

Alejandra G. de Alba Campomanes MD, MPH



Professor of Ophthalmology and Pediatrics
Deborah Hoyt and Creig S. Hoyt, M.D.,
Chair in Pediatric Ophthalmology

University of California, San Francisco



 **Prevent
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A Lifetime of Vision
July 17, 2019 | National Press Club | Washington D.C.

Preschool Vision Screening

- Early identification of vision abnormalities
- Uses a variety of clinical tests or automated instruments to detect amblyopia or its risk factors (ARFs)
- Children with positive findings are then referred for a complete eye examination to confirm the presence of vision problems and for treatment
- The USPSTF recommends vision screening at least once in all children aged 3 to 5 years to detect amblyopia or its risk factors



Amblyopia

- One of the most important causes of vision anomalies in children
- Alteration of the visual neural pathway in a child's developing brain that can lead to permanent vision loss



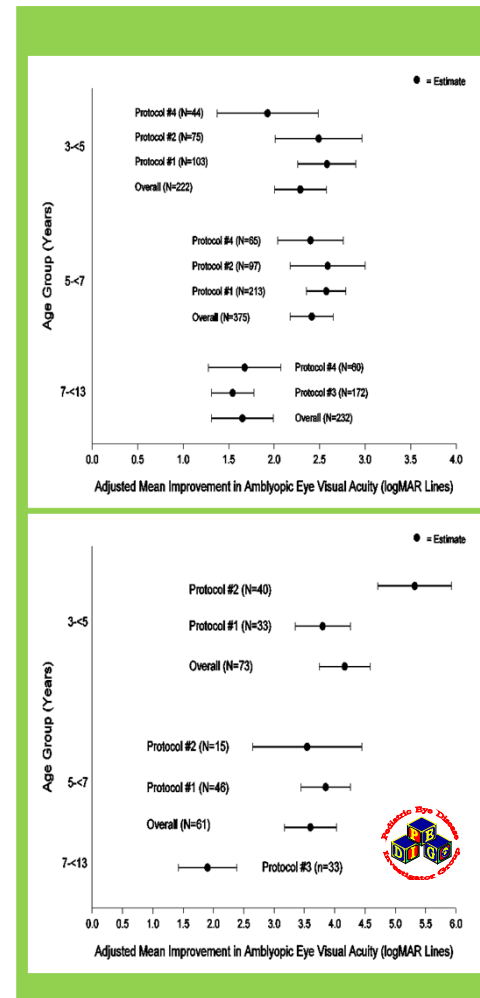
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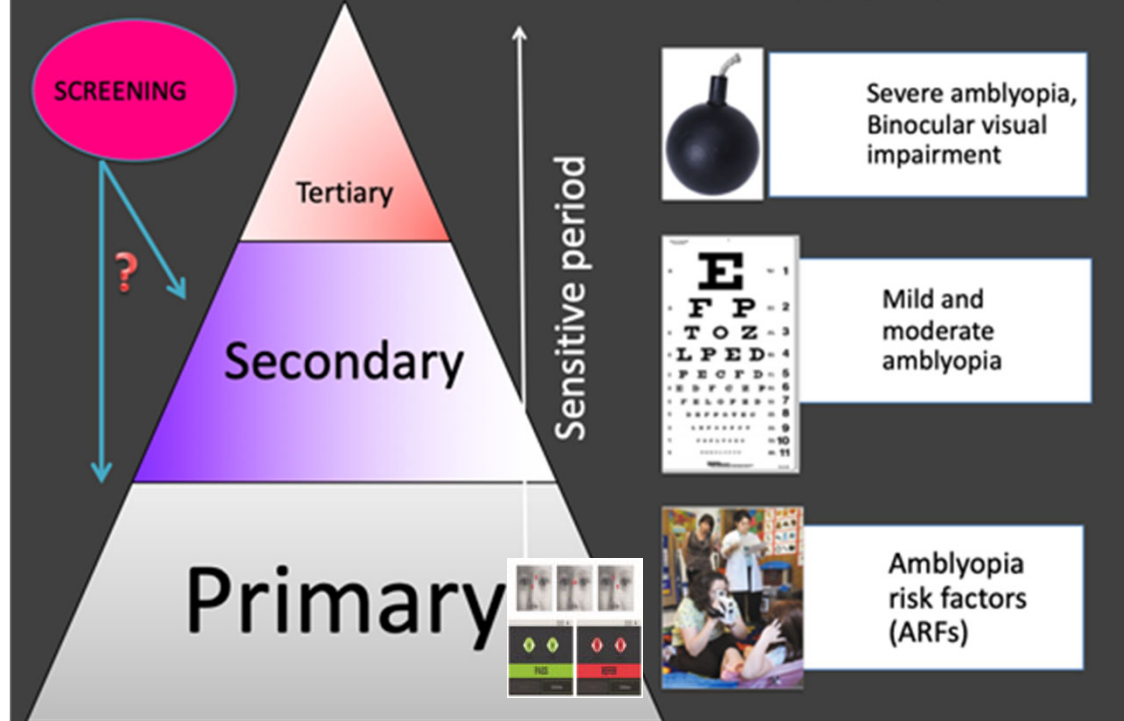
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Why do we care about the early detection of amblyopia?

