

Speech-Language Issues in Children with Fetal Alcohol Syndrome

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**American Speech-Language & Hearing Association
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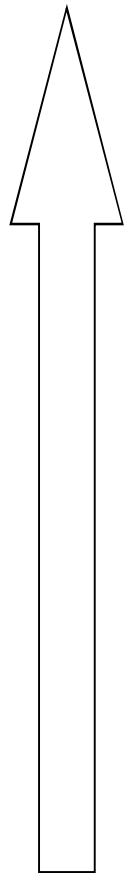
Learner objectives:

1. Identify the likelihood of encountering speech-language deficits secondary to prenatal alcohol exposure, based on current epidemiological data.
2. List common characteristics of children with FAS and the impact on speech-language function.
3. List assessment tools and techniques that will improve treatment efficacy.

Agenda:

1. FASD
2. Clinical Sessions
3. Articulation Samples
4. Diagnosis
5. Epidemiologic data
6. Current Research Study
7. Speech assessment
8. Question/Answer

Common Terminology Associated with Fetal Alcohol Spectrum Disorder (FASD)



- Fetal Alcohol Syndrome (FAS)
- Fetal Alcohol Effect (FAE)
- Alcohol-Related Birth Defects (ARBD)
- Alcohol-Related Neurodevelopmental Disorder (ARND)

Causes – prenatal alcohol exposure

“Of all the substances of abuse, including heroin, cocaine, and marijuana, alcohol produces by far the most serious neurobehavioral effects in the fetus.” –

Institute of Medicine Report to Congress (1996)

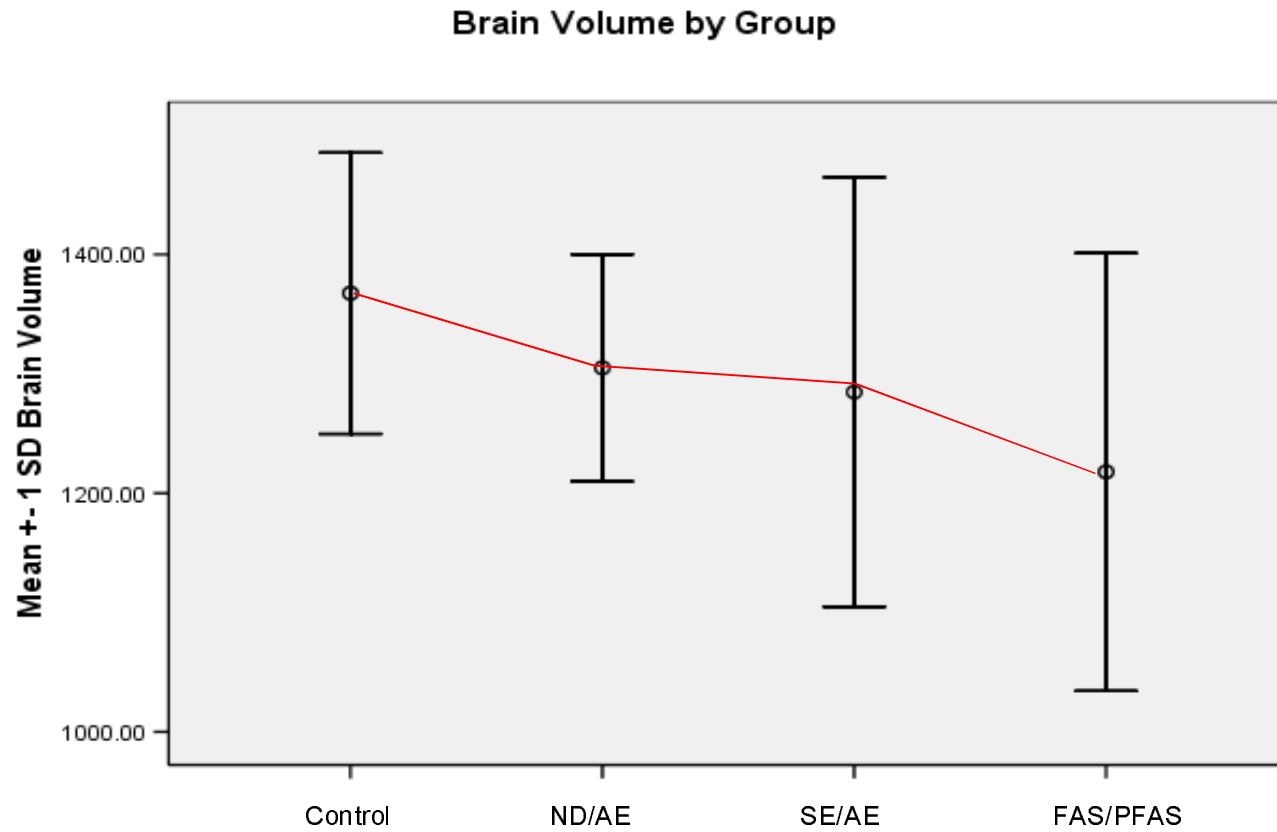
Primary FASD Characteristics

- Developmental delays
- Inconsistent performance
- Impulsivity
- Distractibility
- Attention deficits
- Disorganization
- Gross motor
- Poor social skills
- Difficulty with abstractions
- Memory impairments
- Deficits in higher-level cognitive function (i.e., cause/effect, abstract language)
- Receptive & expressive language

- FAS general diagnostic criteria
 - Growth deficiency
 - Distinct cluster of facial anomalies
 - **Evidence of central nervous system (CNS) dysfunction and/or structural brain abnormalities**

- Primary neurologic characteristics in FAS
 - Reduction in overall brain size
 - Abnormalities of brain shape and symmetry
 - Reduction of **frontal lobe** volume
 - Reduction of **basal ganglia** volume, especially caudate
 - Non-uniform reductions of **cerebellar** volume
 - Reduction and shape abnormalities of **corpus callosum**

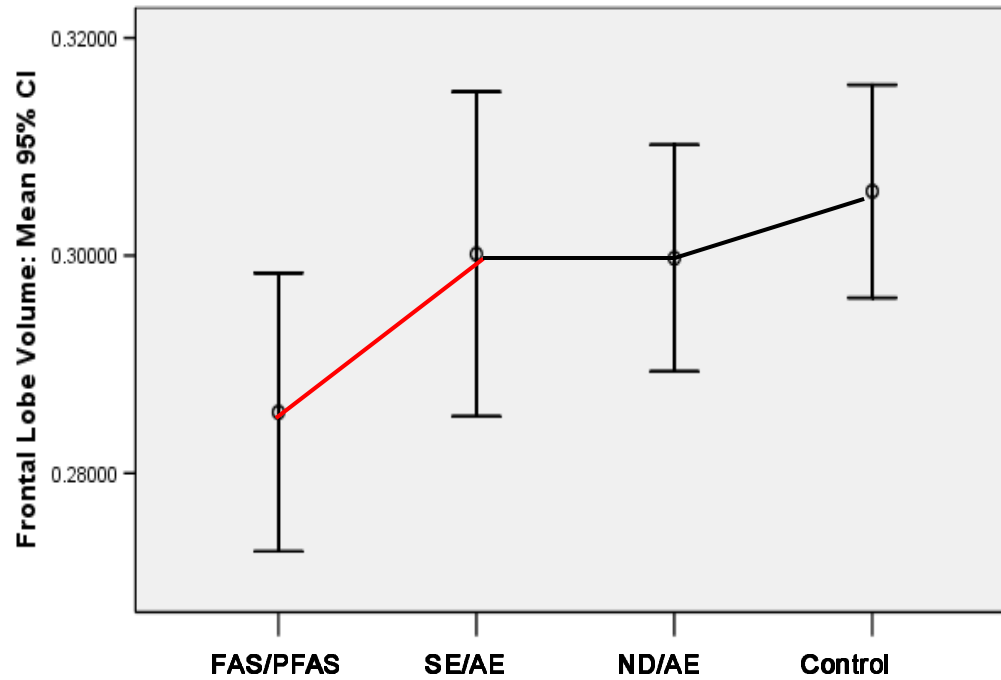
Brain volume (Astley and colleagues, MRI studies)



- Frontal lobe
 - Motor control
 - Planning, foresight, cause and effect
 - Speech motor control (Broca's area; damage -> apraxia)
 - Social/behavioral inhibition
 - Executive function

Frontal lobe volume (Astley et al.)

