Speech & Language: The Key to Child Development

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NASW PENNSYLVANIA CHAPTER
NATIONAL ASSOCIATION OF SOCIAL WORKERS

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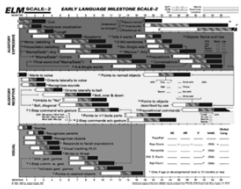
Financial Disclosure

- **Dr. Coplan receives royalties on sales of the *Early Language Milestone Scale,* and *Making Sense of Autistic Spectrum Disorders***



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Outline

- **Definitions**
- **Language acquisition in normal children**
- **Causes of delayed Speech & Language**
- **Intervention**

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Definitions

- **Language = A symbol system for the storage or exchange of information**
  - **Spoken / Written languages**
  - **American Sign Language**
  - **Braille**
  - **Morse Code**
  - **Binary (computer) code**

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Definitions: Speech *vs* Language

- **Components of Language**
  - **Auditory Expressive**
  - **Auditory Receptive (listening comprehension)**
  - **Visual (gestures, Sign, reading & writing)**

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Definitions

- **Components of auditory expressive language**
  - **Semantics (word meaning)**
  - **Pragmatics (social function of language)**
  - **Syntax (structure: word order, e.g.)**
  - **Prosody (inflection)**
  - **Fluency (rate, rhythm)**
  - **Intelligibility (clarity)**
  - **Voice (hoarse? "breathy"?)**

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Language Acquisition in Normal Children

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Language Acquisition in Normal Children

- **Auditory Expressive**
- **Auditory Receptive**
- **Visual**

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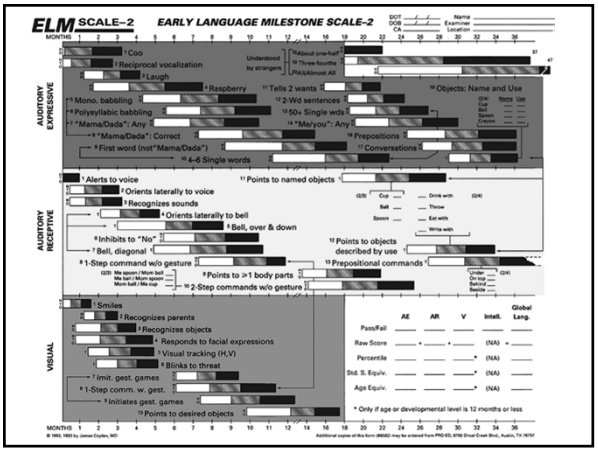

Auditory Expressive

- **Content**
- **Intelligibility**

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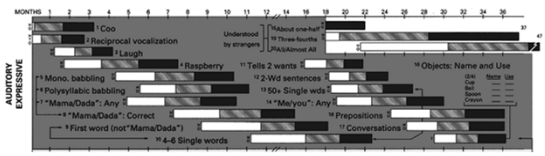
Auditory Expressive



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Aud. Expressive: Content

- **Prelinguistic utterances**
  - **Lack symbolic meaning**
- **Single words**
- **2-word phrases**
- **Telegraphic speech**
- **Sentences**

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Pre-linguistic utterances

- **Cooing**
  - **open vowels**
- **Monosyllabic babbling**
  - **ma, ba, da, ga**
- **Polysyllabic babbling**
  - **lalala, nanana, mamama, dadada, etc**

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Pre-linguistic utterances

- **Birth to ~ 9 mo: Universal**
  - **Regardless of language of rearing**
  - **Regardless of ability to hear**
- **After 9 mo:**
  - **Hearing infants: emulate language of rearing**
  - **Deaf infants: Loss of babbling**

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Aud. Expressive: Content

- **Prelinguistic utterances**
- **Single words**
  - **Common objects; wants**
- **2-word phrases**
  - **"Go store," "Where's daddy?" etc**
- **Telegraphic speech**
  - **Omits tense endings, conjunctions, helper verbs**
- **Sentences**

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Intelligibility (Clarity)

- **% of child's speech understandable by strangers (even if mispronounced)**
- **Rule of 4's:**
  - **Age in Yrs / 4 = % intelligible**
    - **1 yr: 1/4**
    - **2 yr: 2/4**
    - **3 yr: 3/4**
    - **4 yr: 4/4**

