Neonatal Abstinence Syndrome

12-18 Months- part 3

Cincinnati Children's
changing the outcome together

Introduction of Co-Presenters

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  - Medical Director, West Chester Hospital Special Care Nursery, University of Cincinnati Newborn Nursery, NOWS/NAS Follow-up Clinic
  - Pediatrician with experience in newborn medicine for 10 years
- Kate Meister, PhD
  - Assistant Professor, Behavioral Medicine and Clinical Psychology at Cincinnati Children's Hospital and Medical Center
  - Psychologist in NICU Follow-Up and NAS clinic.
  - Clinical specialty training in integrative behavioral health, early childhood psychology and developmental assessment, behavioral sleep medicine
- Liz Rick, MOT, OTR/L
  - Registered Occupational Therapist with 10 years of experience
  - Employed at CCHMC for 7 years
  - A part of the NOWS/NAS Clinic since its start 5 years ago
- Melanie Romaine-Jongewaard, M.S. CCC-SLP, CLC
  - 27 years' experience as a Speech Language Pathologist
  - Speech Language Pathologist in the inpatient setting and In NICU follow up Clinic
  - Specializing in infant feeding, development and Video Swallow Studies

Developmental and Medical Problems in Opioid Exposed Children

Table 2. Comparison of Diagnosis Rates Between Opioid Exposed Infants with Neonatal Abstinence Syndrome and Those with No Detected Exposures

	No detected exposure		*Opioid exposure with NAS*		
	N = 14,933		*N = 138*		P *value*
Behavioral or emotional disorder; N,%	171	1.1	8	5.8	<0.0001*
Developmental delay; N,%	1138	7.6	39	28.3	<0.0001*
Hepatitis C exposure; N,%	21	0.1	48	34.8	<0.0001*
Motor function developmental disorder; N,%	215	1.4	7	5.1	0.0004*
Otitis media; N,%	4221	28.3	43	31.2	0.45
Plagiocephaly; N,%	270	1.8	14	10.1	<0.0001*
Sensory disorder; N,%	1095	7.3	29	21.0	<0.0001*
Speech disorder; N,%	964	6.5	19	13.8	0.0005*
Strabismus; N,%	149	1.0	15	10.9	<0.0001*
Torticollis; N,%	322	2.2	12	8.7	<0.0001*

NAS, neonatal abstinence syndrome.
*Statistical significance after Bonferroni-Holm correction for multiple comparisons.

Hall et al, Population Health Management, 2018

Developmental and Medical Problems in Opioid Exposed Children

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changing the outcome together

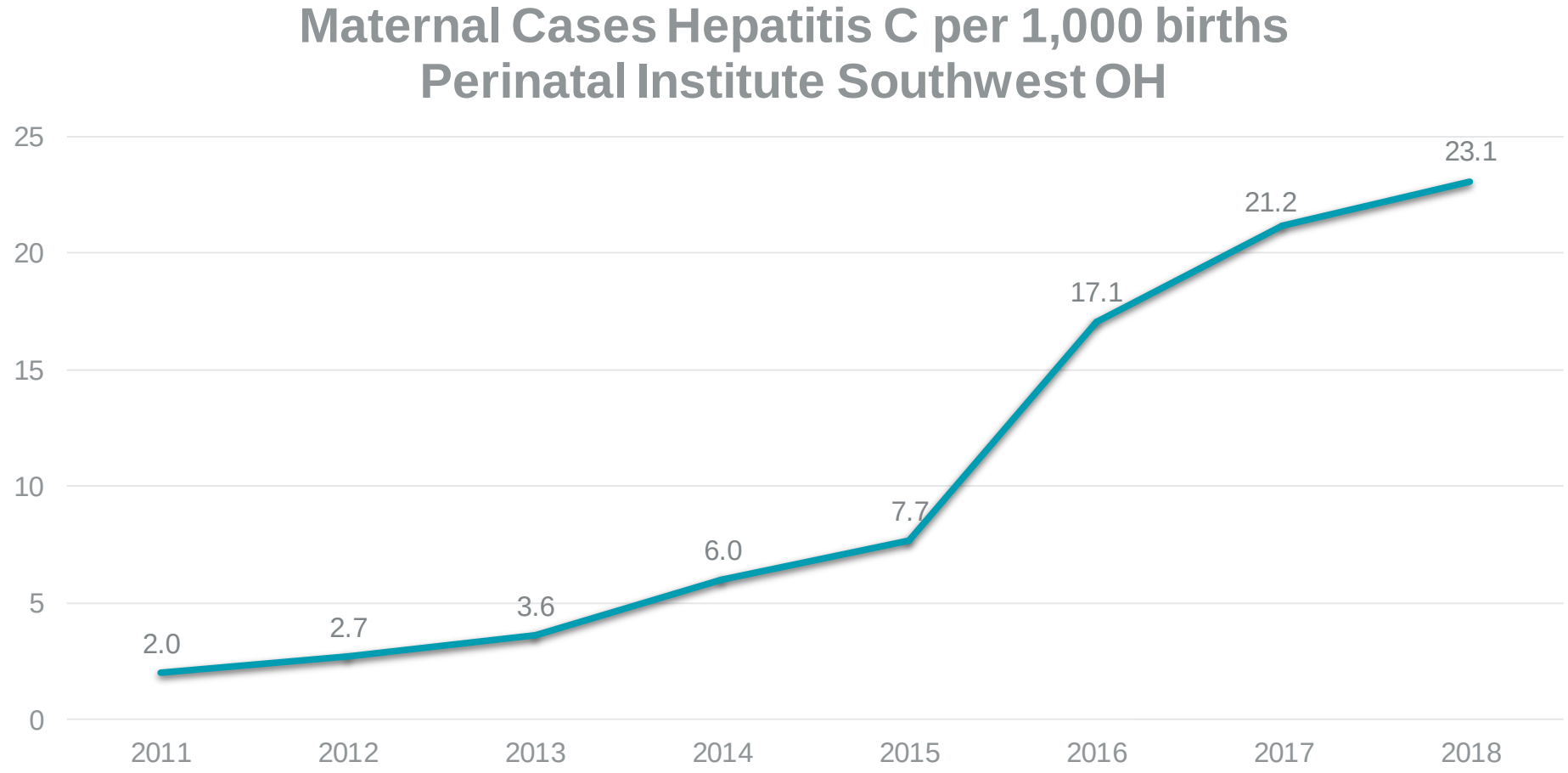
TABLE 3. COMPARISON OF DIAGNOSIS RATES AMONG OPIOID EXPOSED INFANTS WITHOUT NEONATAL ABSTINENCE SYNDROME, OPIOID EXPOSED INFANTS WITH NEONATAL ABSTINENCE SYNDROME, AND INFANTS WITH NO DETECTED EXPOSURES