- $\approx 2.5\%$ prevalence in the US
- Leading cause of monocular vision loss in children (and adults)
- Time of detection (and treatment) matters
- The prevalence of amblyopia is 2.6x higher at age 8 if no screening was done at age 2 (Eibschitz et al; JAAPOS 2000)
- Treatment must occur early during sensitive period
 - Up to 90% treatable at age 3
 - Nearly untreatable by age 10



**AMBLYOPIA RISK FACTORS:
EARLY AND TIMELY INTERVENTION REDUCES DISABILITY**



Systems, processes, outcomes

Developmental differences (language, cognition, attention), learning difficulties, early literacy, academic readiness, achievement gap



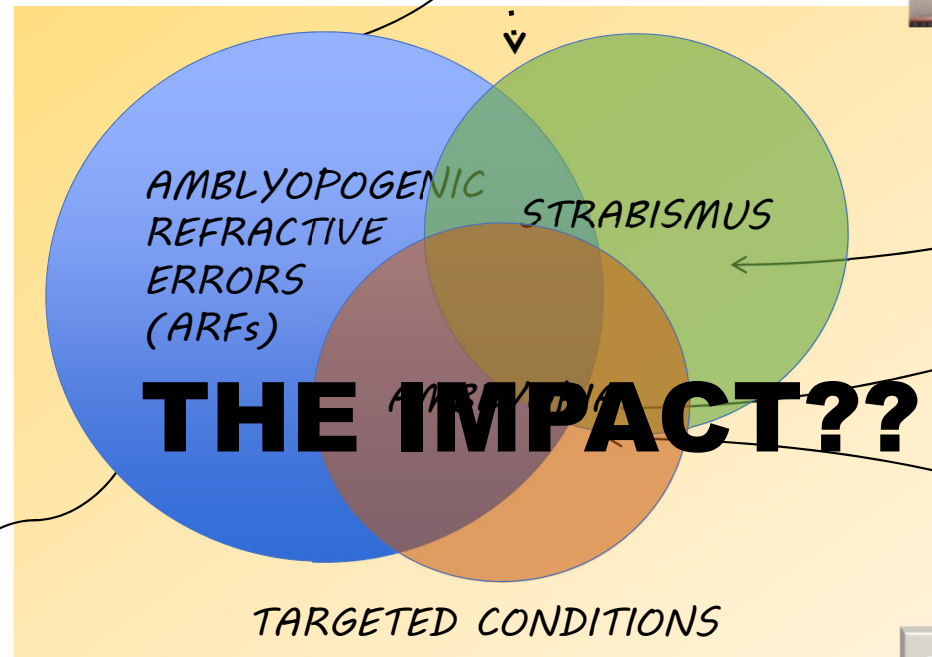
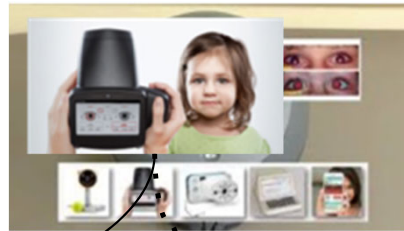
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THE PROCESS

- Target population
- Setting
- Implementation
- Continuity of care
- Compliance
- Data collection
- Evaluation
- Integration



THE METHODS

Vision and learning

- Vision is a well recognized "Health barrier to Learning" (7 HBL)
- Low-income preschoolers with refractive error (hyperopia ≥ 4.0 D or astigmatism > 2 D) perform worse on standardized tests used to predict future academic performance (Roch-Levecq A, Arch Ophthal 2008)
 - After 6 weeks of spectacle correction, these children's test scores matched those of emmetropic children



Vision and learning

- Infants and children with hyperopia (≥ 4.0 D) are twice as likely to fail in visuocognitive, visuomotor, and attention testing (Atkinson J. *Optom Vis Science* 2007)
 - Scores did not differ for children who wore glasses
- Reduced performance on letter and word recognition in hyperopic children (> 2 D) ages 4-5 (Shankar S. *Optom Vis Science* 2007)
- Uncorrected farsightedness (≥ 4.0 D) in children age 4-5 did worse on tests of early literacy