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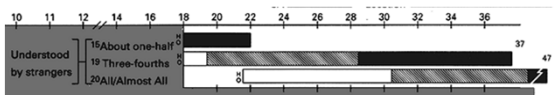
Auditory Expressive - Intelligibility



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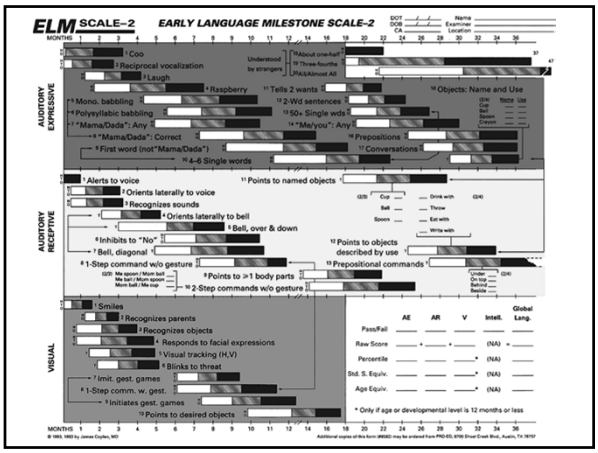

Auditory Receptive: Pre-Linguistic

- **Alerting to sound (0-1 mo)**
- **Recognition of voice / sound (~ 3 mo)**
- **Orienting to sound (5-9 mo)**
- **Recognizes own name (9 mo)**
- **Follows commands**
  - **Understands “No” (9 mo)**
  - **1-step commands with gesture: (9 mo)**
  - **1-step commands w/o gesture (12 mo)**
  - **2-step commands (24 mo)**
  - **etc.**

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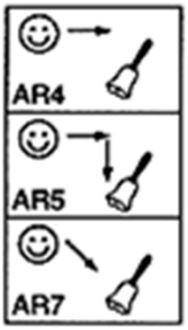
Orienting to sound



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Auditory Receptive: Linguistic

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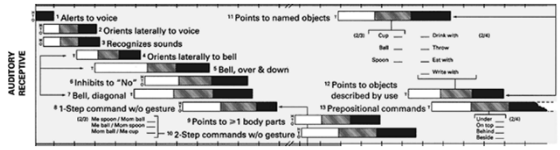
Auditory Receptive



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Visual Language

- **Pre-Linguistic**
  - **Eye contact**
  - **Social smile**
  - **Visual recognition**
  - **Gesture games**

- **Points to desired objects**

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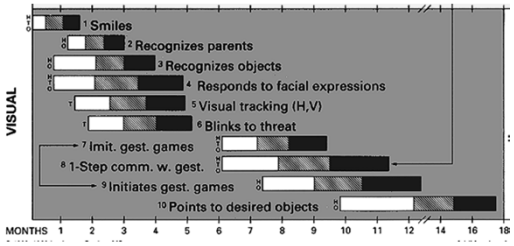
Babbling in the manual mode: Evidence for the ontogeny of language. Petitto LA and Marantette PF. Science 251; 1493-1496, 1991

Visual



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A simple mnemonic

As easy as 1-2-3-4

Age	Auditory Expressive		Auditory Receptive	Visual
	Content	Intelligibility		
1 yr	1 single word	1/4	1-step commands	Index finger pointing
2 yr	2-wd phrases	2/4	2-step commands	---
30 mo	3-5 wd phrases	---	---	---
3 yr	Sentences	3/4	3-step commands	---
4 yr	---	4/4	---	---

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Prevalence & Etiology of "Delayed Speech"

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Delayed Speech or Language

- **Most common developmental concern of childhood**
  - **5 to 10% of preschool children**
  - **May occur in isolation, but frequently indicative of broader underlying developmental disorder**

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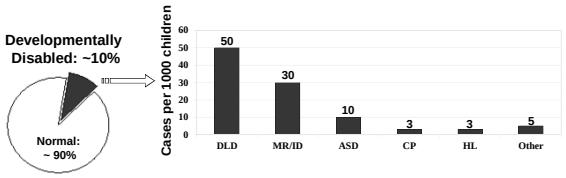
Developmental Disabilities – Birth to 3



ASD: Autistic Spectrum Disorders (Autism, PDD-NOS, Asperger)
CP: Cerebral Palsy (includes dysarthria)
DLD: Developmental Language Disorders
HL: Hearing Loss (permanent, moderate to profound)
MR/ID: Mental Retardation / Intellectual Disability

