [ida]	ladder	Put the ladder away.
	ad [æd]	had	I had fun.
11 ŋ	awng-guh[ɔ̃ŋgə]	longest	She has the longest hair.
	ing [ɪŋ]	sing	Let's sing a song.
12 j	yoo [ju]	you	I like you, too.
13 t	tah [to]	top	Put the top on the box.
	ih-tah [ito]	guitar	That guitar is old.
	iet [ant]	light	The light is on.
14 ʃ	shi [ʃi]	ship	The ship is sailing.
	ih-shih [ʃi]	dishes	The dishes are dry.
	ash [æʃ]	mash	I will mash the potatoes.
15 tʃ	chee [tʃi]	cheese	That cheese is good.
	a-chih [ætʃi]	matches	My top matches my shorts
	ach [ætʃ]	catch	I can catch the ball.
16 l	lie [lai]	like	I like ice cream.
	ih-loh [ilo]	below	It's below freezing.
	el [el]	fell	The baby fell asleep.
17 r	ra [ræ]	ran	I ran to school.
	a-ree [æri]	carry	He can carry that box.
	ohr [or]	door	The door is open.

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Examinee Identification

Figure 3.2
Completed information section of the GFTA-2 Response Form.

IDENTIFYING INFORMATION			
Name	<u>Kyle Knutson</u>		
School/Agency	<u>Oak Grove Elementary</u>		
<input checked="" type="checkbox"/> Male	<input type="checkbox"/> Female	Grade/Ed. Level <u>K</u>	
Language Spoken in the Home <u>English</u>			
Examiner <u>Ms. Rivera</u>			
Reason for Testing <u>referred by teacher because of</u> <u>unintelligible speech</u>			

AGE CALCULATION			
	Year	Month	Day
Test Date	<u>2000</u>	<u>09</u>	<u>29</u>
Birth Date	<u>1995</u>	<u>05</u>	<u>10</u>
Chronological Age*	<u>5</u>	<u>4</u>	

* Use age in years and months only; do not round up.

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Sounds-in-Words Score Summary

Figure 4.1
Score Summary section of the response form completed for Kyle K.

SOUNDS-IN-WORDS SCORE SUMMARY				
<input checked="" type="checkbox"/> Male Norms <input type="checkbox"/> Female Norms See Table B.1.				
Raw Score*	Standard Score	Confidence Interval <input checked="" type="checkbox"/> 90% <input type="checkbox"/> 95%	Percentile	Test-Age Equivalent
<u>28</u>	<u>75</u>	<u>69 — 81</u>	<u>8</u>	<u>3-1</u>

*Raw score equals total number of articulation errors. See Chapter 4.

COMMENTS:

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Record Form

Figure 3.5

Rows 1 to 10 of the recording grids for Sounds-in-Words and Stimulability.

SOUNDS-IN-WORDS	Sound	Word		
		Initial	Medial	Final
	1 p	21	7	3
	2 m	6	13	28
	3 n	3	6	30
	4 w	1		
	5 h	1		
	6 b	4	17	22
	7 g	4	5	29
	8 k	3	6	9
	9 f	18	2	3
	10 d	9	1	33

STIMULABILITY	Sound	Syllable			Word			Sentence		
		Initial	Medial	Final	Initial	Medial	Final	Initial	Medial	Final
	1 p									
	2 m									
	3 n									
	4 w									
	5 h									
	6 b									
	7 g									
	8 k									
	9 f									
	10 d									

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Diagnostic Interpretation

- Compare matrices to determine degree of consistency
 - Sound errors
 - Position in which misarticulations occurred
 - Type of errors (omissions, distortions, additions, substitutions, etc.)
- Determine if errors are on more or less frequently occurring sounds
- Determine whether misarticulations are on sounds that are likely to appear late in speech development

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Additional Interpretation Considerations

- Error type
 - Nasal, plosive, fricative
 - Are error types similar in terms of placement of articulators
 - Are errors related to voicing such as /b/ used for /p/

Supplemental Developmental Norms Example from page 10 (Females)

P-values of items by age, for Female sample—according to Sound Number on the GFTA-2 Response Form

Sound Number	Sound	I M F	2-0 to 2-5	2-6 to 2-11	3-0 to 3-6
1	p	I	0.88	0.91	1.00
1	p	M	0.81	0.93	0.97
1	p	F	0.86	0.90	0.95
2	m	I	0.91	0.93	1.00