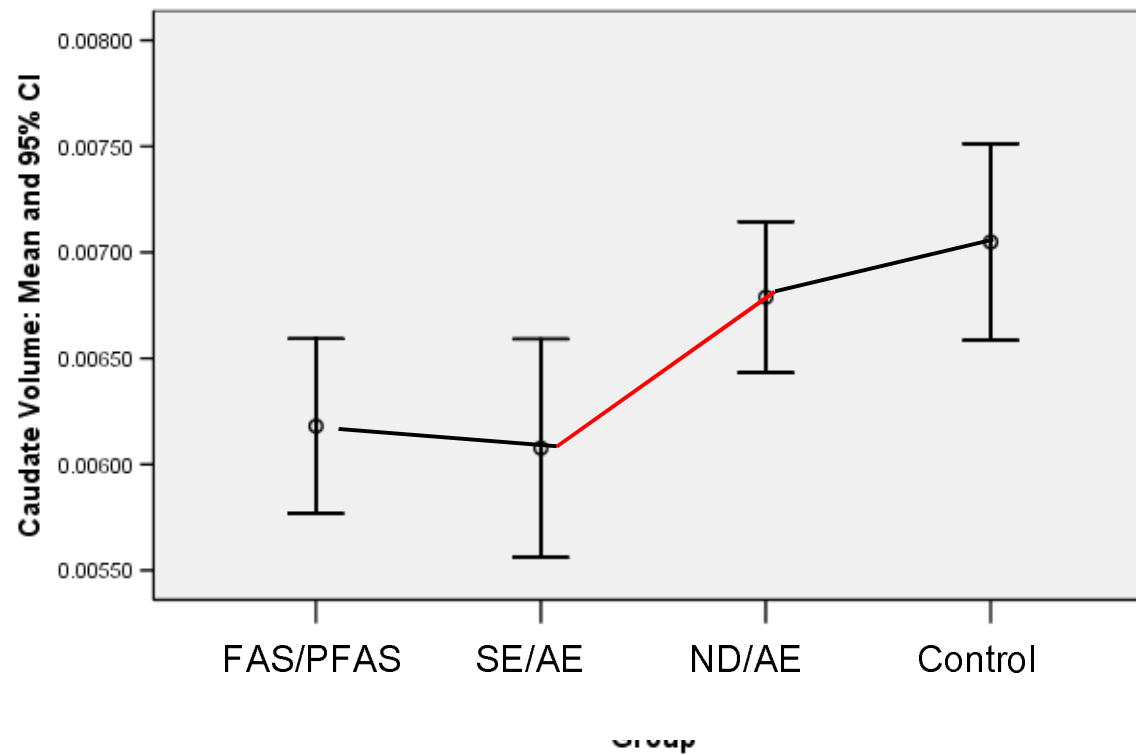
Frontal Lobe (adjusted for brain size) Across 4 Groups



- Basal ganglia
 - Motor control; amplitude, velocity, initiation
 - Background muscle tone
 - Inhibition of unwanted movement
 - Caudate: implicated in memory & learning; closely connected with frontal lobe

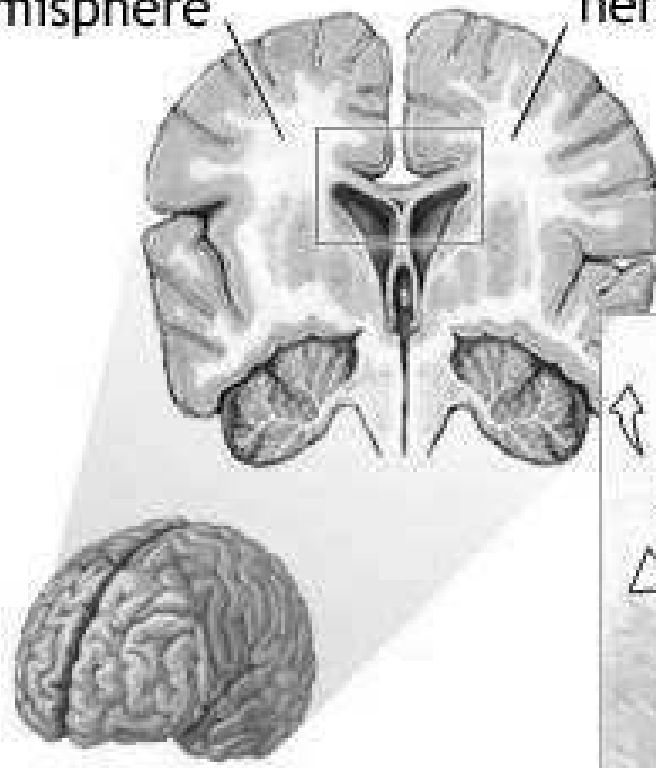
Caudate size (Astley, et al.)

