Objectives

- Know key milestones in speech & language development with emphasis on multilingual exposure
- Recognize the difference between delayed versus disordered speech & language development and indications for referral
- Know the differential diagnosis for speech & language delay
- Understand the management and prognosis of speech & language disorders

Importance of Language

- Delays are prevalent
  - ~15% preschoolers with delays, ~3-6% with disorders
- More common in
  - Boys > girls
  - 1st degree relative with speech, language or reading disorders
  - Low socioeconomic status (language/speech delays)
- Common feature of genetic, chromosomal, neurological d/o
  - Language d/o: Trisomy 21, 22q11 microdeletion, Williams Syndrome
  - Speech d/o: cerebral palsy, Landau-Kleffner, muscular dystrophy

Importance of Language

- Language is the expression of human communication through which ideas, information, emotions and beliefs can be shared
  - Fundamentals usually mastered in toddler-preschool age
  - Has an important role in learning, social relationships and behaviors

Role of the Pediatrician

- Detecting delays should be a priority for the pediatric provider
- Your role is
  - To understand the course of typical development
  - To understand how to use and interpret screening measures and inventories in order to validate parental report
  - To understand the differential diagnosis of delay
  - To arrange an appropriate assessment
  - To refer children to appropriate services
  - To provide guidance and support
**Definitions**

**Language Development**

**Speech Development**

**Screening**

**Causes**

**Evaluation**

**Treatment**

**Prognosis**

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**Speech & Language Disorders**

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**Definition: Communication**

- Communication is the act of conveying, transmitting, exchanging information using a common system
  - Non-symbolic:
    - Ex. Infant crying
    - Ex. Child placing parent’s hand on the door when she wants to leave

**Symbolic Communication**

- Verbal
- Non-Verbal
- Written

**Definition: Language**

- Language is the use of systematic, arbitrary and socially agreed upon signals (words and sentences) to convey meaning
  - Complex and distinctly human skill
    - Allows the understanding, production of infinite number of messages
    - Allows communication about non-present, future, abstract, hypothetical
    - Cements social interactions
  - Receptive language: ability to understand
  - Expressive language: ability to produce

**Definition: Speech**

- Primary output of the language system
  - Uses decodable vocal sounds as the medium of exchange
  - Other output: ex. sign languages
  - Created by the coordination of respiratory, laryngeal, velopharyngeal and oral mechanisms

**Definition: Disorders**

- Language Disorders: persistent and significant limitations on ability to learn language of the community
  - Speech Disorders: persistent deficits in the development of speech skills and voice quality
Definitions

Language Development
Speech Development
Screening
Causes
Evaluation
Treatment
Prognosis

Speech & Language Disorders

Pre-speech period (0 to 10 months)
- Localizing sounds is the earliest step in receptive language
- Cooing is one of the earliest steps in expressive language
- Adults assist development of specific babbling by reinforcing non-specific babbling (as if it had meaning)

Pre-speech Period (0-10 months)

<table>
<thead>
<tr>
<th>Age</th>
<th>Receptive Communication</th>
<th>Expressive Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 month</td>
<td>Startles to loud noise</td>
<td>Makes sound other than crying (e.g., throaty noises)</td>
</tr>
<tr>
<td>3 months</td>
<td>Regards speaker</td>
<td>Coos (vowels), chuckles, vocalizes when talked to</td>
</tr>
<tr>
<td>6 months</td>
<td>Responds to name, stops momentarily to “no”, gestures for “up”</td>
<td>Reduplicate babble (consonants + vowels), listens then vocalizes, smiles and vocalizes to mirror</td>
</tr>
<tr>
<td>9 months</td>
<td>Enjoys gesture games, orients to name well</td>
<td>Says “mama” &amp; “dada” nonspecifically, non-reduplicate babble</td>
</tr>
</tbody>
</table>

Cooing

Reduplicate babbling

Naming Period (10-18 months)