	No detected exposure		*Opioid exposure without NAS*		*Opioid exposure with NAS*			
	N=14,933		*N=473*		*N=138*		P *value*[a]	P *value*[b]
Behavioral or emotional disorder; N,%	171	1.1	14	3.0	8	5.8	0.0008*	0.12
Developmental delay; N,%	1138	7.6	74	15.6	39	28.3	<0.0001*	0.0008*
Hepatitis C exposure; N,%	21	0.1	32	6.8	48	34.8	<0.0001*	<0.0001*
Motor function developmental disorder; N,%	215	1.4	13	2.7	7	5.1	0.03	0.18
Otitis media; N,%	4221	28.3	155	32.8	43	31.2	0.03	0.72
Plagiocephaly; N,%	270	1.8	5	1.1	14	10.1	0.23	<0.0001*
Sensory disorder; N,%	1095	7.3	49	10.4	29	21.0	0.01	0.001*
Speech disorder; N,%	964	6.5	48	10.1	19	13.8	0.001*	0.23
Strabismus; N,%	149	1.0	16	3.4	15	10.9	<0.0001*	0.0004*
Torticollis; N,%	322	2.2	6	1.3	12	8.7	0.19	<0.0001*

[a]Comparison of opioid exposure without NAS and no detected exposure.
[b]Comparison of opioid exposure without NAS and opioid exposure with NAS.
*Statistical significance after Bonferroni-Holm correction for multiple comparisons.
NAS, neonatal abstinence syndrome.

Hall et al, Population Health Management, 2018

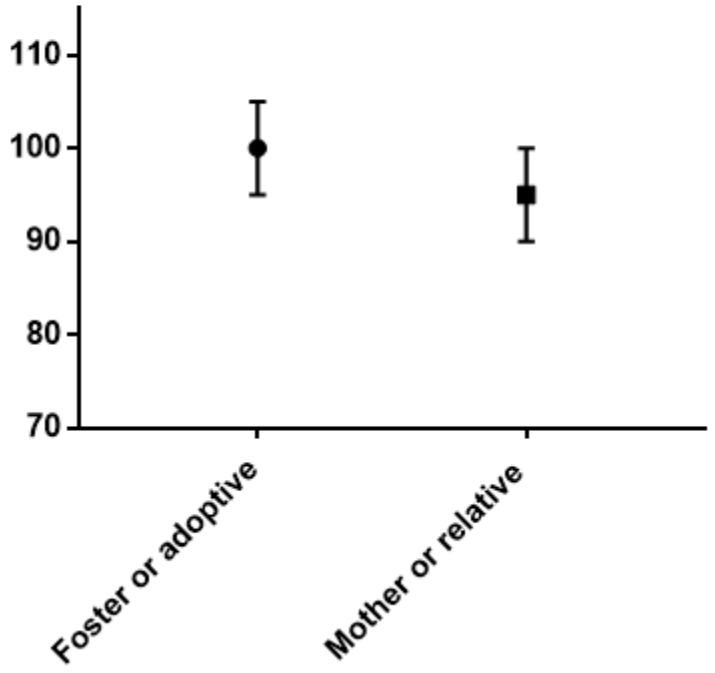
Hepatitis C



- Opioid exposure for 2016 was 33.3/1000 live births
- ~50% of opioid exposed infants were born to mothers with Hepatitis C

Neurodevelopmental Outcomes- caregiver difference

Median Bayley cognitive score in infants with NAS living with foster or adoptive families versus biological relatives



Median 100 vs 95, p=0.03

Merhar et al Journal of Perinatology, 2018

Social Emotional Development and Behavior

NAS and Toddler Development

- Long-term outcomes associated with Neonatal Abstinence Syndrome are not as clearly understood as short-term outcomes (Behnke & Smith 2013; Logan, Brown, and Hayes, 2013)
- Poly-substance exposure, medical co-morbidities, SES, prenatal care, and caregiver mental health are variables that may affect outcomes
- Prenatal opiate exposure has been associated with hyperactivity and shorter attention span in toddlers (Rosen and Johnson, 1985)
- Some studies have found cocaine exposure to be associated behavior problems in preschool age children (Lifschltz and Wilson, 1991)
- Higher risk for emotional and behavioral dysregulation

Social Emotional Milestones (CDC)

12 months

- Cries when mom or dad leaves
- Has favorite things and people
- Shows fear in some situations
- Repeats sounds/actions to get attention
- Puts out arm or leg to help with dressing
- Plays games such as “peek-a-boo” and “pat-a-cake”
- Begins to desire some independence

18 months (CDC)

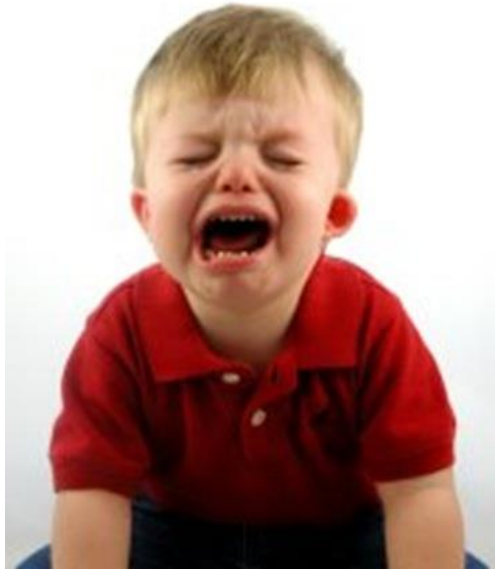
- Likes to hand things to others as play
- May have temper tantrums
- May be afraid of strangers
- Shows affection to familiar people
- Plays simple pretend
- Points to show others something interest

Red Flags: Does not display any fear, does not seek others’ attention, does not demonstrate preference/affection toward caregivers

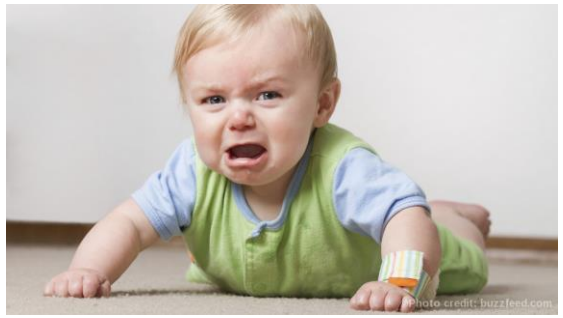
https://www.cdc.gov/ncbddd/actearly/milestones/index.htmld

Common Behavior Concerns

- Tantrums
- Aggression (hitting, biting, hair pulling)
- Not listening
- Head banging



Head banging



- Head banging in young children can occur in the context of typical development or developmental delays
- May result from
  - Frustration (or another strong emotion)
  - Sensory input (boredom)
  - Self-soothing
  - Or a combination of multiple reasons
- Try to not make a big deal about the behavior nor give it too much attention.
- One strategy to deal with head banging would be to create a safe calm down space to place (e.g., living room floor with pillows). Leave child in the calm down space until they calm down.