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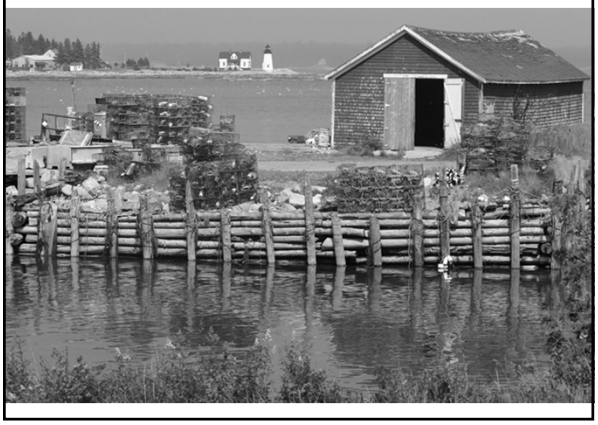

Evaluation of the child with "Delayed Speech"

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Evaluation of the child with "Delayed Speech"

- **Is it delayed speech, or delayed *language*?**
- **What is child's cognitive level?**
- **Is there any evidence of atypicality?**
- **Rule out hearing loss**

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Cognitive Level

- **Intelligence**
  - **Language**
  - **Problem-Solving**
  - **Adaptive (self-care) skills)**
  - **Play**

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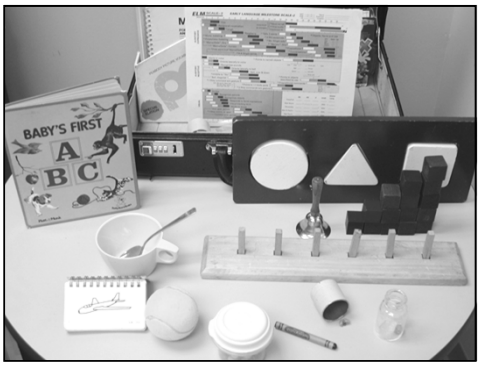

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Problem-Solving

1" Cubes

- **Takes one: 6 m**
- **Transfers: 7 m**
- **Bangs two: 9 m**
- **Takes three: 10-12 m**
- **Copies**
  - **14 m**
  - **18 m**
  - **24-27 m**

- **Builds:**
  - **30-36 m**
  - **3 1/2 yr**
  - **4 yr**
  - **5 yr**
  - **6 yr**

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Problem-Solving

Crayon

- **Mouths: < 9 m**
- **Makes marks 10-12 m**
- **Scribbles p demo: 14 m**
- **Scribbles spont: 16 m**
- **Alternates from stroke to scribble: 22 m**
- **24-27 m**

- **Draws:**
  - **30-36 m**
  - **3 1/2 yr**
  - **4 yr**
  - **5 yr**
  - **6 yr**

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Fine Motor / Adaptive

- **Tools (Spoon; ~ 12 mo)**
- **Fasteners**
  - **Unbuttoning, buttoning (33-36 mo)**
  - **Zippers, snaps (~ 48 mo)**
  - **Shoe tying (5 yr)**
- **Toilet training (less reliable)**

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Play

- **Midline hand play (3 mo)**
- **Banging & Mouthing (7 - 9 mo)**
- **Casting (12 mo)**
- **Tools (crayon) ~ 14 mo**
- **Cause & Effect (14 to 16 mo & up)**
- **Imitative Play (24 mo)**
- **Imaginative Play (36 mo)**
- **Rule-based Play (48 mo)**

Hearing Loss

- **Rule #1: You cannot detect HL at the bedside**
- **Rule #2: When in doubt, refer to Rule #1**

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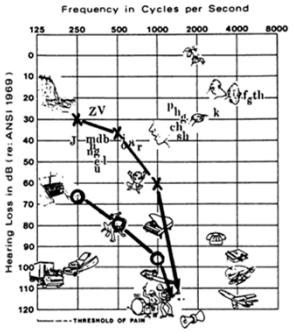

Fig 1. Diagram of frequency-amplitude distribution of common sounds. Severe to profound mid- and high-frequency sensorineural hearing loss of perinatal onset. O, right ear; X, left ear. Partial sparing of low-frequency hearing created false impression of normal hearing on physical examination. Age at audiologic diagnosis: 43 months.