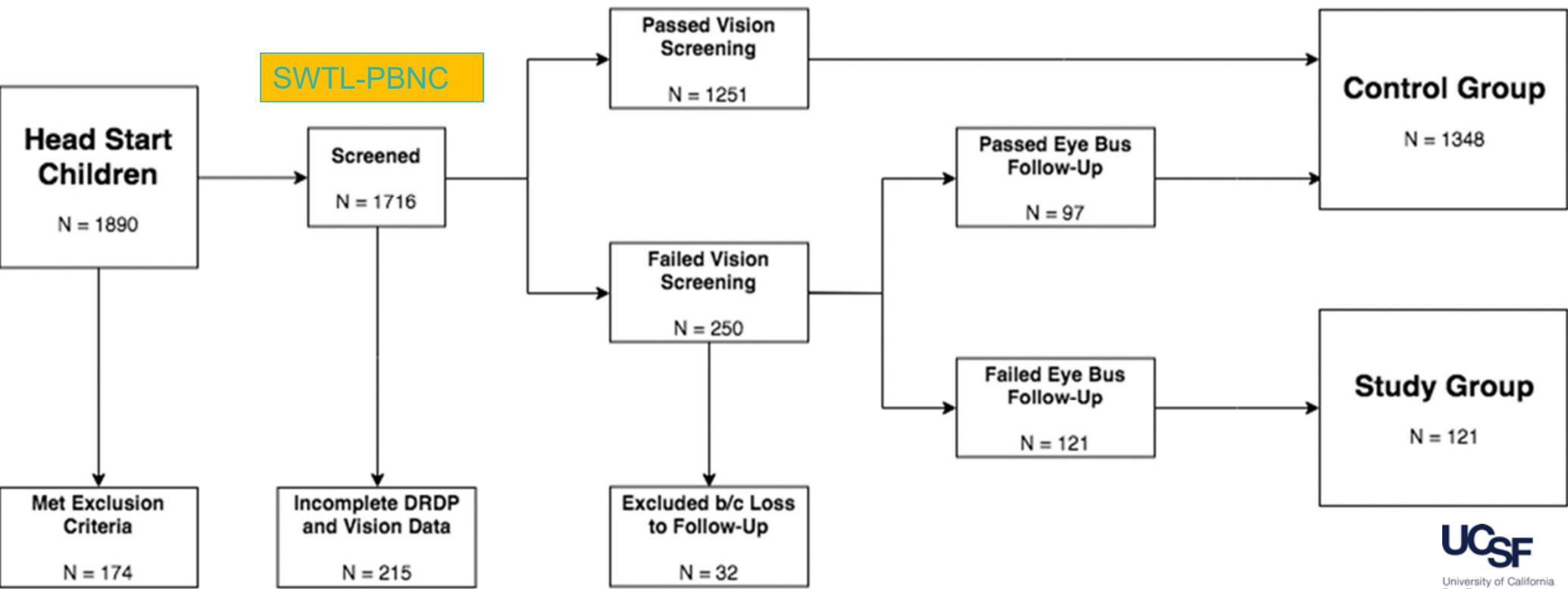


See Well to Learn- PBNC

- Preschool Vision Screening Program in Northern California
- Screening → Follow-up with comprehensive exam → free glasses → follow-up with parents and teachers (education, compliance, concerns, barriers) → data analysis
- Cost-effectiveness data (JAMA Ophthalmology 2016)
- 2017-2018 results for screening/comprehensive eye exams linked to teachers' assessment (DRDP)



SWTL-PBNC



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Desired Results Developmental Profile



DRDP (2015)

An Early Childhood Developmental Continuum

Preschool Fundamental View



for use with preschool-age children



- Series of strength-based assessment instruments that measure the progress of children's knowledge, skills, and behaviors across several domains that represent areas of learning and development that are key for success in school
- Designed and validated by California Department of Education, Berkeley Evaluation and Assessment Research Center, WestEd's Center for Child and Family Studies (consulted in this study)



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DRDP (2015)