Caudate Size (adjusted for brain size) across the 4 Groups

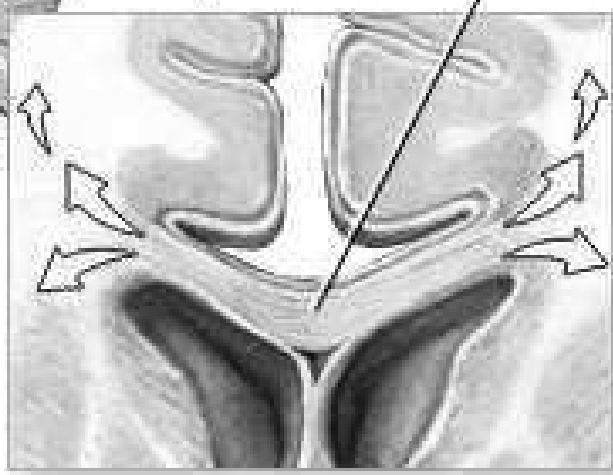


Right hemisphere

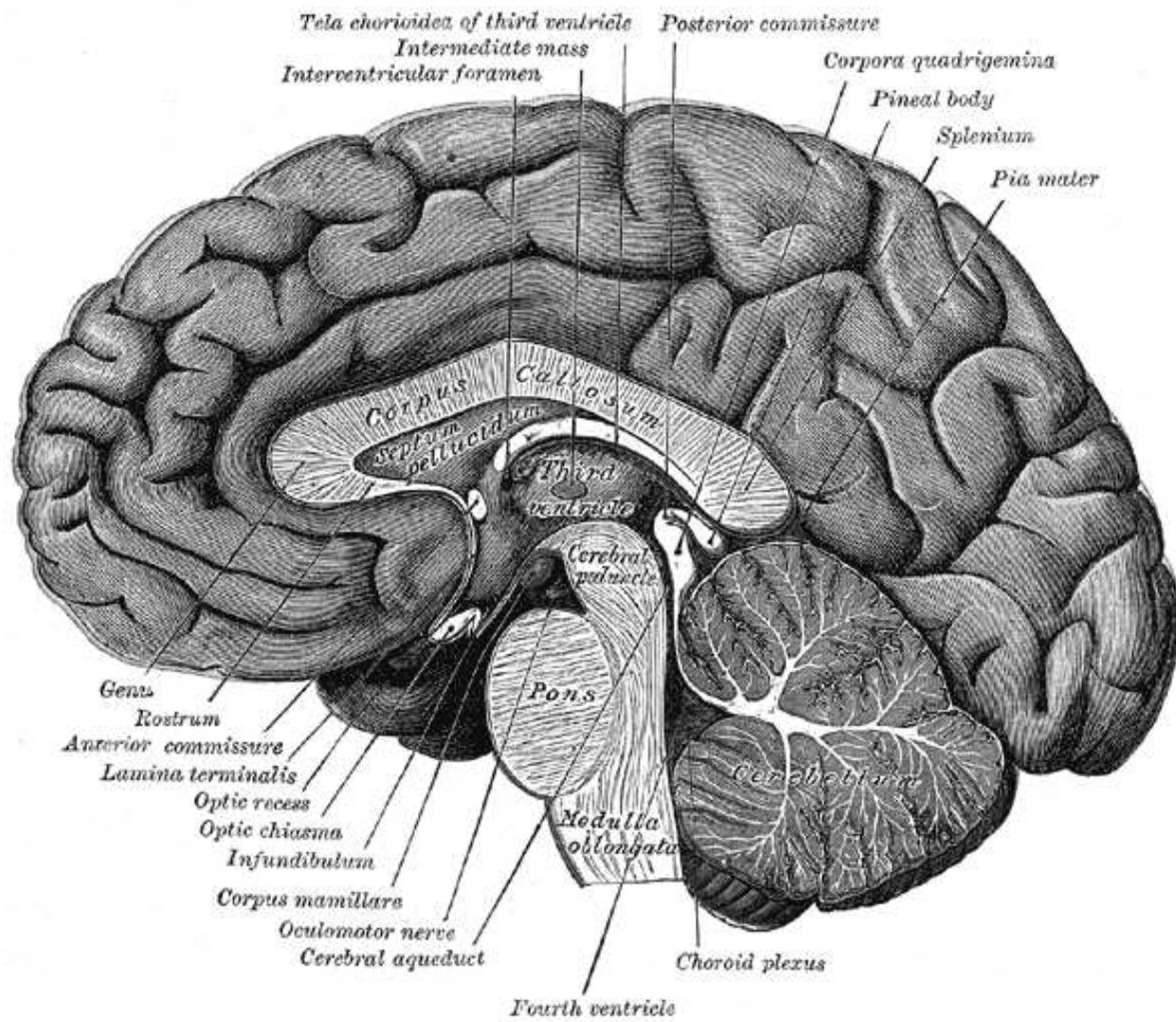
Left hemisphere



Corpus callosum



Brain



- Corpus Callosum
- Connects left and right hemispheres
- In FAS individuals
 - Reduced in length and thickness
 - Anomalous in shape
 - Size/shape abnormalities implicated in verbal learning task



Corpus Callosum – normal individual Corpus Callosum – FAS individual

- **Neurological Summary**

- Gross and fine motor control deficits (frontal lobe, basal ganglia, cerebellum)
- Specific speech motor control deficits (left frontal lobe)
- Learning and memory deficits, especially wrt to verbal learning (caudate nucleus, cerebellum, corpus callosum)
- Impulsivity, lack of inhibition, executive function deficits (frontal lobe)

FASD in the Clinic

Key points to observe:

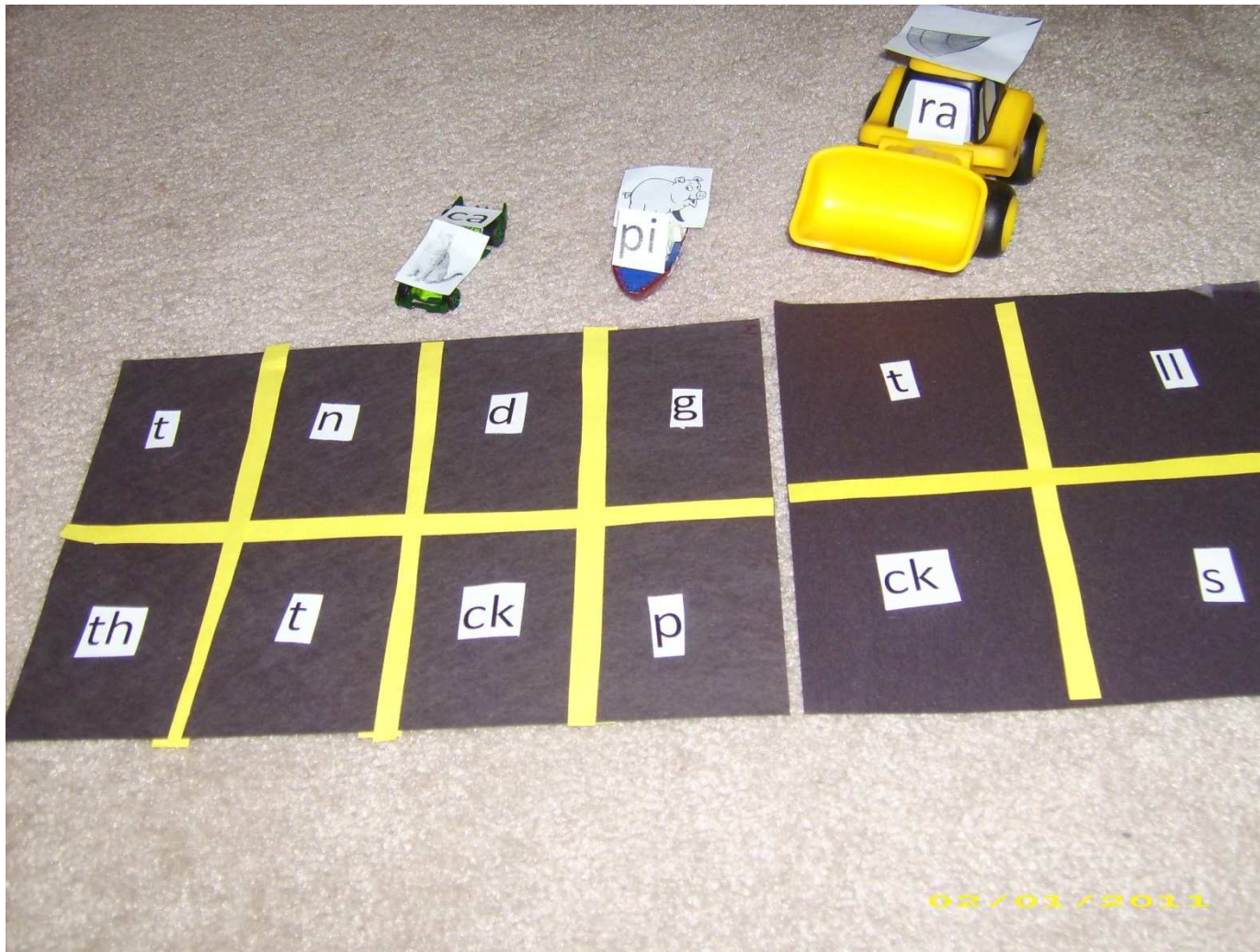
Strengths:

- **Natural curiosity**
- **Appropriate inflection patterns with statements and questions**
- **Engaged in activity and with clinician**