Indications for Audiogram - 1

- **NICU care**
- **Signs or Sx of TORCH infection**
- **Bacterial meningitis**
- **Ototoxic drugs**
- **Head trauma**
- **Anomalies**
  - **Malformations of the head & neck (Branchial arches I & II)**
  - **Abnormal pigmentation (Neural crest)**

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Indications for Audiogram - 2

- **Family Hx of childhood onset HL**
- **Parental concern**
- **Delayed speech**
- **Other developmental disability**
  - **MR**
  - **CP**

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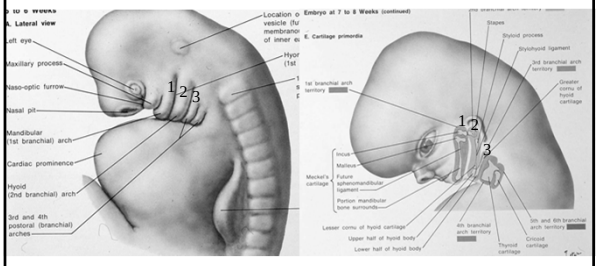

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1st & 2nd Branchial Arch Defect

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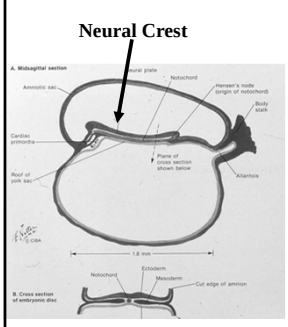

What color is the cat?

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Developmental Language Disorders

- **Isolated impairment of the brain centers responsible for S/L development**
- **Not: HL, MR, ASD, CP, etc**

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Developmental Language Disorders

- **Expressive abnormalities evident initially**
  - **Total output**
  - **Intelligibility**
  - **Grammatical complexity**
- **Receptive abnormalities evident >5 y.o.**
  - **Auditory Memory**
  - **Central Auditory Processing**
- **Increased risk for LD**

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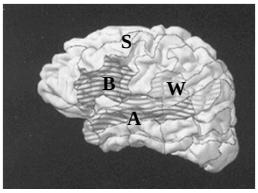
S=Supplemental Motor Area



B=Broca's Area

W=Wernicke's Area

A=Auditory Cortex

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Mental Retardation ("Intellectual Disability")

- **Significantly subaverage general intelligence**
  - **Language (Aud Exp, Aud Recep, and Visual)**
  - **Problem-Solving**
    - **Object permanence, Tools, Cause & effect**
- **Delayed adaptive skills**
  - **Self-feeding, self-grooming, self-dressing**
- **Onset during the developmental period (birth to 5 yrs)**

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Autism: Core Deficits (DSM-IV Criteria)

- **Qualitative impairment of social interaction**
- **Qualitative impairment in communication**
- **Restricted, repetitive, or stereotyped patterns of behavior, interests, or activities**

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Impaired Socialization

- **Poor social reciprocity**
  - **Limited eye contact**
  - **Indifferent to others**
  - **Impaired "Theory of Mind" skills**

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Idiosyncratic Language

- **Impaired language usage ("pragmatics")**
  - **Echolalia**
  - **Delayed Echolalia (scripting)**
  - **Pronoun Reversal**
- **Odd inflection ("prosody")**
  - **Stilted, robotic, sing-song**

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Repetitious Behaviors

- **Rigid Routines**
- **Stereotypies**
- **Lining up / spinning objects**
- **Complex, stereotyped play or preoccupations**
  - ***Fascinated, Fixated, Obsessed,* etc.**

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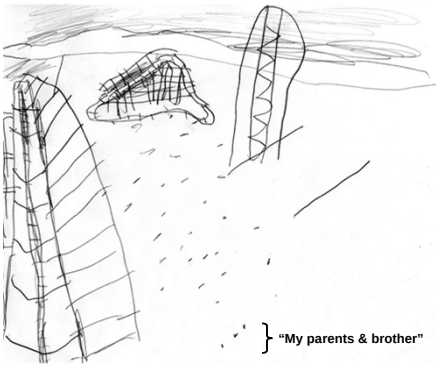
Draw a picture of your family, with everyone in the picture doing something



"Cedar Point Park, with the ocean and Canada in the background."