Behavioral Strategies

- Differential Attention – “pay attention to what you pay attention to”
  - Positive behaviors (e.g., calm body, gentle hands, giving hugs and kissing, sharing) - provide lots of attention and labeled praise.
  - Negative behaviors (e.g., whining, crying, throwing things) - remove your attention from the child. Return your attention as soon as they engage in a positive behavior or start to calm.

Behavioral Strategies

Child-led play

- One-on-one play time
- Follow child's lead – play with what they play with, imitate play, play at child's level
- Focus on describing child's behavior and avoid giving directions or asking questions
- Have fun and give lots of labeled praise!

Avoiding Behavior Concerns

- Predictable, consistent, daily routines
- Ensure adequate sleep and nutrition
- Consistently give lots of attention and praise
- Toddler Soothing: Strategies to help regulate emotions (e.g., when angry/overwhelmed).
  - Distraction/redirection
  - Hugging/co-regulating with a caregiver
  - Use a transitional object
  - These strategies are most effective prior to a tantrum or after (not in the middle of a tantrum)

Why “no” does not usually work

- Toddlers ability to understand logic and engage in self-control are minimal
- Curiosity and exploration of environment are important for development
- Instead of saying “no”
  - Toddler-proof the environment (as much as possible)
  - Use distraction and redirection
  - Tell them “what to do” instead of “what not to do”

https://www.zerotothree.org/resources/1052-nurturing-your-child-s-development-from-12-to-18-months

When do behaviors become a problem?

- Developmentally typical behaviors can be difficult to distinguish from "problematic" or "abnormal" behaviors
- Assess based on frequency, intensity, and impact of the behavior (how does this affect the child's functioning at home and/or daycare)
- Assess caregiver ability to manage the behavior
- Refer to pediatrician or child psychologist for additional evaluation

Sensory Processing in NOWS

What are the risk factors for Sensory Processing Disorder (SPD)?

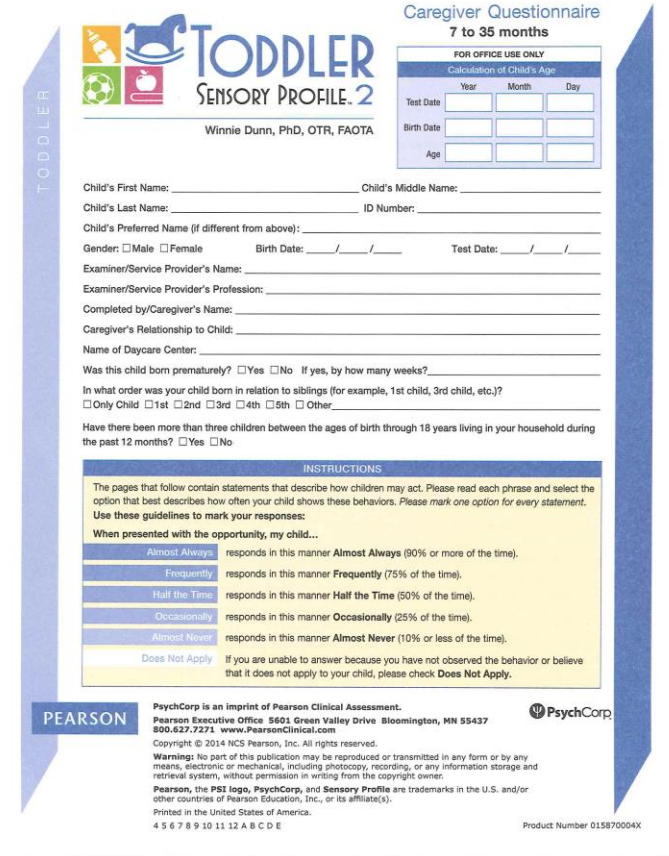
Several groups suggest the following are possible risk factors associated with SPD:

- Low birth weight (less than 2200 grams)
- Prematurity (less than 36 weeks gestation)
- Prenatal complications
- **Maternal stress**
- Maternal illness
- **Maternal use of medications**
- Delivery complications
- Assisted delivery methods
- Ethnic minority
- Living with a single parent
- Lower socioeconomic status

STAR Institute (https://www.spdstar.org/)
(Ben- Sasson et al., 2009; Keuler et al., 2011; May-Benson et al., 2009; Schneider et al., 2007, 2008, 2009; Wickremasinghe et al. in press;)

Early Screening

- Toddler Sensory Profile 2
  - 12-18 month visit
  - Takes caregiver <15 minutes to fill out
  - Provides scores for each sensory system and 4 quadrants:
    - Seeking
    - Avoiding
    - Sensitivity
    - Registration
  - Collect data
  - Guide referrals



Caregiver Questionnaire
7 to 35 months

TODDLER SENSORY PROFILE 2

Winnie Dunn, PhD, OTR, FAOTA

FOR OFFICE USE ONLY
Calculation of Child's Age

	Year	Month	Day
Test Date			
Birth Date			
Age			

Child's First Name: _____ Child's Middle Name: _____
Child's Last Name: _____ ID Number: _____
Child's Preferred Name (if different from above): _____
Gender: ☐Male ☐Female Birth Date: ____/____/____ Test Date: ____/____/____
Examiner/Service Provider's Name: _____
Examiner/Service Provider's Profession: _____
Completed by/Caregiver's Name: _____
Caregiver's Relationship to Child: _____
Name of Daycare Center: _____
Was this child born prematurely? ☐Yes ☐No If yes, by how many weeks? _____
In what order was your child born in relation to siblings (for example, 1st child, 3rd child, etc.)?
☐Only Child ☐1st ☐2nd ☐3rd ☐4th ☐5th ☐Other _____
Have there been more than three children between the ages of birth through 18 years living in your household during the past 12 months? ☐Yes ☐No

INSTRUCTIONS

The pages that follow contain statements that describe how children may act. Please read each phrase and select the option that best describes how often your child shows these behaviors. *Please mark one option for every statement.*
Use these guidelines to mark your responses:
When presented with the opportunity, my child...