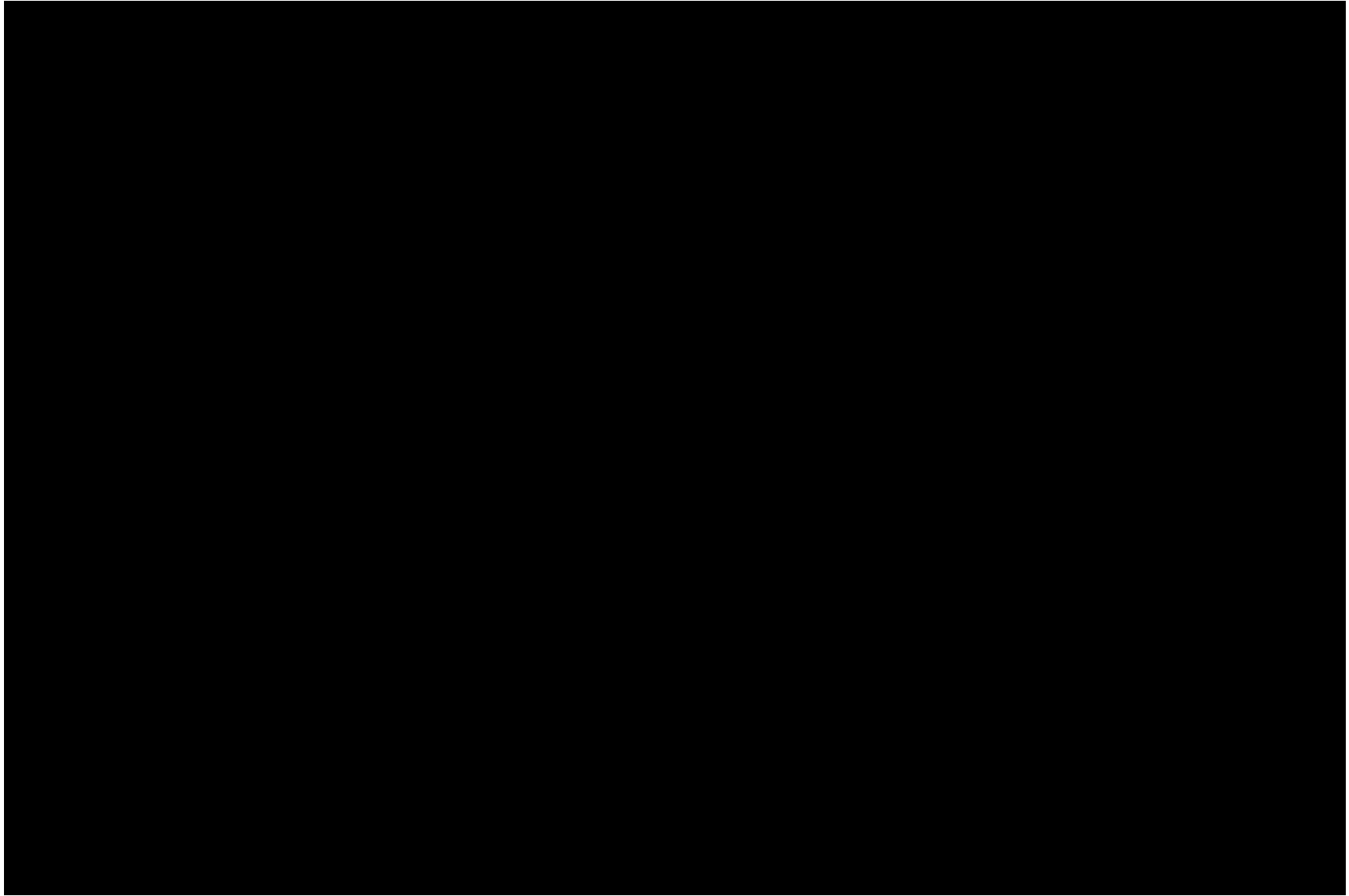
Weaknesses:

- **Dysfluencies**
 - **Prolongations and Repetitions**
- **Simplified sentence structures**
- **Misarticulations**
- **Poor phonological awareness**

Activity Used in Therapy



FASD in the Clinic



FASD in the Clinic

Reported deficits noted by the clinician:

- Short-term memory
- Social pragmatics
- Expressive language
- Receptiveness of “Wh-” questions
- Inconsistent performance

Elephant

- Syllable structure – correct
- Stress patterns – correct
- Phonetic variation
 - l → f (metathesis)

Elephant



Vampire

- Syllable structure – correct
- Stress patterns – correct
- Phonetic variation
 - v → g (backing – change in manner and place)

Vampire



Brother

- Syllable structure – correct
- Stress patterns – correct
- Phonetic variation
 - $\delta \rightarrow d$ (assimilation/stopping on *1st attempt*)
 - $\delta \rightarrow \emptyset$ (*omission on 2nd attempt*)

Brother



Dr. Thunder

- Syllable structure – correct
- Stress patterns – correct
- Phonetic variation
 - $k \rightarrow \emptyset$
 - $t \rightarrow d$ (voicing error)
 - $\theta \rightarrow d$ (assimilation/stopping/possibly associated with voicing errors)
 - $d \rightarrow t / \theta$ (voicing error)

Dr. Thunder Soda



Diplodocus

Correct Pronunciation:

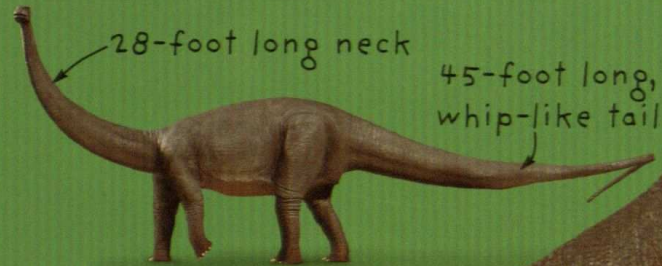
/dɪ 'plɑd ə kəs/

FAS Participant's Pronunciation:

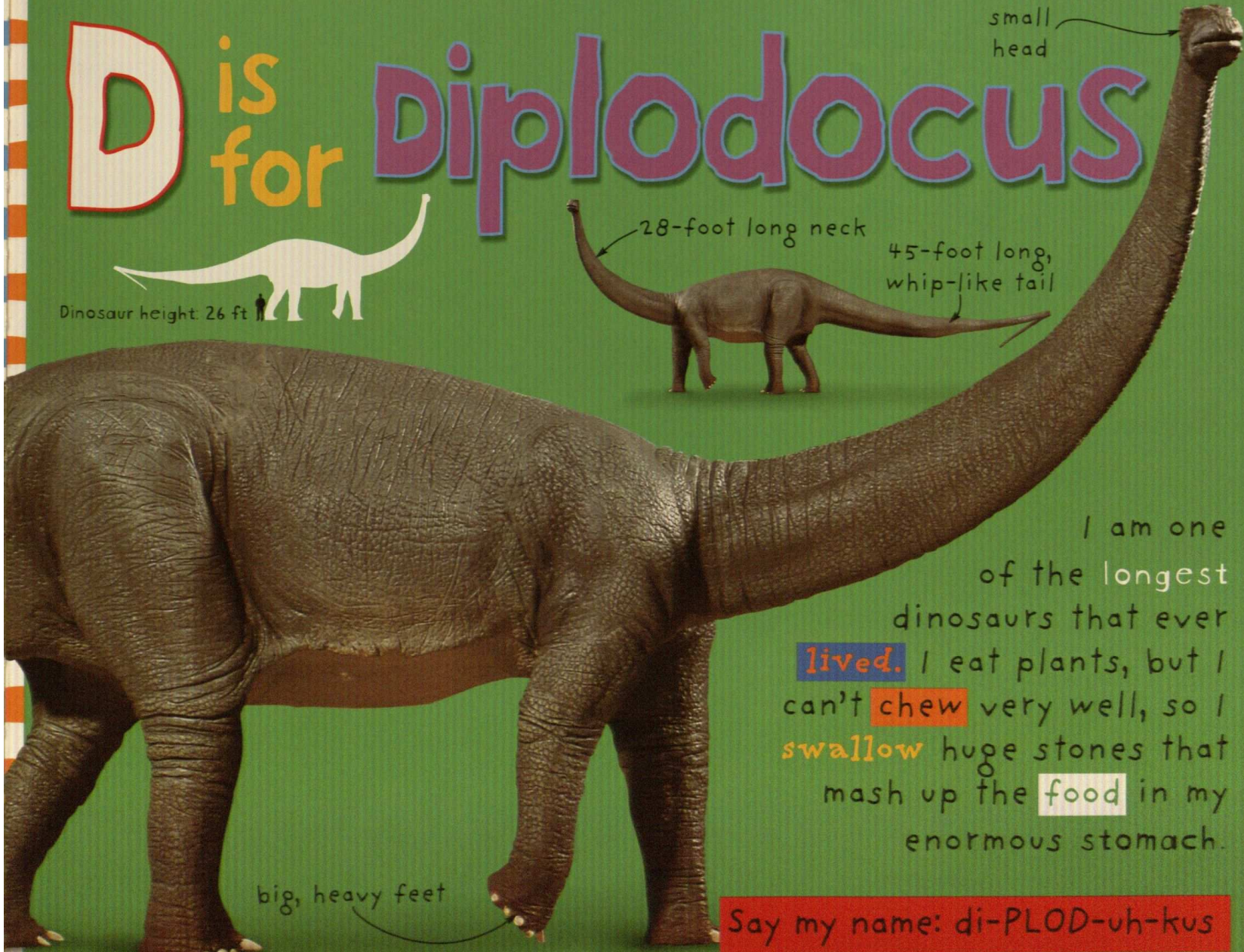
/dɪ k ə lo 'bɑ kə ləs/

D is for Diplodocus

Dinosaur height: 26 ft



small head



big, heavy feet

I am one of the longest dinosaurs that ever **lived**. I eat plants, but I can't **chew** very well, so I **swallow** huge stones that mash up the **food** in my enormous stomach.

Say my name: di-**PL**OD-uh-kus



Fabrosaurus

Correct Pronunciation:

/ fæb rɔ sɔr əs/

FAS Participant's Pronunciation:

/ fæv wɔ sɔr əs/

F is for
for

I am only about 3 feet long, but I have strong arms and hands that help me grab the leaves that I like to eat. I've got strong legs, and can run away from danger quickly.



thick,
flexible
neck



Dinosaur height: 2 ft

beak-like
mouth

long legs for
running fast

sharp
claws

Fabrosaurus

Say my name: FAB-roh-SAWR-us



Iguanodon

Correct Pronunciation:

/ i g w a n ə d ɔ n /

FAS Participant's Pronunciation:

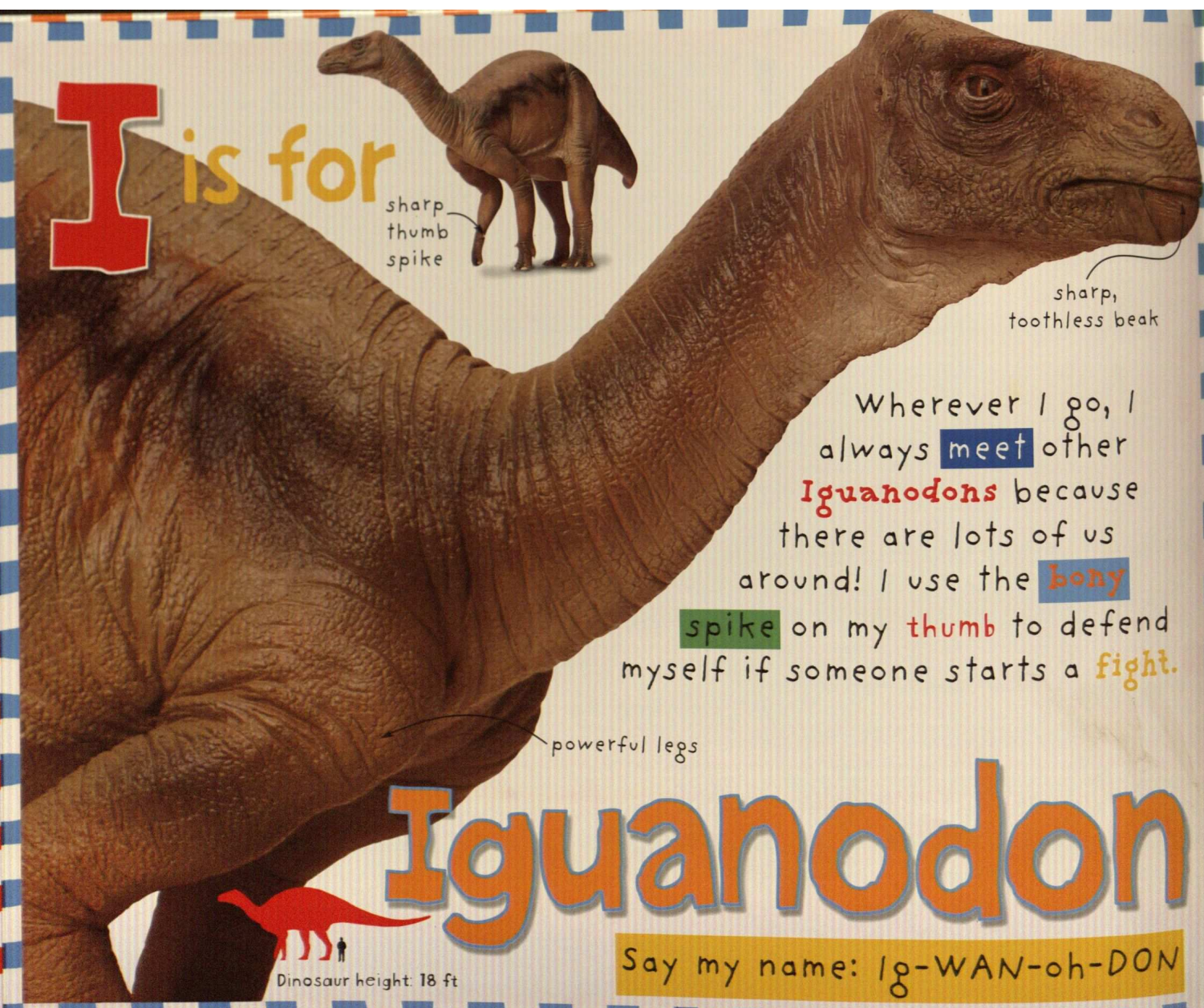
/ e g w a n ə d ɔ n /

I

is for



sharp
thumb
spike



sharp,
toothless beak

Wherever I go, I
always **meet** other
Iguanodons because
there are lots of us
around! I use the **bony**
spike on my **thumb** to defend
myself if someone starts a **fight**.

powerful legs

Iguanodon



Dinosaur height: 18 ft

Say my name: Ig-WAN-oh-DON



Leptoceratops

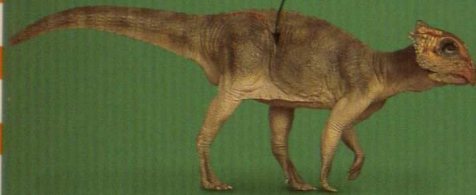
Correct Pronunciation:

/ lɛp to sɛ rə taps/

FAS Participant's Pronunciation:

/ lɛr əz sɛr əz taps/

L is for

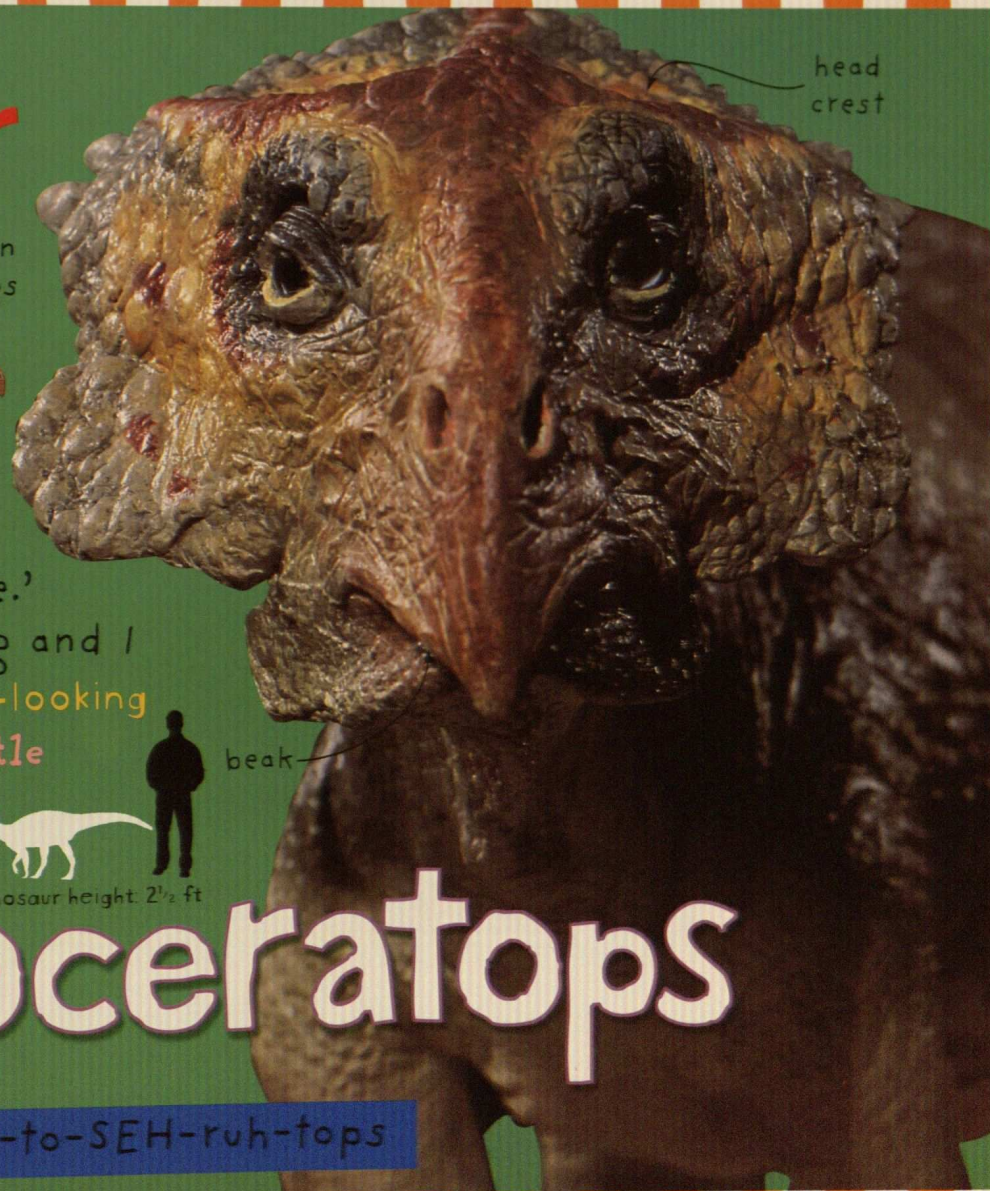


walks on
four legs

My **name** means
'slender-horned face.'
I'm about 6 feet long and I
have this really **cool-looking**
head crest and a **little**
horned beak to
bite my food.



Dinosaur height: 2 1/2 ft



head
crest

beak

Leptoceratops

Say my name: LEP-to-SEH-ruh-tops

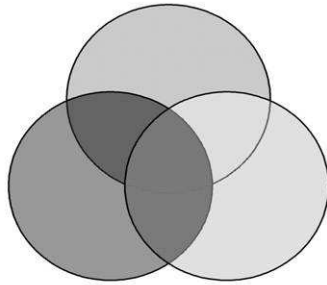


4-Digit Diagnostic Method

DIAGNOSTIC GUIDE FOR
FETAL ALCOHOL SPECTRUM DISORDERS

THE 4-DIGIT DIAGNOSTIC CODE

THIRD EDITION
2004



FAS DIAGNOSTIC AND PREVENTION NETWORK
UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON



Lip-Philtrum Guide 1



Lip-Philtrum Guide 2

4-Digit Diagnostic Code Grid

One Example of FAS

				<u>3</u>	<u>4</u>	<u>4</u>		<u>4</u>		
significant	significant	definite	4		X	X		X	4	high risk
moderate	moderate	probable	3	X					3	some risk
mild	mild	possible	2						2	unknown
none	none	unlikely	1						1	no risk
Growth Deficiency	FAS Facial Features	Brain Dysfunction		Growth	Face	Brain		Alcohol		Gestational Alcohol

Growth Deficiencies

As measured with prenatal and postnatal growth measures including height/length and weight. The results are then plotted on a standardized growth chart. Growth deficiencies are considered below the 10th percentile.

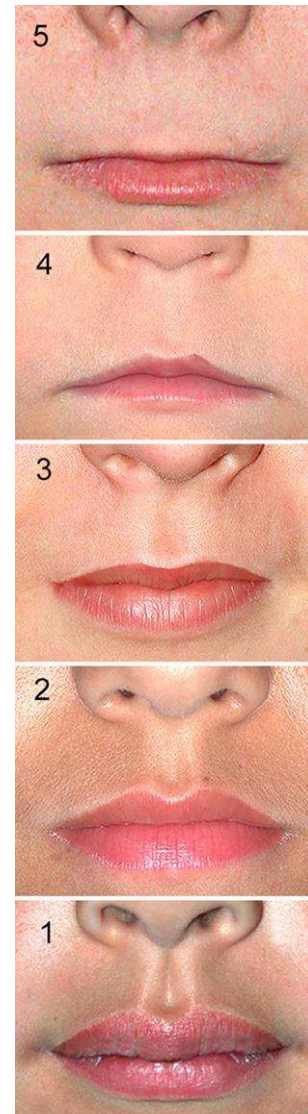
Facial Characteristics

- 1) Short PFL ≤ -2 SD
- 2) Smooth Philtrum Rank 4 or 5
- 3) Thin Upper Lip Rank 4 or 5



FAS

A diagram with the text 'FAS' on the left. Two arrows originate from the right side of 'FAS', one pointing upwards and the other pointing downwards, towards the top and middle images of the Lip-Philtrum Guide.