<table>
<thead>
<tr>
<th>Age</th>
<th>Receptive Communication</th>
<th>Expressive Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 months</td>
<td>Waves “bye-bye” back</td>
<td>Waves bye-bye, says “dada” specifically</td>
</tr>
<tr>
<td>12 months</td>
<td>Follows 1-step command with gesture</td>
<td>1st word (not mama or dada), proto-imperative pointing, uses several gestures with vocalizing</td>
</tr>
<tr>
<td>13 months</td>
<td>Looks when asked “Where’s the ball?”</td>
<td>Immature jargoning</td>
</tr>
<tr>
<td>15 months</td>
<td>Points to 1 body part, gets object from another room</td>
<td>3-5 words, proto-declarative pointing, names 1 object</td>
</tr>
</tbody>
</table>

1st words

1st words with pointing

*Realization of names and labels
### Word Combination Period (18-24 months)

<table>
<thead>
<tr>
<th>Age</th>
<th>Receptive Communication</th>
<th>Expressive Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 months</td>
<td>Points to 2 out of 3 objects, 3 body parts, self, familiar people</td>
<td>10-25 words, giants words (“all gone”), environmental sounds, names 1 picture</td>
</tr>
<tr>
<td>20 months</td>
<td>Point to 3 pictures</td>
<td>Holophrases (“Mommy?”), 2-word combinations (adjective + noun), answers requests with “no”</td>
</tr>
<tr>
<td>24 months</td>
<td>Follows 2-step commands (one object), understands “me” and “you”, points to 5-10 pictures</td>
<td>Uses 2-word sentences (noun + verb), uses 50+ words, 50% intelligibility, refers to self by name, names 3 pictures</td>
</tr>
</tbody>
</table>

### Preschool aged

<table>
<thead>
<tr>
<th>Age</th>
<th>Receptive Communication</th>
<th>Expressive Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 months</td>
<td>Points to parts of pictures, understands action words</td>
<td>Uses 200+ words, 3-word sentences, pronouns, asks questions, 75% intelligibility</td>
</tr>
<tr>
<td>48 months</td>
<td>Follows 3-step commands, names objects by function, understands concepts such as same/different</td>
<td>Tells stories, uses feeling words, 100% intelligible (with few articulation errors)</td>
</tr>
<tr>
<td>60 months</td>
<td>Understands adjectives (long, thin, etc.)</td>
<td>Defines simple words, retells stories</td>
</tr>
</tbody>
</table>

### School aged

- **Reading as a language-based skill**
  - Requires mapping letters (graphemes) to sounds (phonemes)
  - Requires rapid naming
  - Relies on verbal memory
  - Reading is highly associated with phonemic awareness (rhyming, word games, etc.)

### Speech Development

- Occurs in tandem with language development
- Articulation – production of single sound
  - Some consonant blends (sp, tr, bl) may not emerge until school age
  - Difficulty with pronouncing some sounds up to 7 years old
- Intelligibility
  - 50% by 2 years old, 75% by 3 years old, 100% by 4 years old

### Articulation – Consonants

Speech Development

- Fluency – flow of speech output
  - Developmental dysfluency usually resolves by 4 years old, involves whole word repetitions, primarily at beginning of sentences
  - Stuttering (will be discussed later)

Definitions

Language Development → Bilingual Exposure

Speech Development

Screening

Causes

Evaluation

Treatment

Prognosis

Speech & Language Disorders

Bilingual Language Development

- Speaking one language is the exception rather than the norm
- Simultaneous bilingualism
  - Both languages initially may be blended or mixed, which is normal and NOT "confusion"
  - Language differentiation occurs around age 3 years
  - Language differentiation is faster in clear environmental contexts
    - Ex. Language #1 at home, language #2 at school
    - Ex. Language #1 with mom, language #2 with dad
    - Ex. Language #1 70% of the time and language #2 30% of the time

- Sequential bilingualism
  - Learning the second language after starting the first may cause a "silent period" for a few months, which is normal
  - Basic interpersonal communication skills take 3 years to develop in the 2nd language
  - Cognitive academic language proficiency takes 7 years to develop in the 2nd language
  - Note: the term fluency is not the same as proficiency

Bilingual Language Development

- Special cases:
  - Preschool children are at risk for language loss* if immersed in language #2 without maintaining a language #1 rich environment at home
  - This is especially risky for children with language impairments.
  - Preschool children who are internationally adopted can develop age-appropriate English within 1 year if previous and new home environment are language rich.