Almost Always	responds in this manner **Almost Always** (90% or more of the time).
Frequently	responds in this manner **Frequently** (75% of the time).
Half the Time	responds in this manner **Half the Time** (50% of the time).
Occasionally	responds in this manner **Occasionally** (25% of the time).
Almost Never	responds in this manner **Almost Never** (10% or less of the time).
Does Not Apply	If you are unable to answer because you have not observed the behavior or believe that it does not apply to your child, please check **Does Not Apply.**

PEARSON

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800.627.7271 www.PearsonClinical.com

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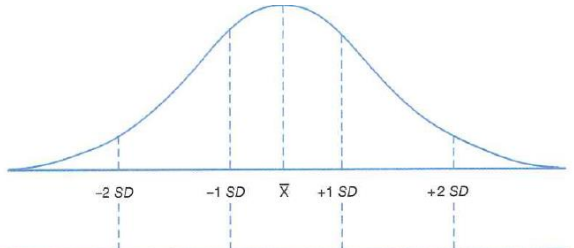
The Normal Curve and Sensory Profile 2 Classification System

Scores one standard deviation or more from the mean are expressed as More Than Others or Less Than Others, respectively. Scores two standard deviations or more from the mean are expressed as Much More Than Others or Much Less Than Others, respectively.



				◄ Less Than Others			More Than Others ►	
		Raw Score Total	Percentile Range[a]	Much Less Than Others	Less Than Others	Just Like the Majority of Others	More Than Others	Much More Than Others
Quadrants	Seeking/Seeker	/35		0-------17	18-------22	23-------33	34-------35	**
	Avoiding/Avoider	/55		0-------5	6-------10	11-------21	22-------26	27-------55
	Sensitivity/Sensor	/65		0-------6	7-------12	13-------27	28-------34	35-------65
	Registration/Bystander	/55		0-------3	4-------9	10-------21	22-------26	27-------55
Sensory and Behavioral Sections	General	/50		0-------5	6-------10	11-------22	23-------27	28-------50
	Auditory	/35		0-------2	3-------5	6-------14	15-------17	18-------35
	Visual	/30		0-------5	6-------10	11-------19	20-------24	25-------30
	Touch	/30		0-------1	2-------5	6-------13	14-------16	17-------30
	Movement	/25		0-------9	10-------12	13-------20	21-------23	24-------25
	Oral	/35		0-------1	2-------5	6-------15	16-------19	20-------35
	Behavioral	/30		0-------3	4-------6	7-------14	15-------17	18-------30

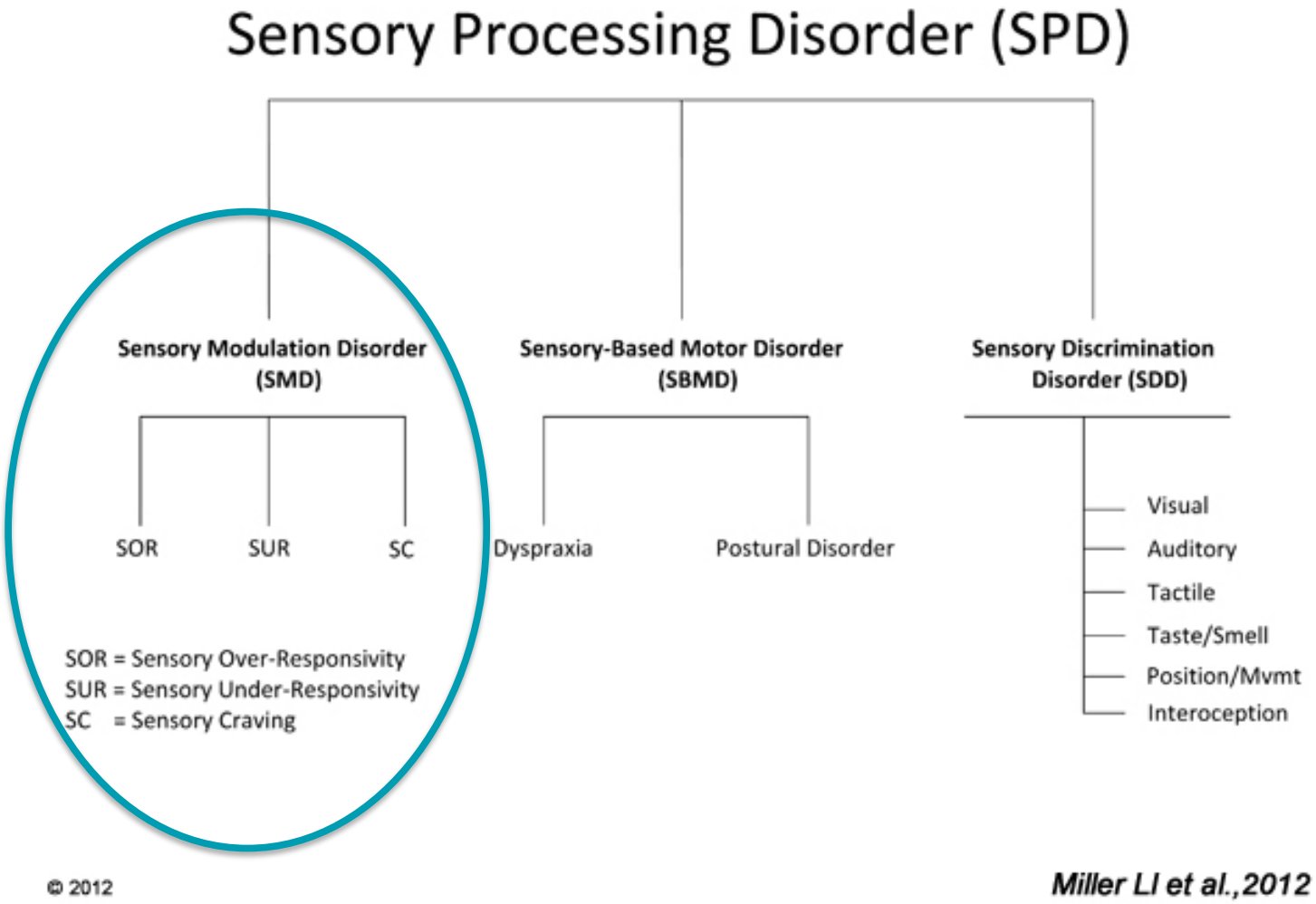
https://www.pearsonassessments.com/store/usassessments/en/Store/Professional-Assessments/Motor-Sensory/Sensory-Profile-2/p/100000822.html

Overview of Sensory Systems

- Tactile -- touch
- Auditory -- sound
- Visual -- sight
- Olfactory -- smell
- Gustatory -- taste
- Vestibular -- position and movement in relation to gravity
- Proprioception -- input from muscles and joints regarding body is in space as well as the concept of pressure
- Interoception -- sensations in organs; feeling of hunger, pain, itch, body temperature