Lip-Philtrum Guide I

Central Nervous System Dysfunction

Functional:

Memory

Cognition

Language

Executive Function

Attention

Motor

Sensory Integration

Psychological

Structural:

Reduced size of:

corpus callosum

cerebellum

basal ganglia

Alcohol Exposure

4	High Risk	Alcohol use during pregnancy is CONFIRMED. <i>and</i> Exposure pattern is consistent with the medical literature placing the fetus at “high risk”
3	Some Risk	Alcohol use during pregnancy is CONFIRMED. <i>and level</i> of alcohol use is less than in Rank (4) or level is unknown.
2	Unknown Risk	Alcohol use during pregnancy is UNKNOWN.
1	No Risk	Absence of alcohol use during pregnancy is CONFIRMED

Prevalence

	FAS	Drinking
General population	1/1000	12%
Foster Care	1/100	15-48%
UofW FASD Clinic	5/100	100%

FAS/PFAS and SE/AE Race and Alcohol

n=1400 UofW FAS DPN				
Race	FAS/PFAS	# Days/Week	SE/AE	# of Drinks per week
Black	19%	6	21%	8
Caucasian	13%	5	27%	7
Native Americans	5%	4	42%	13

Binge drinking = ↑ FAS

Other drinking patterns = ↑ SE/AE

FASD Photographic Software

The screenshot displays the 'Facial Photographic Analysis Software' interface. The main window shows a photograph of a child's face with a '3/4' label on the forehead. The software includes a menu bar (File, Reports, Image, Tools, Guides, Database, Data/Logs, Customize Lists, Window, Help) and a toolbar with various icons and a 50% zoom level. The 'Worksheet' panel on the right contains the following data:

Patient Identification	
Last Name	<input type="text"/>
First Name	<input type="text"/>
Middle Name/Initial	<input type="text"/>
Subject Study Number	None
Birth Date	<input type="text"/>
Gender	<input type="text"/>
Race/Ethnicity	<input type="text"/>
Source of Photo	<input type="text"/>

View: **frontal** | 3/4 | lateral

Eyes	
Select Normal Chart	Caucasian (Hall '89)
Real Scale Length	19.05 mm
Length of Scale in Photo	<input type="text"/> pixels
Patient's Right PFL	204.0 pixels
Right PFL	<input type="text"/> mm
Right PFL	<input type="text"/> zscore
Inner Canthal Distance	<input type="text"/> pixels
Inner Canthal Distance	<input type="text"/> mm
Inner Canthal Distance	<input type="text"/> zscore
Patient's Left PFL	<input type="text"/> pixels
Left PFL	<input type="text"/> mm
Left PFL	<input type="text"/> zscore
Mean PFL	<input type="text"/> pixels
Mean PFL	<input type="text"/> mm
Mean PFL	<input type="text"/> zscore

Phot ID | Eyes | Lip/philtrum | Anomalies | Quality | Outcome

X: 1148 Y: 1008 pixels: 204.0 NUM CAPS INS 5:34 PM

ASSESSMENT CHALLENGE:

- identify motoric issues that may affect the child's speech and language.

- separate motor disorder from phonologic/linguistic disorder

Bolinger (2011), Bolinger & Dembowski (2011)

“Disambiguating the linguistic (phonologic) aspect from the motoric aspect of speech articulation remains a challenge in speech-language pathology” – Ray Kent, 2000

FAS Speech Assessment

- Behavioral and Speech Tasks
 - Standardized Tests
 - Verbal Motor Production Assessment for Children (VMPAC)
 - Structured Photographic Articulation Test (SPAT-D)
 - Primary Test of Nonverbal Intelligence (PTONI).
 - Observation
 - Basic Oral Mechanism Exam
 - Hearing Screening

Testing Procedure Outline

- Hearing Screening

- Oral Mech Exam

sensory break

(w/ snack to collect data for VMPAC)

- VMPAC

sensory break

(w/ small talk for connected speech sample)

- SPAT-D

Verbal Motor Production Assessment of Children (VMPAC)

- 5 areas tested
 - General Motor Control
 - Chewing, swallowing, posture, & respiration
 - Focal Oromotor Control
 - kiss, blow, smile, pucker, phoneme production
 - Sequencing
 - Bite/blow, smile/kiss, speech diadochokinesis
 - Connected Speech and Language Control
 - Describe pictures
 - Speech Characteristics
 - Pitch, resonance, intensity, & prosody

Example of Experimental Participant – Results

Chronological Age: 8;5

Age Equivalent (PTONI Scores): 5;6

SPAT-D results:

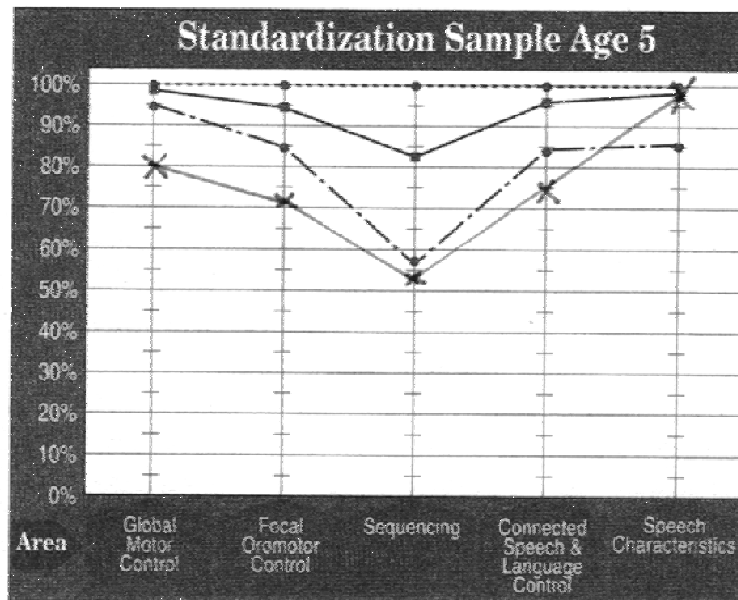
Voicing errors

Stopping errors

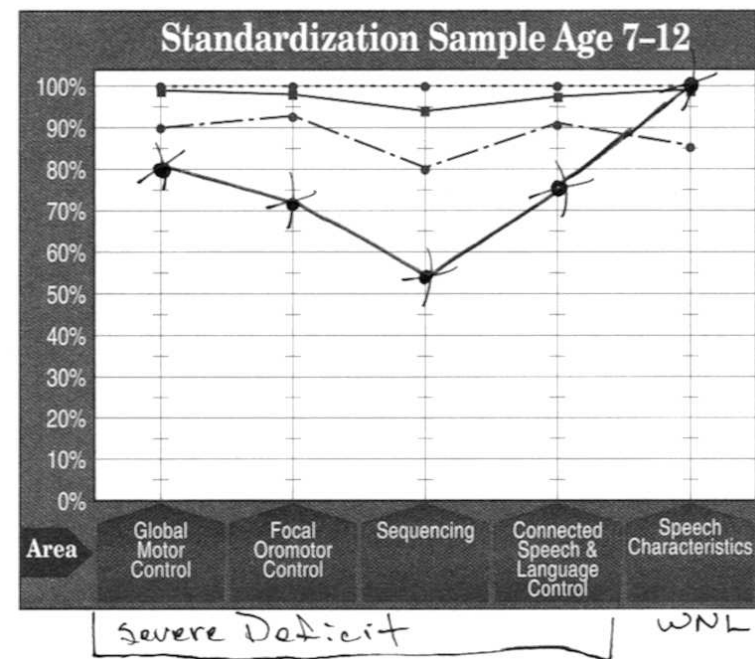
Cluster reduction

Age equivalence: 4;0-4;5

Percentile rank: 2



Mental Age Comparison



Chronological Age Comparison

Example of Control Participant – Results

Chronological Age: 8;9

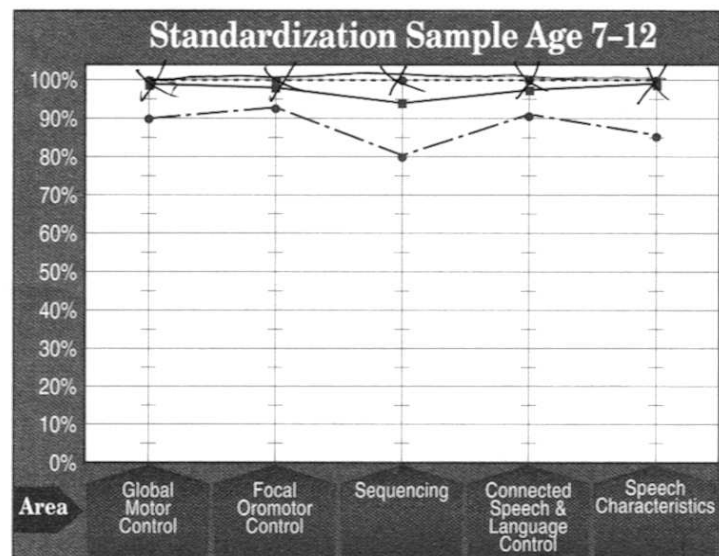
Age Equivalent (PTONI Scores): 9;4

SPAT-D results suggested no perceived articulation errors during the naming or connected speech tasks.