An Early Childhood Developmental Continuum

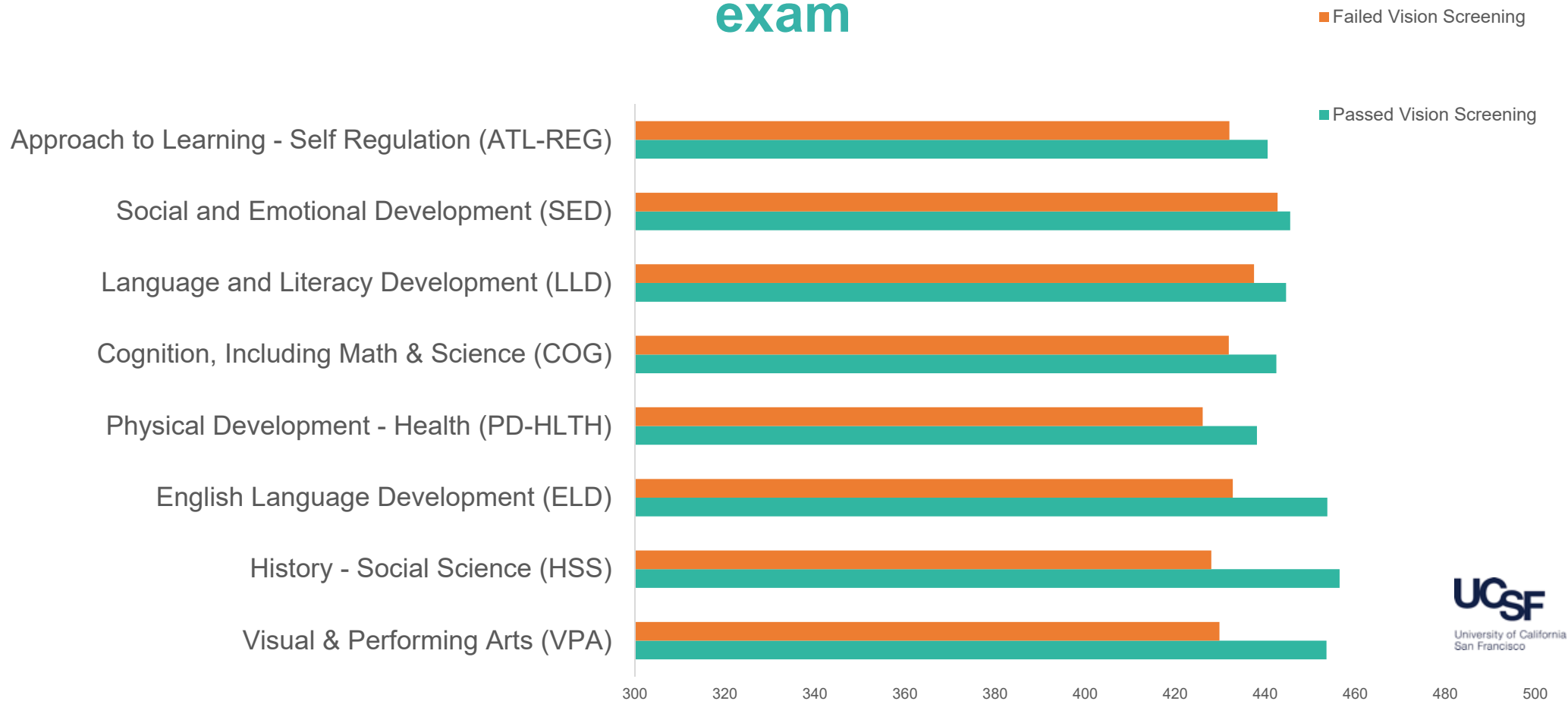
Measures at-a-Glance

Preschool Comprehensive View

Domain Name	Domain Abbreviation	Number within Domain	Measure Name
Approaches to Learning –Self-Regulation	ATL-REG 	1	Attention Maintenance
		2	Self-Comforting
		3	Imitation
		4	Curiosity and Initiative in Learning
		5	Self-Control of Feelings and Behavior
		6	Engagement and Persistence
		7	Shared Use of Space and Materials
Social and Emotional Development	SED 	1	Identity of Self in Relation to Others
		2	Social and Emotional Understanding
		3	Relationships and Social Interactions with Familiar Adults
		4	Relationships and Social Interactions with Peers
		5	Symbolic and Sociodramatic Play
Language and Literacy Development	LLD 	1	Understanding of Language (Receptive)
		2	Responsiveness to Language
		3	Communication and Use of Language (Expressive)
		4	Reciprocal Communication and Conversation
		5	Interest in Literacy
		6	Comprehension of Age-Appropriate Text
		7	Concepts About Print
		8	Phonological Awareness
		9	Letter and Word Knowledge
		10	Emergent Writing
English Language Development	ELD 	1	Comprehension of English (Receptive English)
		2	Self-Expression in English (Expressive English)
		3	Understanding and Response to English Literacy Activities
		4	Symbol, Letter, and Print Knowledge in English