STAR Institute (https://www.spdstar.org/)

Sensory Subtypes



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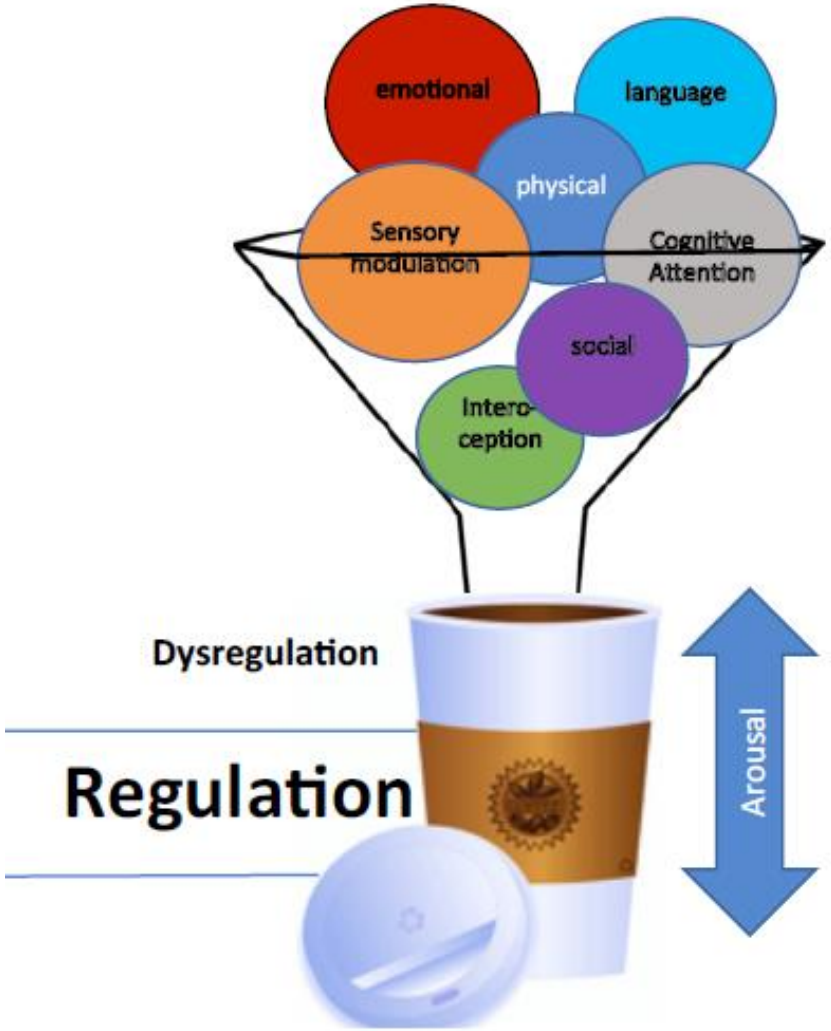
Goal for all subtypes is REGULATION



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Sensory Over-Responsiveness

- More sensitive to sensory stimulation than most people. Their bodies feel sensation too easily or too intensely.
- Might feel as if they are being constantly bombarded with information.
- Often have a “fight or flight or freeze” response to sensation
  - Hearing a loud noise
  - Being touched unexpectedly
- May try to avoid or minimize sensations
  - Cover their ears to avoid loud sounds
  - Withdraw from being touched

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Sensory Over-Responsiveness

- Schneider's group (Schneider et al., 2007, 2008, 2009; Moore et al., 2008) working with non-human primates found that SPD-SOR was associated with **maternal stress** during gestation, **drug and/or alcohol use by mothers during pregnancy,** and postnatal lead exposure.
- PET scans revealed up-regulation of D2-receptor binding that correlated with increased behavioral withdrawal responses to tactile stimuli, supporting the hypothesis that neurophysiologic factors contribute to the expression of SOR behavior.

Over-Responsiveness at 12-18 Months

- Becomes extremely upset during grooming tasks (teeth brushing, nail trimming, etc.) or dressing/bathing activities
- May demonstrate tantrums of long duration or extreme intensity (more than peers)
  - Cannot calm self
- Resists cuddling, arches away when held
- Excessively cautious and afraid to try new things
- Hitting may be a sign of over-responsiveness– “fight, flight, or freeze”
  - Important to understand why it’s happening so you know how to respond

STAR Institute (https://www.spdstar.org/)

Sensory Under-Responsivity

- Less sensitive to input than others, may not notice things that others do
- May appear withdrawn, difficult to engage and or self-absorbed
- May lead to poor body awareness, clumsiness or movements that are not graded appropriately
- May not perceive objects that are too hot or cold or they may not notice pain in response to bumps, falls, cuts, or scrape

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Under-Responsiveness at 12-18 Months

- Clumsy and uncoordinated
- Loose or ‘floppy’ muscles -- motor delays
- Ignores you when their name is called
- Difficult to engage
- Rarely plays with toys

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Sensory Craving

- Actively seek or crave sensory stimulation and seem to have an almost insatiable desire for sensory input.
- Constantly moving, crashing, bumping, and/or jumping.
- May “need” to touch everything and be overly affectionate, not understanding what is “their space” vs. “other’s space.”
- Often thought to have Attention Deficit Hyperactivity Disorder (ADHD) or Attention Deficit Disorder (ADD).
  - Strong correlation between prenatal opioid exposure and ADHD/ADD.

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Sensory Craving at 12-18 Months

- Bangs head on walls/furniture/people
- Aggression– hitting, biting, hair pulling
- Constantly throwing toys
- “On the go”-- body seems to move faster than it should for their age and developmental level (early walkers)
- Decreased attention span – cannot attend to a seated activity for 2-5 minutes

STAR Institute (https://www.spdstar.org/)

Treatment Principles

Sensory Under-Responsive

Fill the cup

Sensory Over-Responsive

Empty the cup

Sensory Craver

Cup has a hole in it!