Percentile rank: 99

Age equivalence: 7;6-9;11

Chronological and
Mental Age
Comparison



WNL

Results

	SPAT-D	VMPAC - General Motor	VMPAC - Focal Oromotor	VMPAC - Sequencing	VMPAC - Connected Speech/Lang	VMPAC - Speech Characteristics
Exp Participant 1	X	X	X	X	X	
Exp Participant 2		X	X			
Exp Participant 3	X		X	X	X	X
Exp Participant 4		X	X	X		X
Exp Participant 5	X	X	X	X	X	
Control Participant 1-5						X***
<p>“X” indicated deficit noted using standardized scores from each test given.</p> <p>***Control participant 2 exhibited a speech characteristic deficit secondary to seasonal allergies.***</p>						

Assessing Focal Oromotor using the VMPAC

This video illustrates tasks utilized in the VMPAC – Focal Oromotor subtest.

Tasks:

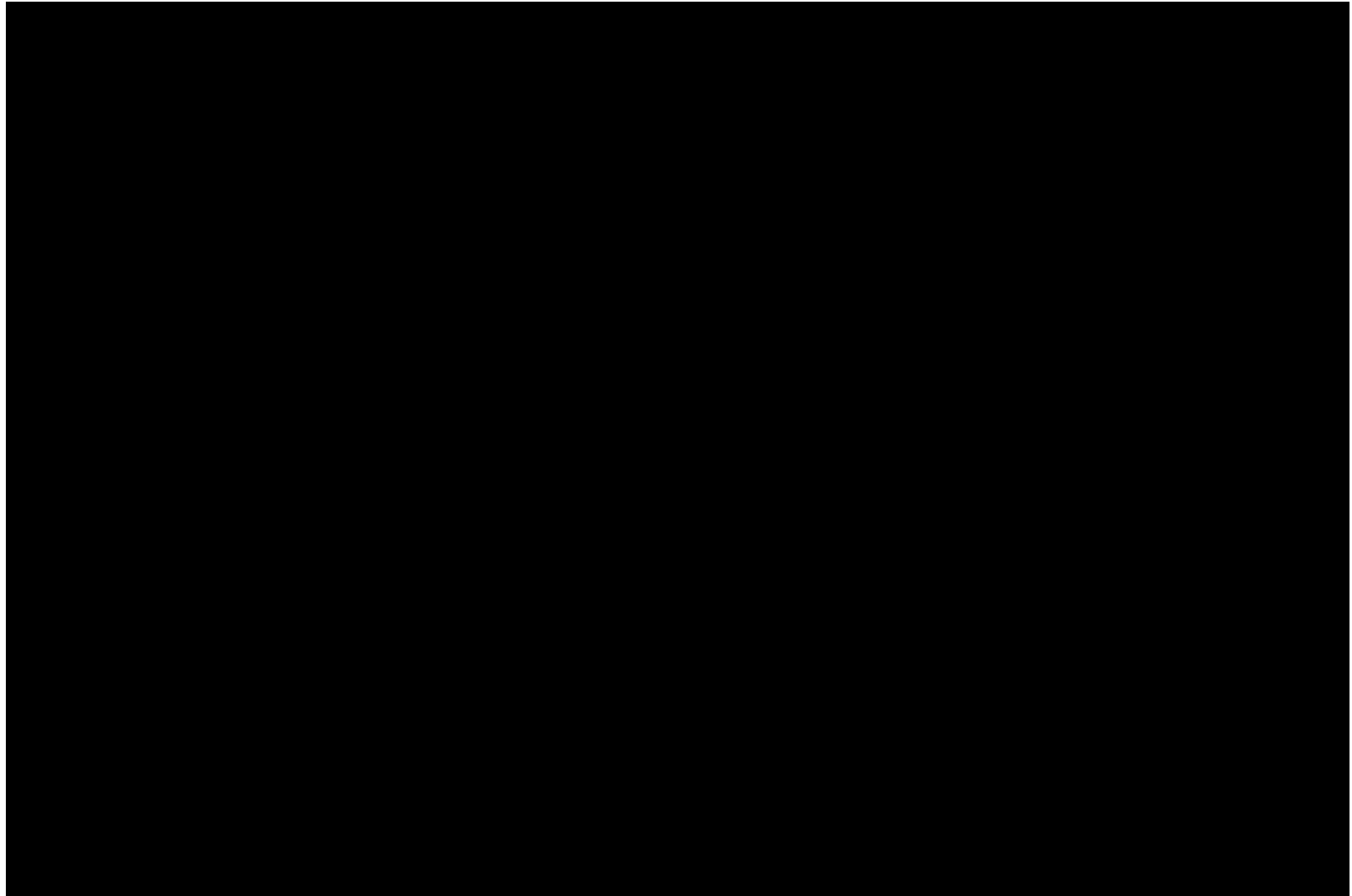
- **Basic oromotor tasks**
 - smile, pucker, blow
- **Combined oromotor tasks**
 - smile & pucker, blow and stick out tongue
- **Vocalization of phonemes**
 - in isolation (e.g., /i/)
 - in series (e.g., /u o i/)
 - in word context (e.g., pea, tea, key)
 - connected speech (e.g., Dad sat on a mat.)

***Note the limited range of movement of the subject's upper lip and the classic FAS facial features.”

Assessing Focal Oromotor using the VMPAC

- Classic FAS facial features
 - flattened philtrum
 - flat bridge of nose
 - eyes slightly spaced wider
- Limited range of oromotor movements in the context of SPEECH
- Sequencing
 - Example: last stated 1st performed
- Inconsistencies

Assessing Focal Oromotor using the VMPAC



Recommendations for working with children with FASD

1. Assist in developing picture schedules for younger children with FASD.
2. Assist caregiver/parents/teachers in understanding the importance of well defined spaces for the person with FASD (i.e., using colored tape to mark personal spaces within the home and classroom)
3. Social scripts for roleplaying.
4. Teach one skill at a time, one step at a time.
5. Provide hands on activities that correlate to abstract concepts

Remember – behavioral events are attempts at communication. It is our job to assist the child in developing stronger communication skills to avoid negative behaviors.

TAKE HOME EXERCISE: Turn on all televisions and radios in your home. Then sit for 3 minutes and listen to the “information” being presented. Afterwards, sit down and try to summarize the information you learned. This is how a child with FASD learns everyday of their life.

Thank you and have a nice day!



Bye!



Thank you. Have a great day! Bye!



For more information or copies of this presentation, please contact:

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Recommended reading

- Riley, E.P. & McGee, C.L. (2005). Fetal alcohol spectrum disorders: An overview with emphasis on changes in brain and behavior. *Experimental Biology and Medicine*, 230 (6), 357-365.
- Astley, S.J., Aylward, E. H., Olson, H.C., et al. (2009). Magnetic resonance imaging outcomes from a comprehensive magnetic resonance study of children with fetal alcohol spectrum disorders. *Alcoholism: Clinical and Experimental Research*, 33 (10), 1671-1689.
- <http://education.alberta.ca/media/377037/fasd.pdf>