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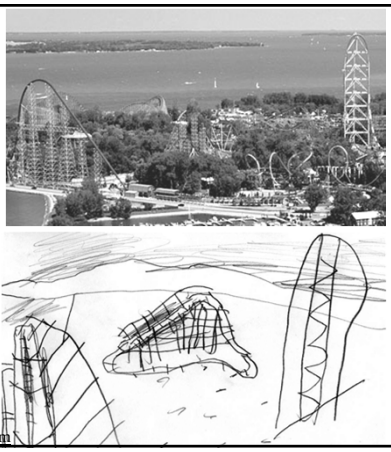

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Not in DSM, but also part of ASD

Sensorimotor Issues

- **Attraction / Aversion to sensory inputs**
  - **Visual: Lights, reflections, spinning objects, looks from odd angles**
  - **Auditory: Hypersensitivity / "acts deaf"**
  - **Tactile: Deep pressure / rubbing / licking / oral aversions**
  - **Olfactory: Sniffing non-food objects**
  - **Food Selectivity**
  - **Pain threshold: Increased / Decreased**
  - **Fear: Idiosyncratic fears / absence of fear**
- **Clumsiness**

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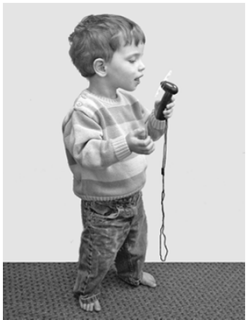
Visual self-stimulation in ASD



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Quantifying severity of ASD - 1

Clinical Domain ⇓	Decreasing Atypicality ⇒		
	Severe	Moderate	Mild
1. Social Interaction	•No eye contact •No physical affection •Cannot be engaged in imitative tasks	•Intermittent eye contact •Seeks affection "on his own terms" •May invade personal space of others (not true affection) •Engageable in imitative tasks, although with difficulty	•Good eye contact •Shows interest in others, but often does not know how to join in •Easily engaged in imitative activities •Rigid; has difficulty if perceives that rules have been broken •Difficulty with "Theory of Mind" & "Central Coherence"

Coplan J Atypicality, intelligence and age: a conceptual model of autistic spectrum disorder. Dev Med Child Neurol 2003 45(10):712-6

Theory of Mind

- **Realization that other people have an internal mental & emotional state, that may be different from one's own**
- **Ability to infer the internal mental & emotional state of others**
- **Able to infer motives of others**

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Which one is "disappointment"?

Theory of Mind

Muff

**Muff is a little yellow kitten.
She drinks milk.
She sleeps on a chair.
She does not like to get wet.**

**What is this story about?
How would Muff feel, if you gave her a bath?**

•Clean

Theory of Mind

Camping

Six boys put up a tent by the side of the river. They brought things to eat with them. When the sun went down, they went into the tent to sleep. In the night, a cow came and began to eat grass around the tent. The boys were afraid. They thought it was a bear.

Is this a sad story, a scary story, or a funny story?

•A scary story, because the boys were scared. **(PDD-NOS)**
•It was a most unusual story, because you don't often find cows in the woods. **(Asperger Syndrome)**

Central Coherence

- **Ability to see "the big picture" rather than a collection of individual elements**

What's happening in this picture?

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What's happening in this picture?

"The man is swimming, and the car is about to fall on him."

What's happening in this picture?

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What's happening in this picture?

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"The girl is screaming."

What's happening in this picture?

"That girl is trying to steal the other girl's book."

Q: What's happening in this picture?
A: *The kitten is on the boy's back and is about to eat him.*

Quantifying severity of ASD - 2

Clinical Domain ⇓	Decreasing Atypicality ⇒		
	Severe	Moderate	Mild
2. Language •Pragmatics •Prosody	•Nonverbal •No response to voice; may "act deaf" •No use of gestures as a means of compensating for absence of spoken language •May use "hand-over-hand" to guide caregiver to desired objects	•Echolalia, Delayed echolalia •May use stock phrases in an attempt to communicate •Verbal perseveration •Makes use of visual communication modalities (symbol cards; sign language) •Odd inflection (stilted, sing-song; ↑↓ volume)	•Speaks fluently, but lacks understanding of verbal nuance, inference, or humor •Difficulty with "Theory of Mind" language tasks (fibbing; framing topic for partner; conversational repair)

Coplan J Atypicality, intelligence and age: a conceptual model of autistic spectrum disorder. Dev Med Child Neurol 2003 45(10):712-6