Detecting Delays

- Use the same language milestones as a monolingual-exposed child to screen for delays in bilingual-exposed child
  - Ex. 1st word by 12 months
  - Ex. 2 word phrases by 24 months ("Want agua" is acceptable!)
  - Ex. 50 words by 24 months (Add up the absolute number of labels)
- Children with problems in one or more language need to be evaluated
**Tips on Bilingual Development**

- Reassure parents that learning 2 languages will **NOT** cause speech or language problems.
- Practice is needed, just like for any other skill.
  - If child has a dominant language, it could change without practice.
- Parents’ language proficiency is an important part of your advice on who should speak what at home.
  - Ex. Parents speak only Spanish at home if both are Spanish-proficient.
  - Ex. Spanish-proficient parent speaks Spanish only, while English-proficient parent speaks English only.

- Give opportunities to hear and practice both languages daily.
- Use many forms to teach language:
  - Books
  - Audiotapes and CDs
  - Videos and DVDs (better for concepts > language)
  - Language camps & educational programs

**Definitions**

- Language Development
- Speech Development
- Screening
- Causes
- Evaluation
- Treatment
- Prognosis

**Speech & Language Disorders**

**Screening**

- Language is difficult to assess in a well-child visit.
  - Toddlers rarely cooperate.
  - History will be particularly important.
- Language milestones are least familiar to providers & parents.
- General development screening tools (e.g., PEDS) provide a cut-off score only.
  - If needed, use Center of Hope’s handy-dandy expanded checklist to quickly assess speech/language.

**Screening Tools**

- Language inventories:
  - Language Development Survey (English & Spanish)
  - MacArthur-Bates Communicative Development Inventories, 2nd Edition (English & Spanish)
- Language-specific screening tools:
  - Early Language Milestone, 2nd edition (ELM)
  - Capute Scales (Cognitive Adaptive Test/Clinical Linguistic Auditory Milestone Scale [CAT/CLAMS])

**Language “Red Flags”**

<table>
<thead>
<tr>
<th>Age</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-6 months</td>
<td>Lack of response to sound, interest in social interaction, or intent to communicate</td>
</tr>
<tr>
<td>6-12 months</td>
<td>Lack of cooing or babbling</td>
</tr>
<tr>
<td>12 months</td>
<td>Failure to understand routines, produce mama/dada specifically</td>
</tr>
<tr>
<td>15-18 months</td>
<td>Failure to use or understand pointing, poor understanding of words, no expressive vocabulary</td>
</tr>
<tr>
<td>18-24 months</td>
<td>Limited symbolic play, loss of ability to communicate</td>
</tr>
<tr>
<td>24 months</td>
<td>Lack of ability to follow commands, vocabulary &lt;35-50 words, no 2-word utterances, rote memorization without novel phrases</td>
</tr>
</tbody>
</table>
**Language “Red Flags”**

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<tr>
<th>Age</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 months</td>
<td>Lack of ability to follow 2-step commands, limited vocabulary, no simple sentences, &lt;20-75% intelligible, excessive repetition</td>
</tr>
<tr>
<td>48 months</td>
<td>Lack of ability to follow 3-step commands, poor sentence structure, no complex sentences, &lt;75% intelligible, stuttering</td>
</tr>
<tr>
<td>60 months</td>
<td>Inability to express ideas, persistent stuttering</td>
</tr>
<tr>
<td>72 months</td>
<td>Errors in sound production, inability to manipulate sounds of words for rhyming, poor reading skills</td>
</tr>
</tbody>
</table>

**Using the Developmental Quotient**

- Helps to know how far is too far, how far behind is the child
- DQ = Developmental age / chronological age x 100
- Interpreted as rate of acquisition of milestones
  - Think “developmental velocity”