"At-a-Glance" Developmental Sound Acquisition

GFTA-2 Table 2.1: Age at which 85% of GFTA Standardization sample correctly produced initial consonant and consonant cluster sounds

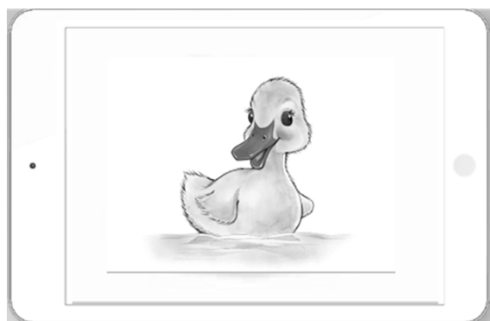
Age	Initial Sound
2	/b/, /d/, /h/, /m/, /n/, /p/
3	/f/, /g/, /k/, /t/, /w/
4	/kw/
5	ch, sh, /l/, /s/, sh, dj, /bl/
6	/r/, /v/, /br/, /dr/, /fl/, /fr/, /gl/, /gr/, /kl/, /kr/, /pl/, /st/, /tr/
7	/z/, /sl/, /sp/, /sw/, voiced and voiceless th

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| GFTA-2 Update | 11/11/2014

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Digital Administration and Scoring



Examinee screen



Examiner screen for response capture and scoring

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**Goldman
Fristoe 2**
Test of Articulation™

Automatic, Immediate Scoring Results

• GFTA-2 Error Analysis

Sounds	Initial			Medial			Final			Initial			Medial			Final			Initial			Medial			Final		
	Initial	Medial	Final	Initial	Medial	Final	Initial	Medial	Final	Initial	Medial	Final	Initial	Medial	Final	Initial	Medial	Final	Initial	Medial	Final	Initial	Medial	Final			
p																											
m																											
n																											
w																											
h																											
b																											
g				d		d																					
k	t			t		t																					
f						p																					
d				-																							
n				n		n																					
l				-																							

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Results

GFTA-2 Test of Articulation
End of Subtest

GFTA-2 Test of Articulation Standard Score <40

Total Raw Score : Sounds-in-Words 50

Item Raw Scores


Additional Measures

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Sounds-in-Sentences



Q-interactive®



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Coming Late 2015



- New print and digital editions for GFTA-3 administration and scoring
- Assess consonants in multiple contexts
- Updated norms
- Criterion-referenced evaluation of vowels
- Spanish edition in development; Publication date TBD





Two Sets of Test Stimuli: Example

Look at this boy. What is he wearing on his foot? (shoe)



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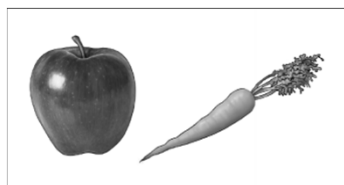
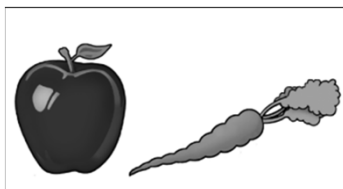
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Two Sets of Test Stimuli: Example

An apple is a fruit; a carrot is a _____



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Phoneme Production is Tested in Multiple Contexts

Examples of words testing Initial /p/

- Pencil
- Puzzle
- Pig



Examples of words testing Final /n/

- Lion
- Green
- Crown
- Seven



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New Scoring Procedures

- *All* obligatory consonants are scored
- Information about vowel productions can be recorded for later analysis

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On Q-interactive

What is Q-interactive?

Use two iPads: One for the examiner; one for the examinee

Guides you through the assessment process

Obtain scores automatically and immediately

Video

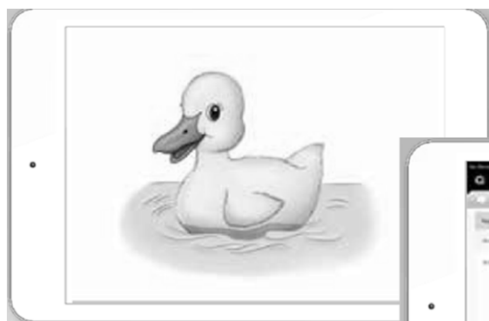


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View of Examiner and Examinee iPad Screens



Examinee screen



Examiner screen for response capture and scoring

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Modified Sounds-in-Sentences



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Wrap-Up

Questions & Answers

ALWAYS LEARNING

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