Quantifying severity of ASD - 3

Clinical Domain ⇓	Decreasing Atypicality ⇒		
	Severe	Moderate	Mild
3. Repetitious Behaviors *Cognitive*	•Extreme distress if *routines* are changed or when required to *transition* from one task to another •Fascination with odd objects (tags, wheels, fans, etc.)	• Same, but with diminishing level of distress; able to accept verbal preparation for changes in routine • Complex repetitious play (lining up objects, memorizes numbers, letters, etc)	• May demonstrate conscious awareness of preference for routines; easier to self-modulate •Play remains repetitious, but repetitive quality is more subtle; preoccupation with arcane topics
Motoric	•Frequent, intense stereotypical movements (flapping, spinning, toe-walking, finger twiddling)	• Motor stereotypies occasional; may re-emerge when excited	• Motor stereotypies rare or absent

Coplan J Atypicality, intelligence and age: a conceptual model of autistic spectrum disorder. Dev Med Child Neurol 2003 45(10):712-6

Quantifying severity of ASD - 4

Clinical Domain ⇓	Decreasing Atypicality ⇒		
	Severe	Moderate	Mild
4. Sensorimotor Phenomena: •*Intense aversion or attraction to specific classes of stimuli* •*Clumsiness*	•*Auditory*: Hyperacusis, covers ears, acts deaf •*Visual*: self-stimulation (lights/patterns); looks at objects from odd angles •*Tactile*: rubbing, licking, mouthing, deep pressure; averse to light touch •*Olfactory*: Sniffing •Extreme food selectivity •↑ ↓Pain threshold •Fears: Heightened / blunted	Same, but diminishing intensity	Same, but diminishing intensity

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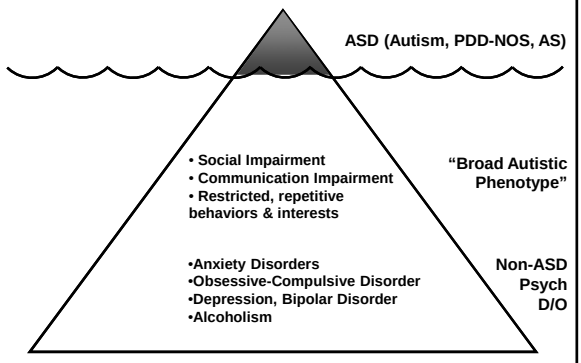
Neuropsychiatric Disorders in Genetically Vulnerable Families



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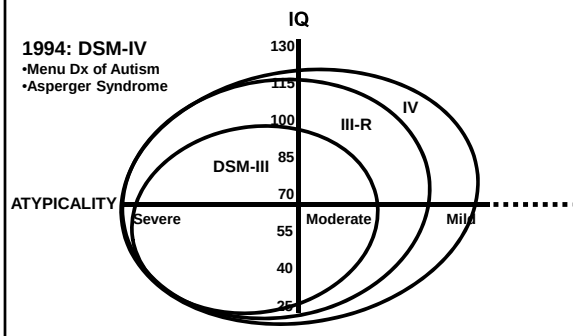
DSM Criteria and the ASD Explosion



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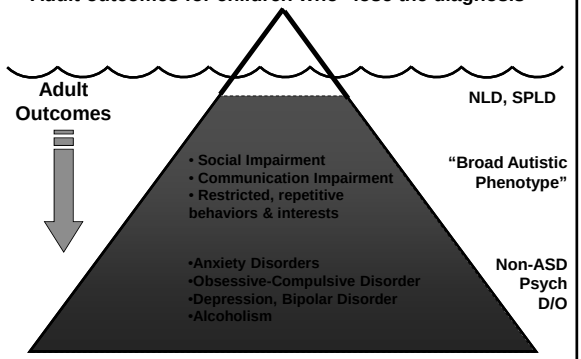
Adult outcomes for children who "lose the diagnosis"



NLD: Non-Verbal LD, SPLD: Semantic-Pragmatic Lang. Disorder

The ASD "explosion"

- **Although the prevalence of ASD has risen, there is no evidence that the incidence has changed**
- **⬆Prevalence can be accounted for by:**
  - **Expanded Dx criteria ➡ ⬆⬆Dx Milder Cases**
  - **Federal service & reporting requirements**
  - **Enhanced methods of ascertainment**