<table>
<thead>
<tr>
<th>DQ&gt;85</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>70&lt;DQ&lt;85</td>
<td>Concerning</td>
</tr>
<tr>
<td>DQ&lt;70</td>
<td>Significant delay</td>
</tr>
</tbody>
</table>

**Domains**

- Motor: gross, fine
- Self-help (adaptive)
- Problem-solving (cognitive)
- Social-emotional
- Language: receptive, expressive, pragmatic, speech

**Using the Developmental Quotient**

- Expressive language delay
- Communication disorder

**Definitions**

- Language Development
- Speech Development
- Screening
- Causes
- Evaluation
- Treatment
- Prognosis

**Speech & Language Disorders**
### Myths vs. Fact

<table>
<thead>
<tr>
<th>Myth</th>
<th>Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys are very delayed (&gt;6 months)</td>
<td>Boys are slightly delayed (1-2 months)</td>
</tr>
<tr>
<td>2nd and 3rd born children let their older sibling speak for them</td>
<td>Children have strong motivation to speak when the can</td>
</tr>
<tr>
<td>Children from bilingual households are significantly delayed</td>
<td>Children from bilingual households may show minor delays and early mixing</td>
</tr>
<tr>
<td>OME causes significant delay</td>
<td>OME may cause mild-moderate delay</td>
</tr>
<tr>
<td>Delays will resolve without intervention</td>
<td>Response to interventions depends on the reason and severity of delays</td>
</tr>
</tbody>
</table>

### Learning Language

- **Observational and social learning**
  - No direct instruction needed
- **Biological factors**
  - Human brain is self-organizing system
  - Infants pick up statistical properties in speech
  - Infants link speech perception to motor output
- **Environmental factors**
  - Children learn language of their environment
  - Quantity and quality of input affects rate of learning

### Requirements for Learning Language

<table>
<thead>
<tr>
<th>Social Interactions</th>
<th>Verbal Input</th>
<th>Hearing</th>
<th>Brain Function</th>
<th>Oral mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supportive</td>
<td>Adequate</td>
<td>Intact</td>
<td>Healthy</td>
<td>Functioning</td>
</tr>
</tbody>
</table>

### Risks for Learning Language

<table>
<thead>
<tr>
<th>Social Interactions</th>
<th>Verbal Input</th>
<th>Hearing</th>
<th>Brain Function</th>
<th>Oral mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsupportive</td>
<td>Inadequate, adult-centered</td>
<td>Impaired</td>
<td>Impaired</td>
<td>Abnormal structure or function</td>
</tr>
<tr>
<td>Child abuse or neglect</td>
<td>Low SES, low language stimulation</td>
<td>Hearing loss, anatomic anomalies</td>
<td>Genetic d/o, CNS injury, ID, ASD, language d/o</td>
<td>Cleft palate, VPI, CP</td>
</tr>
</tbody>
</table>

### Differential Diagnosis

**Expressive delay**
- Environmental
- Neuromotor deficits
- Anatomic abnormalities
- Normal variation (“late talker”)
- Speech disorders

**Expressive & receptive delay**
- Hearing loss
- Intellectual disability
- Autism spectrum disorders
- Language disorders

### Hearing Loss

- Undetected hearing loss used to be more prevalent cause of speech/language delays
- Universal NBHS detects many (not all) cases of congenital losses
- Hearing assessments needed (even if passed NBHS)
  - Mild-moderate congenital loss
  - Syndromes with progressive or acquired hearing loss
  - Unilateral hearing loss
- Management: Amplification, cochlear implantation
ASD and ID