Domain Name	Domain Abbreviation	Number within Domain	Measure Name
Cognition, Including Math and Science	COG 	1	Spatial Relationships
		2	Classification
		3	Number Sense of Quantity
		4	Number Sense of Math Operations
		5	Measurement
		6	Patterning
		7	Shapes
		8	Cause and Effect
		9	Inquiry Through Observation and Investigation
		10	Documentation and Communication of Inquiry
		11	Knowledge of the Natural World
Physical Development –Health	PD-HLTH 	1	Perceptual-Motor Skills and Movement Concepts
		2	Gross Locomotor Movement Skills
		3	Gross Motor Manipulative Skills
		4	Fine Motor Manipulative Skills
		5	Safety
		6	Personal Care Routines: Hygiene
		7	Personal Care Routines: Feeding
		8	Personal Care Routines: Dressing
		9	Active Physical Play
		10	Nutrition
History–Social Science	HSS 	1	Sense of Time
		2	Sense of Place
		3	Ecology
		4	Conflict Negotiation
		5	Responsible Conduct as a Group Member
Visual and Performing Arts	VPA 	1	Visual Art
		2	Music
		3	Drama
		4	Dance

DRDP domain scores in children with ARFs vs. children who pass vision screening or follow-up exam






DRDP (2015)




An Early Childhood Developmental Continuum

Measures at-a-Glance

Preschool Fundamental View

- Multiple measures within a specific domain-related competency
- Selected a priori measures that were visually oriented/guided

Domain Name	Domain Abbreviation	Number within Domain	Measure Name	Page Number
Approaches to Learning –Self-Regulation	ATL-REG 	1	Attention Maintenance	1
		2	Self-Comforting	2
		3	Imitation	3
		4	Curiosity and Initiative in Learning	4
		5	Self-Control of Feelings and Behavior	5
		6	Engagement and Persistence	6
		7	Shared Use of Space and Materials	7
Social and Emotional Development	SED 	1	Identity of Self in Relation to Others	8
		2	Social and Emotional Understanding	9
		3	Relationships and Social Interactions with Familiar Adults	10
		4	Relationships and Social Interactions with Peers	11
		5	Symbolic and Sociodramatic Play	12
Language and Literacy Development	LLD 	1	Understanding of Language (Receptive)	13
		2	Responsiveness to Language	14
		3	Communication and Use of Language (Expressive)	15
		4	Reciprocal Communication and Conversation	16
		5	Interest in Literacy	17
		6	Comprehension of Age-Appropriate Text	18
		7	Concepts About Print	19
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Cognition, Including Math and Science	COG 	1	Spatial Relationships	27
		2	Classification	28
		3	Number Sense of Quantity	29
		4	Number Sense of Math Operations	30
		5	Measurement	31
		6	Patterning	32
		7	Shapes	33
Physical Development –Health	PD-HLTH 	1	Perceptual-Motor Skills and Movement Concepts	34
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		3	Gross Motor Manipulative Skills	36
		4	Fine Motor Manipulative Skills	37
		5	Safety	38
		6	Personal Care Routines: Hygiene	39
		7	Personal Care Routines: Feeding	40
		8	Personal Care Routines: Dressing	41
		9	Active Physical Play	42
		10	Nutrition	43

LLD 9: Letter and Word Knowledge

Child shows increasing awareness of letters in the environment and their relationship to sound, including understanding that letters make up words

Mark the latest developmental level the child has mastered:

Responding		Exploring			Building		
Earlier	Later	Earlier	Middle <input type="radio"/>	Later <input type="radio"/>	Earlier <input type="radio"/>	Middle <input type="radio"/>	Later <input type="radio"/>
		<i>There are no earlier levels for this measure</i>	Demonstrates awareness that pictures represent people or things	Demonstrates awareness of a few common simple symbols in the environment	Demonstrates awareness of a few letters in the environment	Identifies some letters by name	Identifies letters (not at the same level) and shows understanding of letter words
Possible Examples			<ul style="list-style-type: none"> Points to a picture of a bird in a book when adult communicates, "Bird." Goes and gets teddy bear after seeing a picture of a bear. 	<ul style="list-style-type: none"> Recognizes that a stop sign means "stop." Places paper in a recycling bin after noticing the recycling symbol (three arrows forming a circle) on the bin. Notifies a familiar store or business in the neighborhood from its logo. Asks an adult what signs in Braille say. 	<ul style="list-style-type: none"> Holds up hand or communicates, "Me," when an adult holds up a sign with child's name. Finds the first letter of own name in the environment, such as on labels, artwork, cubbies, or chairs. Communicates, "I found the same letter," when playing a letter matching game in print or Braille. 	<ul style="list-style-type: none"> Names some letters while looking at an alphabet book. Points and names some letters in an alphabet puzzle. Identifies some letters in Braille. 	<ul style="list-style-type: none"> Names at least ten letters while looking at an alphabet board. Copies the word "cat" and communicates that it says "cat" (letters may not be written accurately). Says, "Fish," when reading the word in Braille.