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Dysarthria

- **Abnormality of speech production due to impairment of muscles of articulation**
- **Usually due to Cerebral Palsy**
- **Symbolic aspects of language (comprehension, language production via non-speech methods): *unaffected***

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Stuttering - 1

- **Abnormality of rate or rhythm of speech (*dysfluency*)**
- **Onset coincides with period of normal, transient *disfluency* (~30-36 mo)**
- **Symbolic aspects of language unaffected**

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Stuttering - 2

- **Indication for Consultation**
  - **Atypical onset (<24 or >36 mo)**
  - **Duration > 6 mo**
  - **Whole word ➔Part-wd ➔ Initial syllable**
  - **Parental anxiety level**
  - **(+) FH of lifelong stuttering**

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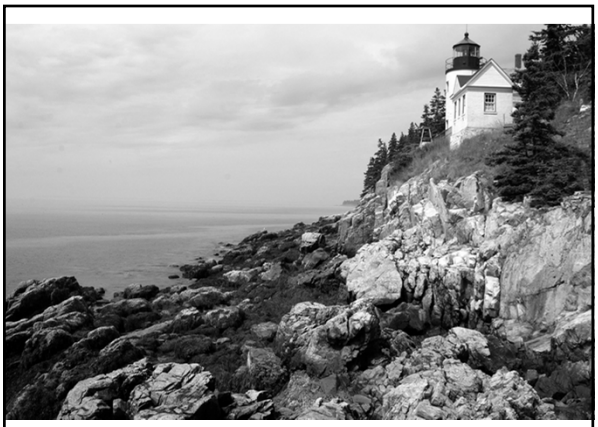

Non-causes of speech or language delay

- **Bilingualism**
- **Tongue tie**
- **Laziness**
- **Birth order**

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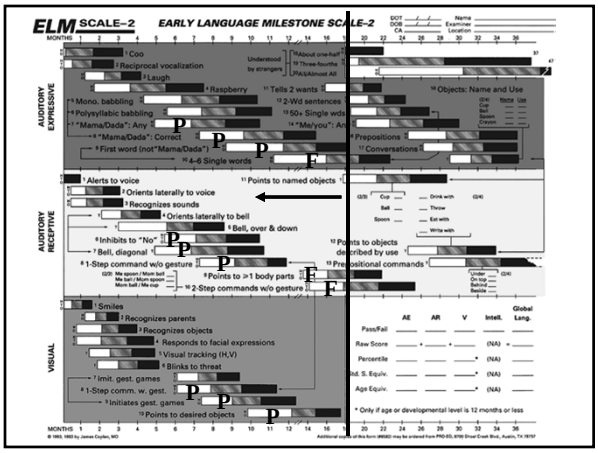
Clinical Examples

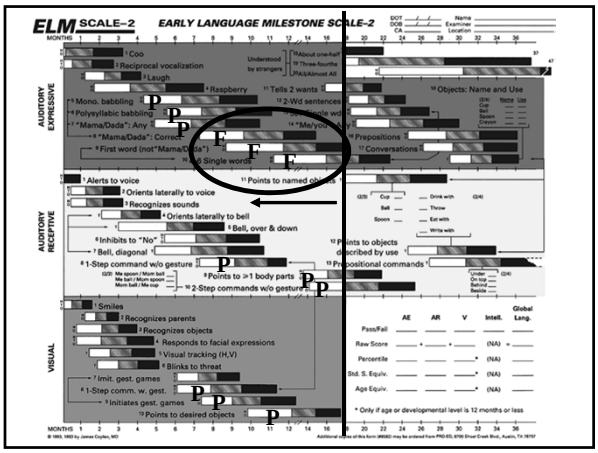
Example 1

- **Normal Development**
  - **Normal auditory expressive skills**
  - **Normal auditory receptive skills**
  - **Normal visual communication skills**



Example 2: Isolated Speech Delay

- **Delayed auditory expressive abilities**
- **Normal auditory receptive skills**
- **Normal visual skills**