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Sensory Under-Responsive

Treatment Principles

- Increase arousal in an organized way
- Use fast/blast activities in all sensory domains
  - High intensity of inputs in short bursts
- Teach families and caregivers to integrate high intensity input into a sensory lifestyle

STAR Institute (https://www.spdstar.org/)

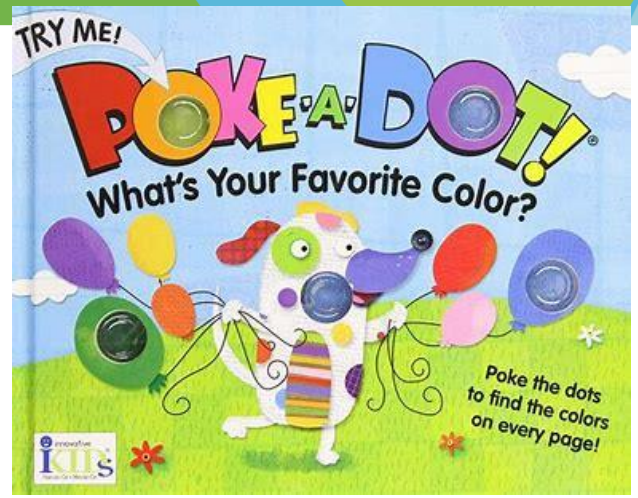
Sensory Over-Responsiv

Treatment Principles

- Use calming activities (low/slow):
  - Linear swinging
  - Deep touch pressure
- Heavy work
  - Large pillows for lifting and moving
  - Heavy objects for pushing or pulling
  - Resistive materials
- Gradual exposure with a focus on regulation
- Do not surprise them with the sensation – Predictability

STAR Institute (https://www.spdstar.org/)

Sensory Craving



Treatment Principles

- Giving the sensory craver more input makes him want more of the input
  - Akin to a gas tank with a leak in it - you keep filling it up but you never get full… and it's highly flammable!
  - These individuals are not under aroused- they don't need more of the input

- Provide lots of structure to movement based activities, make them purposeful and functional
  - Have them crawl through a tunnel to retrieve a puzzle piece and crawl back through to place it in the puzzle
- Incorporate heavy work
  - Engage the child with play-doh, a sand table, bristle blocks, or other resistive activities to promote fine motor development and increase attention span
  - "Touch-and-Feel" or "Poke-A-Dot" books for kids with poor attention to books

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Sensory Craving Behaviors

- Head banging/crashing
  - Provide **proactive** input to reduce the behavior– don't reward it after!
  - Safe, directed input to head/body – vibrating massager while singing "Head, Shoulders, Knees, and Toes"
  - Squishes in pillows while pretending to make a sandwich
- Hitting/biting
  - Pat-a-cake with resistive squeezes during hand claps
  - Offer chewy tubes or other oral input (drinking applesauce/yogurt through a straw)
- Throwing toys
  - Use of bean bags or weighted balls to throw into a basketball hoop or other container

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Educational Disabilities

TABLE 3 Conditional Multivariable Logistic Regression Used To Analyze Special Education Outcomes of Children With a History of NAS ($N = 1815$) and Children Without a History of NAS ($N = 5441$)

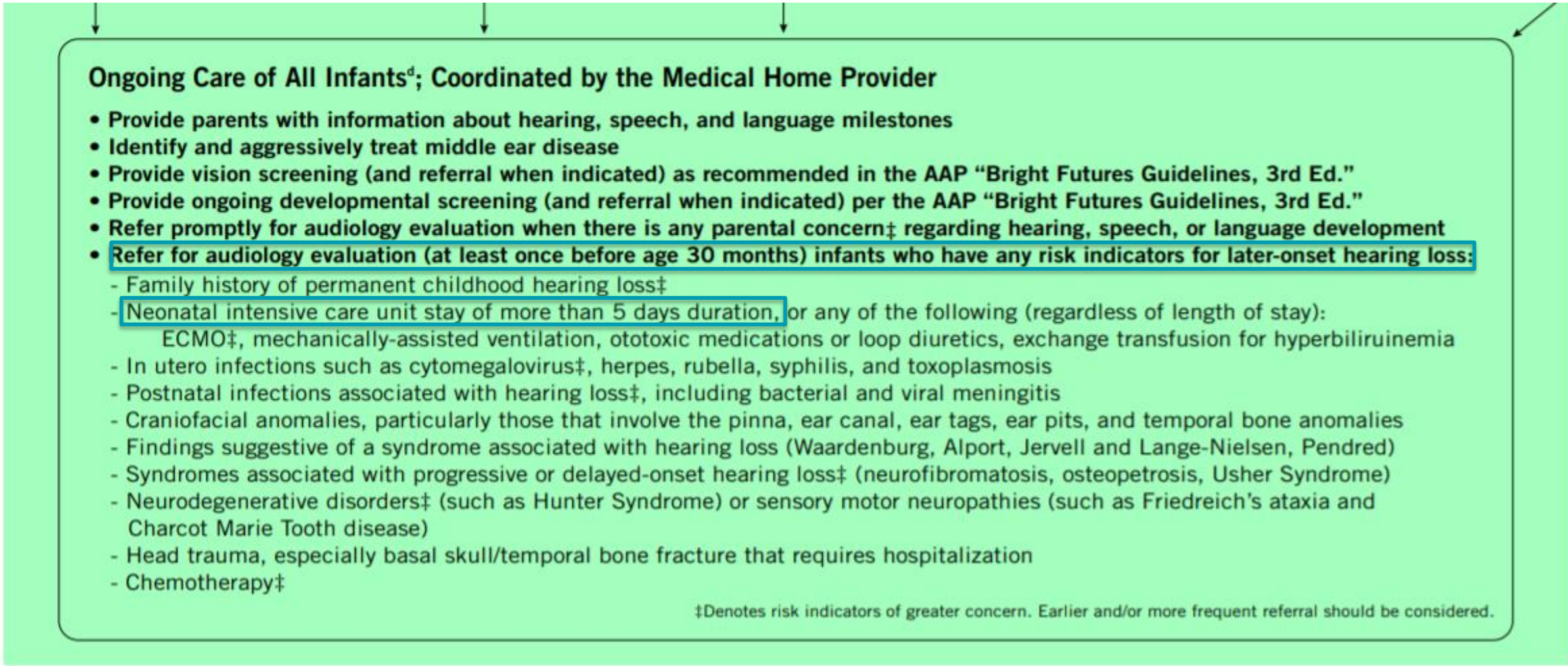
Outcome	aOR (95% CI)
Referred for evaluation	1.44 (1.23–1.67)
Eligible for services	1.36 (1.15–1.60)
Developmental delay	1.34 (1.03–1.76)
Speech or language impairment	1.26 (1.04–1.52)
Received therapies or services	1.37 (1.16–1.61)
Accommodations	1.32 (1.03–1.69)
Speech	1.33 (1.12–1.57)

Explanatory regression model was controlled for matching factors (sex, race and/or ethnicity, age, public health region of residence, TennCare insurance status), maternal tobacco use during pregnancy, and maternal education status.