Sees a photo of mother and communicates, "Mama."

- Names at least ten letters while placing them on a magnet board.
- Copies the word "cat" and communicates that it says "cat" (letters may not be written accurately).

most of the letters of the alphabet, when reading an alphabet book.

- Communicates, "Ball starts with B," after hearing the word "ball" in a story.
- Looks at the word "mat" in large print and says "m" (letter sound).

- Child is not yet at the earliest developmental level on this measure
- Child is emerging to the next developmental level
- Unable to rate this measure due to extended absence

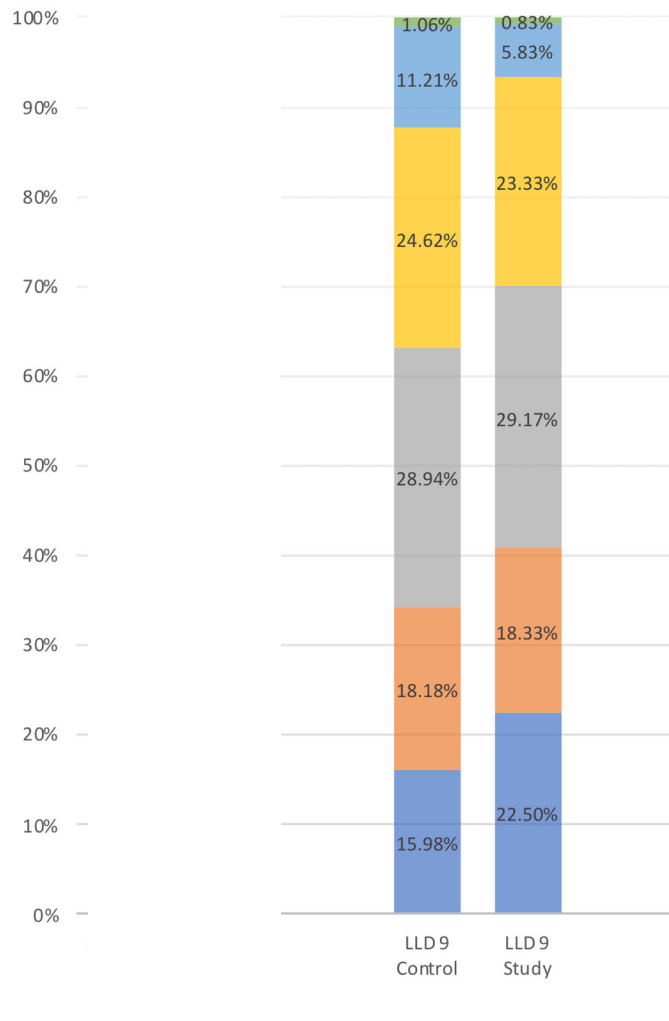



LLD 9

Letter and Word Knowledge

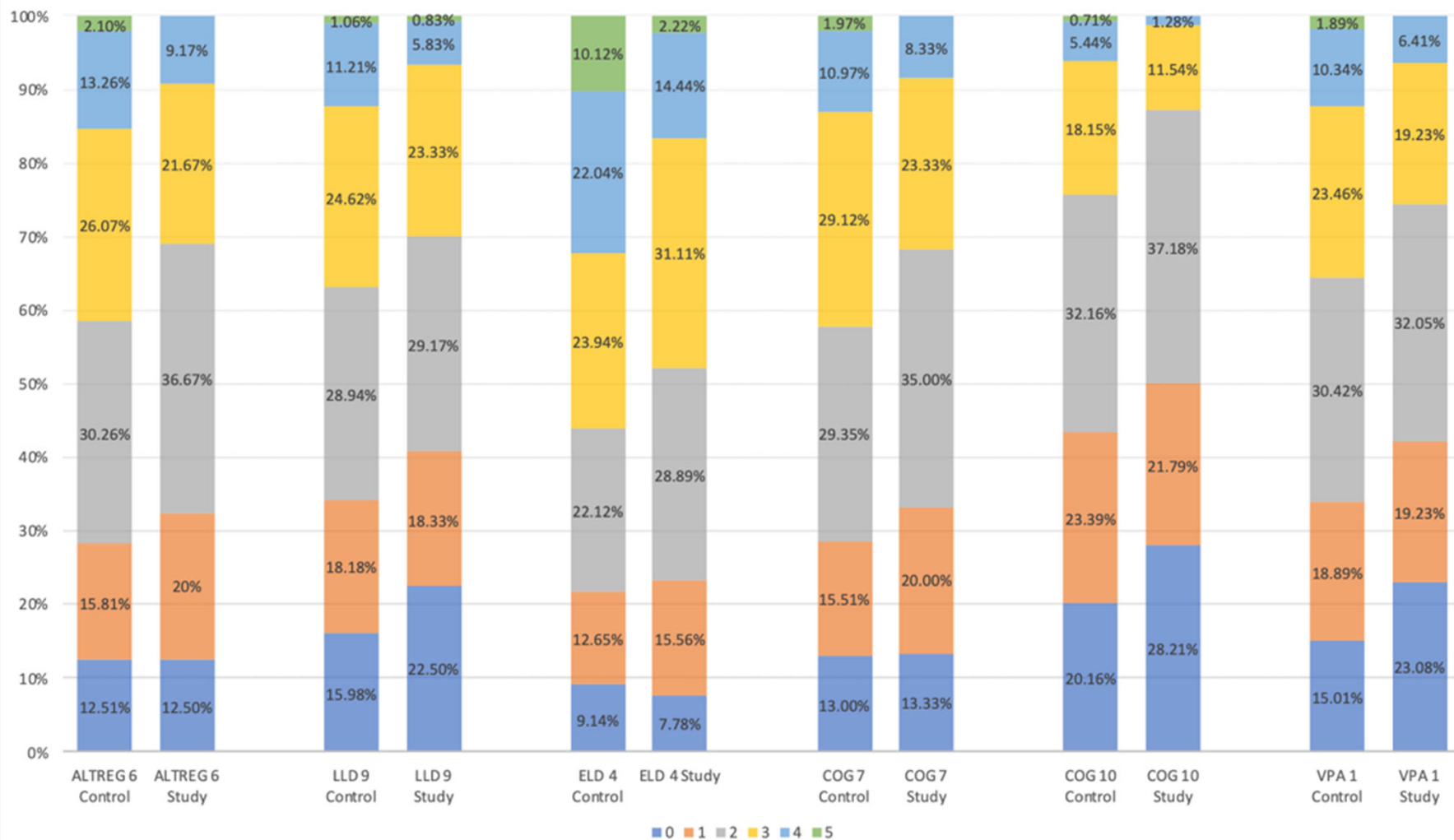
LLD 9

PROPORTION OF STUDENTS IN DRDP DEVELOPMENTAL CATEGORIES



Language and Literacy Development 	1	Understanding of Language (Receptive)
	2	Responsiveness to Language
	3	Communication and Use of Language (Expressive)
	4	Reciprocal Communication and Conversation
	5	Interest in Literacy
	6	Comprehension of Age-Appropriate Text
	7	Concepts About Print
	8	Phonological Awareness
	9	Letter and Word Knowledge
	10	Emergent Writing

PROPORTION OF STUDENTS IN DRDP DEVELOPMENTAL CATEGORIES



ELD 4: Symbol, Letter, and Print Knowledge in English

Child shows an increasing understanding that print in English carries meaning

Conditional Measure

Measure not rated: English is the only language spoken in this child's home.

Mark the latest developmental level the child has mastered:

Discovering Language <input type="radio"/>	Discovering English <input type="radio"/>	Exploring English <input type="radio"/>	Developing English <input type="radio"/>	Building English <input type="radio"/>	Integrating English <input type="radio"/>
<p>Demonstrates awareness that pictures or objects can represent people or things</p>	<p>Demonstrates awareness that symbols carry meaning or that print in home language carries meaning</p>	<p>Demonstrates awareness that print in English carries meaning</p>	<p>Demonstrates understanding that English print consists of distinct letters with names in English</p>	<p>Identifies several English letters; and Recognizes own name in English print</p>	<p>Identifies at least ten English letters; and Identifies a few printed words frequently used in English</p>
<p>Possible Examples</p> <ul style="list-style-type: none"> Points to a picture of a bird in a book after seeing or hearing a bird outside. Goes and gets teddy bear after seeing a picture of a bear. Sees a photo of mother and communicates in home language, "Mama." Explores a toy teacup and tries to take a drink. 	<ul style="list-style-type: none"> Shows an adult a book and requests, "Mời có thể đọc cho con nghe quyển sách này không?" ["Can you read me this book?" in Vietnamese]. Gestures toward a Chinese character representing own name and says name. Asks an adult to read a note written in home language by a parent. Brings tricycle to a stop when a peer holds up a stop sign. 	<ul style="list-style-type: none"> Points to a caption written in English under a picture and asks an adult, in home language, what it says. Points to the printed word "flower" under a picture of a flower and says, in home language, "That says 'flower.'" Gestures to the title of a book about trucks and communicates to an adult, in home language, "This book is about trucks." 	<ul style="list-style-type: none"> Asks, in home language or in English mixed with home language, "What letter is this?" while pointing to the first letter of own name on cubby label. Communicates in English, "M," while gesturing at a letter on a sign written in English during a neighborhood walk (the sign may or may not have the letter M). Gestures toward the letter O on a peer's name tag after drawing an O in a sand tray. 	<ul style="list-style-type: none"> Gestures at name printed in English and communicates, in English or home language, "That's my name." Names four English letters correctly while playing with magnetic letters with a peer. Communicates, "I have a T, and you have a T. I have an A, but not you," ["I have an A, but you don't."] while gesturing at own name and a peer's name. 	<ul style="list-style-type: none"> Names all the letters in own name correctly one by one, and then gestures at a friend's name and names several letters, while standing at the name chart. Recognizes words posted in the writing center, such as "Mom," "Dad," and "love," after a small group activity about writing letters to family members. Identifies labels such as "blocks," "door," "books," or "art" while showing own grandma around the room. Communicates to a peer, "Mira, este dice ['Look, this says' in Spanish] 's-t-o-p' [using English letter names]," while pointing to a stop sign to a Spanish-speaking peer.

Child is emerging to the next developmental level

Unable to rate this measure due to extended absence



ELD 4

Symbol, Letter, and Print Knowledge in English

ELD 4

ATL-REG 6: Engagement and Persistence

Child increasingly persists in understanding or mastering activities, even if they are challenging or difficult

Mark the latest developmental level the child has mastered:

Responding		Exploring		Building			Integrating
Earlier	Later	Earlier ○	Later ○	Earlier ○	Middle ○	Later ○	Earlier ○
	<i>There are no earlier levels for this measure</i>	Participates in a simple activity briefly	Selects activities, but switches quickly from one to another, even with adult support to help focus on one activity	Continues self-selected activities with adult support, even though interest briefly shifts to other activities	Continues self-selected activities on own, seeking adult support to work through challenges	Works through challenges on own while engaged in self-selected activities	Returns to activities, including challenging ones, on multiple occasions to practice a skill or to complete the activity
Possible Examples		<ul style="list-style-type: none"> • Puts a ring on and off of a ring stack a few times. • Fills and dumps sand from a bucket. • Shakes a bell while others are singing. • Uses hands to smear finger paint. • Activates a switch toy. 	<ul style="list-style-type: none"> • Chooses to play in the dramatic play area for a short while and then plays in the block area. • Selects a puzzle to work on with an adult, works on it together for a short time, and then wanders off, even with the adult's encouragement to continue. • Joins a small group and attends briefly to an adult reading a book, and then shifts attention to another activity. 	<ul style="list-style-type: none"> • Strings large beads with an adult to make a necklace, briefly watches another child who brings magnets to the table, and then continues stringing beads. • Stops playing with blocks and starts to move away from block area, but returns when an adult offers props, such as cars and street signs, to use with the blocks. • Pauses to watch children running by while scooping sand, but returns to scooping when the adult offers another sand toy. 	<ul style="list-style-type: none"> • Continues working on a difficult puzzle, asking an adult for help when needed. • Continues looking at a book as an adult encourages other children entering the same area to find a book. • Asks adult for headphones, while listening to a story on tape, when other children begin to play noisily nearby. • Starts to get ready to go outside with other children, and asks for adult assistance with fasteners when putting on shoes. 	<ul style="list-style-type: none"> • Continues to build a structure with interlocking blocks even when having difficulty finding the "right" pieces. • Glues a variety of materials together to create a three-dimensional collage, trying different ways to make them stick. • Repeatedly tries to trace around own hand. • Completes an obstacle course using a walker, even on bumpy ground. 	<ul style="list-style-type: none"> • Continues to work on spinning a round hoop around own waist over successive days. • Continues at a pottery activity that involves shaping clay, letting it dry, painting it, and letting it dry some more. • Writes own name, then writes it more clearly a second time at classroom sign-in table.

○ Child is not yet at the earliest developmental level on this measure

○ Child is emerging to the next developmental level

○ Unable to rate this measure due to extended absence



Conclusions

- Important to consider and discuss the impact of vision screening on child/family/education/health system
- Vision screening programs may have a significant impact on early childhood development (education, academic readiness, literacy/reading level, etc.)
- This data is important to inform policymakers, early education programs, stakeholder alignment, buy-in, and funding



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