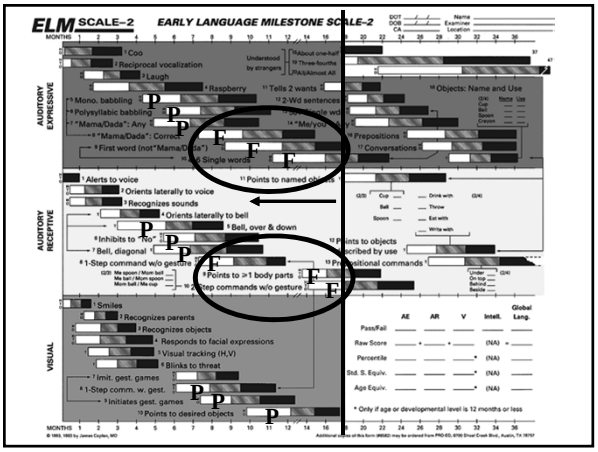


Example 2:
Isolated Speech Delay

- **Partial Hearing Loss**
- **Developmental Language Disorder**
- **Dysarthria / Oromotor Apraxia**

Example 3:
Delayed Oral/Aural but normal *Language*

- **Delayed auditory expressive skills**
- **Delayed auditory receptive skills**
- **Normal visual skills**

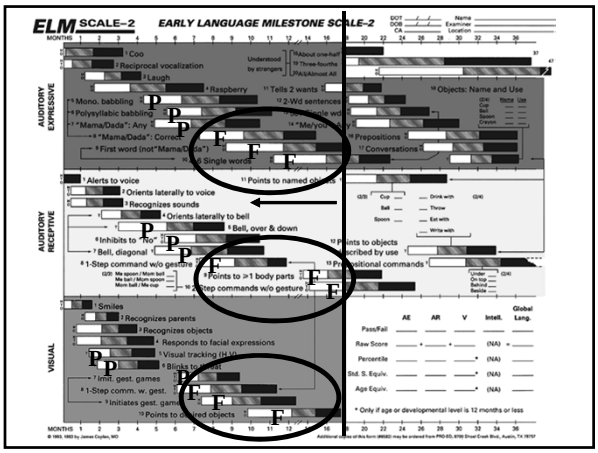


Example 3:
Delayed Oral/Aural but normal *Language*

- **Moderate-Severe Hearing loss**
- **Developmental Language Disorder**

Example 4:
Delayed *Language*

- **Delayed auditory expressive abilities**
- **Delayed auditory receptive skills**
- **Delayed visual skills**



Example 4: Delayed *Language*

- **Global Cognitive Delay (MR / ID)**
- **Autistic Spectrum Disorder**

Evaluation of "Delayed Speech"

- **Delayed speech or delayed *language*?**
- **Rule out hearing loss**
- **Determine cognitive level**
- **R/O Atypicality**
- **Laboratory testing as indicated**
  - **Fra-X, G-banding, CPK, HIV, etc..**
  - **EEG: Landau-Kleffner syndrome**

Evaluation - History

- **Medical Hx**
  - **Prematurity**
  - **IUGR**
  - **Teratogenic exposure**
- **Family Hx**
  - **Developmental disabilities**
    - **Hearing Loss**
    - **Reading level**

Evaluation - History

- **Developmental Hx**
  - **Language**
  - **Oromotor**
  - **Fine Motor / Adaptive**
  - **Personal Social**
  - **Play**
  - **Academic**

Evaluation - Physical Exam

- **Growth parameters**
- **Minor Dysmorphic Features**
- **Neurodevelopmental Assessment**

Neurodevelopmental Assessment

- **Mental Status**
  - **Eye contact, cooperation, attention span**
- **Cranial Nerves**
- **Tone, strength, DTR's**
- **Primitive Reflexes**
- **Automatic Movement Reactions**
- **"Soft Signs"**
- **Developmental testing**

Laboratory Studies

- **Audiogram**
- **SNP, Fragile-X**
- **Other studies as indicated**
  - **CPK (boys with DD, GM delay)**
  - **EEG (Landau Kleffner Syndrome)**
  - **MRI (malformation syndromes)**
  - **Rett Panel (girls w. deterioration)**

Intervention

- **Special education**
  - **Orally based speech therapy**
  - **Verbal Behavior ("VB")**
  - **Augmentative communication**
    - **Sign**
    - **Picture Exchange Communication System**
  - **Treat associated Developmental Disabilities**

Summary

- **Language: Symbol system**
- **Speech: only 1 component of language**
- **"Delayed Speech" is often "delayed language**
- **Often the initial symptom of larger developmental problem (HL, DLD, ID, ASD)**

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