Fill et al; Pediatrics 2018

Speech and Language Development and Potential issues

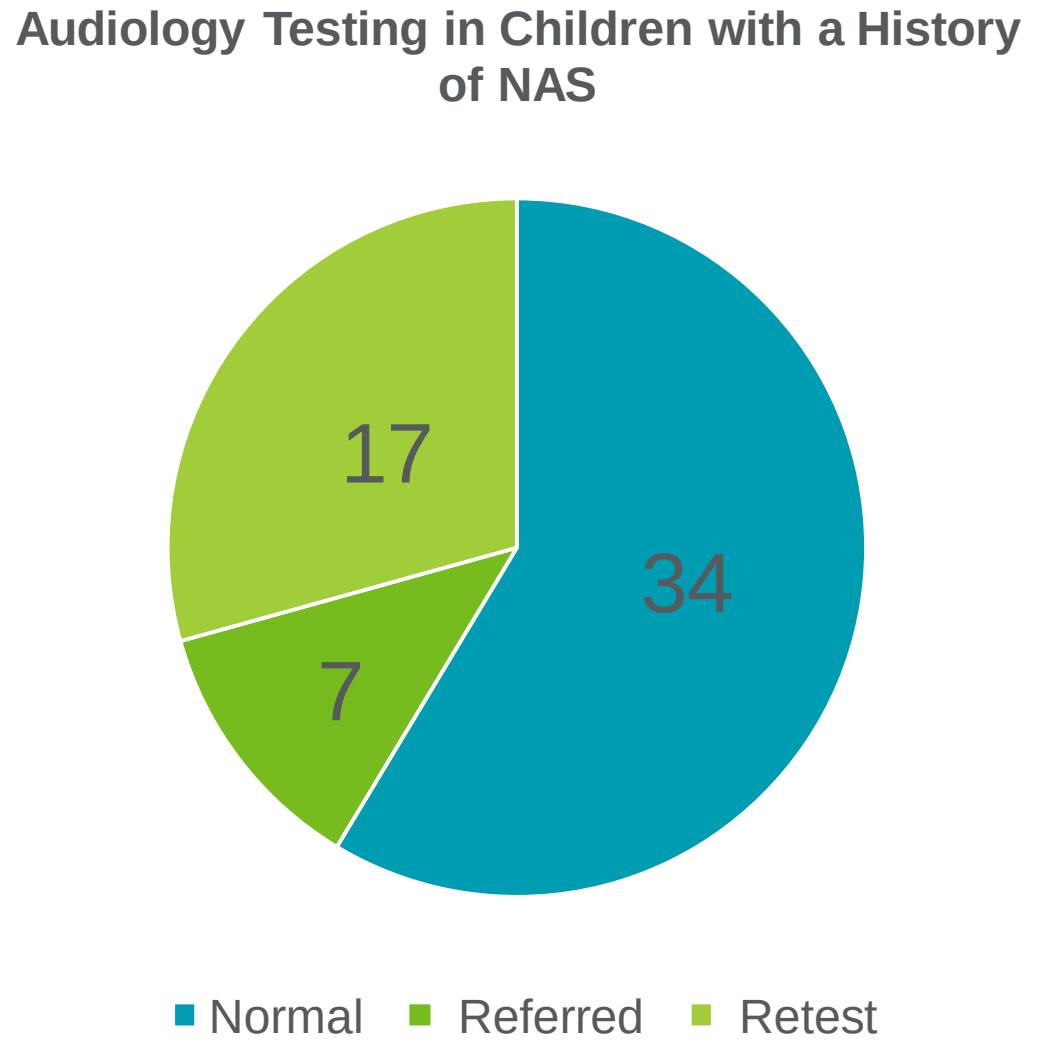
Audiology Screening



February 2010 - American Academy of Pediatrics Task Force for Improving Newborn Hearing Screening, Diagnosis and Intervention (www.medicalhomeinfo.org)

Audiology Testing

- In our clinic, we refer all infants for hearing testing at 12 months
- In review of 58 patients sent for hearing testing in 2014:
  - 59% had normal tests
  - 29% required further follow-up hearing tests ranging from 3 mo-1 year
  - 12% required referral to ENT



Typical Speech and Language Development from 12-18 months

Speech

Speech-physically producing sounds to form spoken words

Language

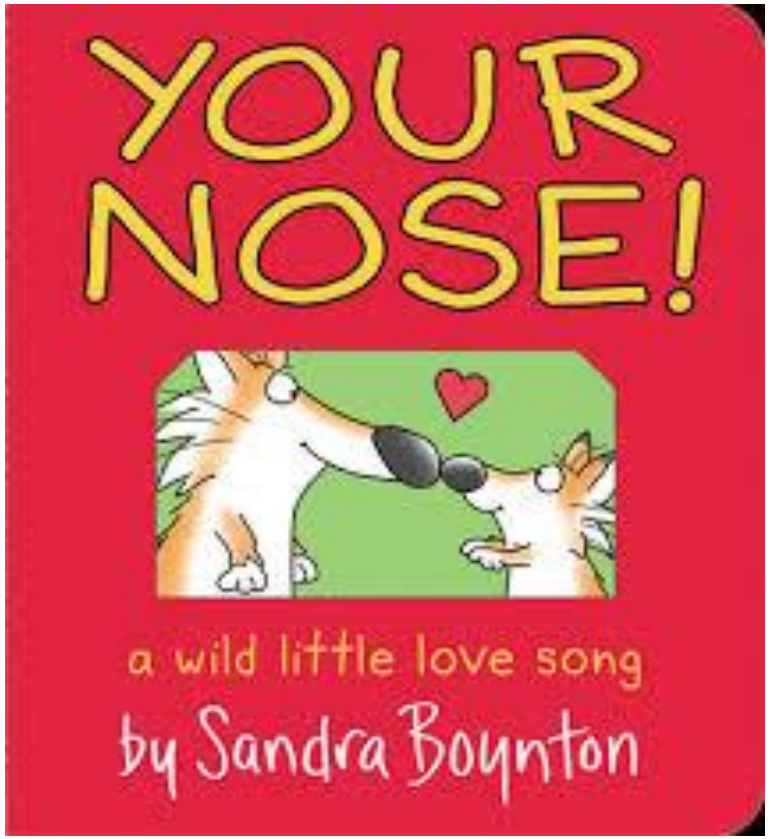
- The message that is sent back and forth during talking.
- Receptive-Understanding the message from others
- Expressive-expressing messages through words and sentences
- Pragmatics-use of language for social reasons