<table>
<thead>
<tr>
<th></th>
<th>Hearing Loss</th>
<th>Intellectual Disability</th>
<th>ASD</th>
<th>Language Disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expressive</td>
<td>↓</td>
<td>↓</td>
<td>OR</td>
<td>↑</td>
</tr>
<tr>
<td>Receptive</td>
<td>↓</td>
<td>↓</td>
<td>OR</td>
<td>↓</td>
</tr>
<tr>
<td>Nonverbal IQ</td>
<td>NL</td>
<td>↓</td>
<td>OR</td>
<td>↑</td>
</tr>
<tr>
<td>Adaptive</td>
<td>NL</td>
<td>↓</td>
<td>OR</td>
<td>↑</td>
</tr>
<tr>
<td>Social-Emotional</td>
<td>NL</td>
<td>↓</td>
<td>OR</td>
<td>↑</td>
</tr>
<tr>
<td>Audiology</td>
<td>ABNL</td>
<td>NL</td>
<td>NL</td>
<td>NL</td>
</tr>
</tbody>
</table>

Speech & Language Disorders

- When does “delay” become “disordered”?
  - When delays are severe or when mild to moderate delays persist
  - If delays limit age-appropriate functioning in learning, communication, and social skills
  - When pattern of development shows qualitative differences in course (e.g., dissociation, regression, deviancy)
- Strong familial component, especially first degree relatives
- High concordance rate in twin studies

Speech & Language Disorders

- Speech Sounds
- Phonology
- Voice & Resonance
- Morpho-syntax
- Semantics
- Pragmatics
- Fluency

Dissecting Speech

- Speech Sounds:
  - Articulation
  - Coordinating breath & movements
  - Motor planning (execution)
- Speech Sound Disorders:
  - Articulation Disorder
  - Dysarthria
  - Dyspraxia

Speech Sound Disorders

- Articulation Disorder – difficulty with articulating speech sounds, often consonants
  - Errors compromise intelligibility, are consistent
  - Treatment: speech therapy to produce sounds in isolation → sentences
- Dysarthria – poor articulation due to neuromotor disorder affecting speech subsystems (e.g., respiration, phonation) & oral motor skills
  - Uncommon except in neurological disorders
  - Consistent with overall movement patterns (spastic, hypotonic, ataxic)

Verbal Dyspraxia*

*Also called Childhood Apraxia of Speech

- Difficulty with planning and programming for speech sounds
- Core feature: inconsistent and/or unusual pattern of consonant errors and vowel distortion
  - Effortful production, often with grasping or observable physical struggle
  - Speech sounds often segmented or “choppy”
  - Imitation is more difficult than spontaneous production
  - Severely compromised intelligibility
- Not explained by weakness, paresis, paralysis
Verbal Dyspraxia
- Can be difficult to differentiate from articulation disorder
- Often concomitant language disorder
- Diagnosis often suspected based on low response to therapy
- Treatment
  - Is intensive (e.g., Said to requires an average of 151 sessions to have effect)
  - May require augmentative communication

Speech Disorders
- Speech Sounds
- Voice & Resonance
- Fluency

Voice Disorders
- In children, usually related to vocal abuse (i.e., yelling)
  - Treatment of persistent hoarseness if important to prevent nodules
  - Duration of treatment is typically short and focused on home program for vocal hygiene

Speech Disorders
- Speech Sounds
- Voice & Resonance
- Fluency

Stuttering
- Usually emerges between 3 and 6 years old
- Involves single sound and part word repetitions and/or prolonged and blocking of sounds
- Treatment:
  - Speech therapy to decrease stuttering events, prevent “secondary characteristics” (facial grimacing, blinking, eye movements), prevent negative affective response (e.g., speaking avoidance)
  - Sometimes medications (i.e., risperidone)

Dissecting Language
- Phonology: sounds and rules
- Morpho-syntax: grammar
- Semantics: meanings
- Pragmatics: social functions
Language Disorders

- Lower threshold to being "disordered" compared to IQ
- Mild (-1.5 to -2.0 SD), moderate (-2 to -2.5SD), severe (-2.5 to -3SD)

Treatment: language therapy

Expressive delay

- Hearing evaluation
- Oral-motor examination
- Speech/language evaluation
- Other evaluations only as indicated (e.g., MRI, neurology referral, etc.)
- If normal variation, monitor for "catch up" and consider referral as needed

Expressive delay

- If environmental,
  - Provide language stimulation handouts
  - Provide tips for bilingual families
  - Consider Kid's Day Out or preschool program

Receptive & Expressive Delay

*Less common, but more serious

- Hearing evaluation
- Administer MCHAT
- Speech/language evaluation
- Comprehensive developmental evaluation (if ASD or GDD/ID high on your DDX)
## Who could do a comprehensive eval?