Liam

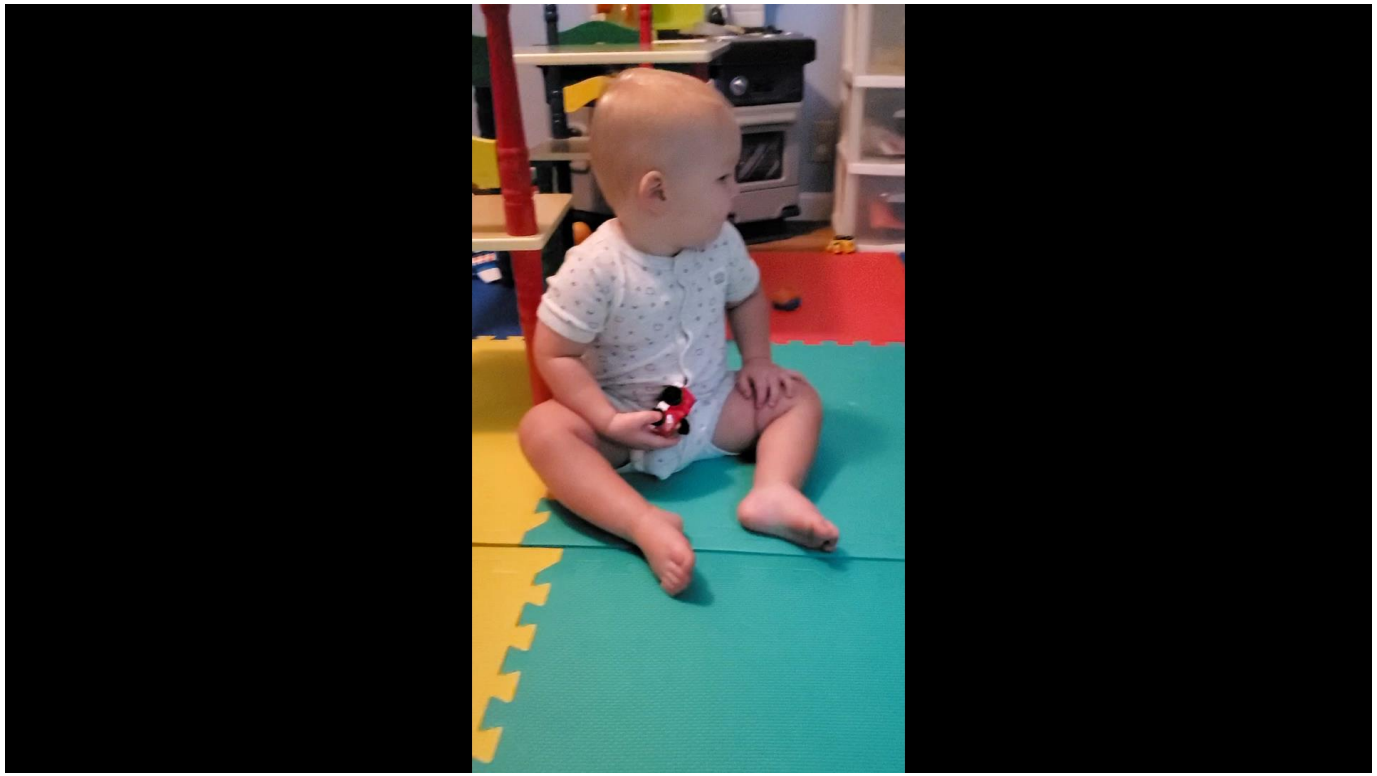
- Case Study-
  - Full term Infant of polysubstance abuser-NAS with methadone treatment
  - Prenatal Hepatitis C exposure
  - Placed in custody of the county (foster mother) after discharge from the birth hospital
  - Regulation and feeding issues in the first few days/weeks
  - Tremors and hypertonia
  - Foster mother is an RN at CCHMC, now has adopted him
  - Grandparents watch him when Mom is working

12-18 months Receptive Language

- Pays attention to a book or toy for ~2 min
- Points to pictures in a book or to body parts when named
- Can point to or get an object when asked
- Easily follows simple 1 step command "Get your cup" or "touch your nose"
- Listens to simple stories or songs
- Listens closely to others



Receptive Directions of Body Parts



Receptive Direction of Nouns

12-18 months Expressive Language

- Says “no” and shakes head for “no”
- Asks for more
- Repeats animal sounds
- Calls family members and pets by name.
- Names familiar objects and pictures in books
- Repeats words when asked
- Uses ~20 single words by 18 months
- Mixes jargon, gestures, and words
- Uses single words to mean many things-ex: “cup” may mean “Where’s my cup?” or “I want a drink”

Expressive Imitation

Expressive Response

12-18 months Social Language

- Enjoys rhymes and finger play games (itsy bitsy spider, Patty Cake)
- Repeats other children's sounds
- Hugs dolls, animals, and other people
- Pretends to feed others

RED FLAGS by age 18 months

- Has fewer than 10 words
- Does not use consonant + vowel combinations that others recognize as words even if they are mispronounced
- Does not respond consistently to being called by name
- Does not respond to familiar sounds (phone ringing)
- Does not show or give objects spontaneously
- Does not start a turn taking game (peek a boo)
- Does not direct others' attention to something by pointing or making eye contact

Speech and Language Stimulation Techniques for Families

- Read!!!- Dialogic Reading technique recommended
- Expand on any speech and language they may have ex “Daddy” say “Daddy is home”
- Play children’s music and dance and move to the music
- Sing and play finger plays with them
- When a child is pointing to an object they want or takes you to an item say “I see your cup, tell me cup” Encourage them to look at your mouth and say cup again. Praise any attempt made to say cup.

ASHA Development Chart

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If school-age children don't reach the following milestones for language, SLPs should consider evaluation.	
Birth to 1 month	crying and vegetative sounds
2 to 3 months	eye gaze
6 to 9 months	joint attention
9 to 12 months	using gestures
12 to 15 months	following simple commands
18 months	symbolic play, pretend play
24 months	sequencing of activities
36 months	episodic play

Typical vocabulary development	
12 months	first words, usually labeling familiar objects and actions in child's environment
15 months	four- to six-word vocabulary
18 months	20- to 50-word vocabulary
24 months	200- to 300-word vocabulary

Speech development milestones	
birth to 1 month	crying and vegetative sounds
1 to 6 months	cooing, laughter, squealing, growling
4 to 6 months	marginal babbling
6 to 8 months	reduplicated babbling
8 to 10 months	variegated babbling
8 to 12 months	echolalia
9 to 12 months	phonetically consistent forms and jargon

Speech intelligibility milestones (for parents' understanding)	
18 months	up to 25 percent intelligible
2 years	50 to 75 percent intelligible
3 years	75 to 100 percent intelligible

Speech intelligibility milestones (for unfamiliar listeners)	
18 months	up to 25 percent intelligible
2 years	up to 50 percent intelligible
3 years	up to 75 percent intelligible
4 years	100 percent intelligible

ASHA Wire (2020).

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Resources

Red Flags for Speech. (2020). In *ASHA Wire*. Retrieved from https://leader.pubs.asha.org/doi/10.1044/leader.SCM.21112016.32

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Questions?