- Early Childhood Intervention
  - Provides complete developmental status
  - Does not provide underlying diagnosis (e.g., CP, ASD, ID, etc.)
  - Concurrent referral to medical specialists may be necessary
- Developmental-Behavioral Pediatricians
- Psychologists
- School Districts
- (Neurologists)

## Speech & Language Disorders

<table>
<thead>
<tr>
<th>Definitions</th>
<th>Language Development</th>
<th>Speech Development</th>
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</tr>
</thead>
</table>

## Speech/Language Therapy

- Predicated on accurate diagnosis
- Parent component very important
- Format of therapy
  - Individual versus group
  - Typically play-based
- Duration of therapy depends on format, child’s attention
- Frequency of therapy depends on underlying condition

## Speech/Language Therapy

- <3 years old: ECI is ideal because of service coordination and parental involvement
  - If more frequent and/or specialized therapy is needed, refer to a home health or clinic-based rehab agency.
  - A child cannot receive speech/language therapy through both ECI and another agency, but can still receive service coordination through ECI.

## Speech/Language Therapy

- ≥3 years old: school district and/or rehabilitation agency depending on severity
  - Mild-moderate language disorders treated through school
  - Moderate-severe language disorder often managed by both
  - A child can receive therapy at both school and private agency
  - Medically involved children usually benefit from therapy outside school if there is good rehabilitation potential
    - For example, schools often not equipped to meet therapy needs for dysphagia or oral-motor skills

## Early Childhood Intervention (ECI)

- <3 years old
- State funded
- Appropriate for all income levels
- Therapy may be infrequent but focus is on parent training
- Other services may include: behavioral counseling, nutrition services, vision services, hearing services, school transition services, service coordination
School District
- ≥3 years old
- Speech/language therapy
  - ECI, parent or teacher must initiate request for evaluation
  - Physician referral is usually not accepted
  - Typically 1-2 sessions per week (30 minutes/session) in small groups
- Preschool Program for Children with Disabilities (PPCD)
  - Half-day program for children 3-5 years old with deficits in ≥1 area of development and/or severe language disorder

Rehabilitation Agencies
- Home health
  - More appropriate for children who are homebound
  - Consider if parent resources such as transportation, time, or follow-through are factors
  - Some agencies accept only Medicaid
- Clinic setting
  - More appropriate for children with sensory, behavioral, or attention concerns

Once a Disorder is Identified
- Initiate chronic-condition management
  - By the language disorder
  - By any underlying etiology (e.g., Trisomy 21)
- Provide anticipatory guidance, parental education
  - Learning and applying knowledge
  - General tasks and demands
  - Communication
  - Interpersonal interactions and relationships
  - Community, social and civic life
- Prognosis of condition variable but predictable based on nature and severity
  - Language-based learning disabilities, even if language disorder apparently resolved
    - Reading: linking speech sounds to written symbols
    - Listening, reading comprehension
    - Written, oral expression
    - Increased emotional and behavioral health disorders
- Surveillance for
  - Increased emotional and behavioral health disorders

Final Remarks
- Not listening to parents
- Not obtaining a hearing evaluation
- Not assessing other areas of development adequately
- Referring only to speech/language therapist when condition other than language disorder is suspected
## Final Remarks

- **Prevention** – Encourage interactions, rich verbal environment
- **Identification** – Screen early & often; don’t miss in bilingual households
- **Differential diagnosis** – Dissect the problem to know where to refer; conduct hearing assessment on all children with language delays
- **Management** – Early intervention and speech/language therapy; close follow-up; anticipatory guidance and surveillance of other areas (e.g., learning and behaviors)

**Questions?**