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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
Why do we care about the early detection of amblyopia?

• ≈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
Developmental differences (language, cognition, attention), learning difficulties, early literacy, academic readiness, achievement gap
AMBYLOPOGENIC REFRACTIVE ERRORS (ARFs)

STRABISMUS

THE IMPACT??

TARGETED CONDITIONS

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

• Vision is a well recognized "Health barrier to Learning" (7 HBL)

• Low-income preschoolers with refractive error (hyperopia $\geq 4.0$ D or astigmatism $>2D$) 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 (>2D) 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)
Head Start Children
N = 1890

Screened
N = 1716

Passed Vision Screening
N = 1251

Failed Vision Screening
N = 250

Passed Eye Bus Follow-Up
N = 97

Failed Eye Bus Follow-Up
N = 121

Control Group
N = 1348

Study Group
N = 121

Met Exclusion Criteria
N = 174

Incomplete DRDP and Vision Data
N = 215

Excluded b/c Loss to Follow-Up
N = 32
Desired Results Developmental Profile

- 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).
<table>
<thead>
<tr>
<th>Domain Name</th>
<th>Domain Abbreviation</th>
<th>Number within Domain</th>
<th>Measure Name</th>
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</thead>
<tbody>
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<td>Approaches to Learning - Self-Regulation</td>
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<td>Attention Maintenance</td>
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<td>2</td>
<td>Self-Comforting</td>
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<td>Imitation</td>
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<td>Curiosity and Initiative in Learning</td>
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<td>Self-Control of Feelings and Behavior</td>
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<td>6</td>
<td>Engagement and Persistence</td>
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<td>7</td>
<td>Shared Use of Space and Materials</td>
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<tr>
<td>Social and Emotional Development</td>
<td>SED</td>
<td>1</td>
<td>Identity of Self in Relation to Others</td>
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<td>2</td>
<td>Social and Emotional Understanding</td>
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<td>3</td>
<td>Relationships and Social Interactions with Familiar Adults</td>
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<td>Relationships and Social Interactions with Peers</td>
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<td>Symbolic and Socodramatic Play</td>
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<tr>
<td>Language and Literacy Development</td>
<td>LLD</td>
<td>1</td>
<td>Understanding of Language (Receptive)</td>
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<tr>
<td></td>
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<td>2</td>
<td>Responsiveness to Language</td>
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<td>3</td>
<td>Communication and Use of Language (Expressive)</td>
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<td>4</td>
<td>Reciprocal Communication and Conversation</td>
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<td>5</td>
<td>Interest in Literacy</td>
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<td>6</td>
<td>Comprehension of Age-Appropriate Text</td>
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<td>7</td>
<td>Concepts About Print</td>
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<td>8</td>
<td>Phonological Awareness</td>
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<td>9</td>
<td>Letter and Word Knowledge</td>
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<td>10</td>
<td>Emergent Writing</td>
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<td>English Language Development</td>
<td>ELD</td>
<td>1</td>
<td>Comprehension of English (Receptive)</td>
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<td>2</td>
<td>Self-Expression in English (Expressive)</td>
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<td>3</td>
<td>Understanding and Response to English Literacy Activities</td>
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<td>4</td>
<td>Symbol, Letter, and Print Knowledge in English</td>
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<tr>
<td>Cognition, Including Math and Science</td>
<td>COG</td>
<td>1</td>
<td>Spatial Relationships</td>
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<td></td>
<td>2</td>
<td>Classification</td>
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<td>3</td>
<td>Number Sense of Quantity</td>
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<td>4</td>
<td>Number Sense of Math Operations</td>
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<tr>
<td>Physical Development - Health</td>
<td>PD-HLTH</td>
<td>1</td>
<td>Perceptual-Motor Skills and Movement Concepts</td>
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<td></td>
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<td>2</td>
<td>Gross Locomotor Movement Skills</td>
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<td>3</td>
<td>Gross Motor Manipulative Skills</td>
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<td>4</td>
<td>Fine Motor Manipulative Skills</td>
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<td>5</td>
<td>Safety</td>
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<td>6</td>
<td>Personal Care Routines: Hygiene</td>
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<td>7</td>
<td>Personal Care Routines: Feeding</td>
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<td>8</td>
<td>Personal Care Routines: Dressing</td>
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<td>History - Social Science</td>
<td>HSS</td>
<td>1</td>
<td>Sense of Time</td>
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<td>2</td>
<td>Sense of Place</td>
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<td></td>
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<td>3</td>
<td>Ecology</td>
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<td>4</td>
<td>Conflict Negotiation</td>
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<td>5</td>
<td>Responsible Conduct as a Group Member</td>
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<tr>
<td>Visual and Performing Arts</td>
<td>VPA</td>
<td>1</td>
<td>Visual Art</td>
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<td></td>
<td></td>
<td>2</td>
<td>Music</td>
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<td>3</td>
<td>Drama</td>
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<td>4</td>
<td>Dance</td>
</tr>
</tbody>
</table>
DRDP domain scores in children with ARFs vs. children who pass vision screening or follow-up exam

- Approach to Learning - Self Regulation (ATL-REG)
- Social and Emotional Development (SED)
- Language and Literacy Development (LLD)
- Cognition, Including Math & Science (COG)
- Physical Development - Health (PD-HLTH)
- English Language Development (ELD)
- History - Social Science (HSS)
- Visual & Performing Arts (VPA)
- Multiple measures within a specific domain-related competency
- Selected a priori measures that were visually oriented/guided
**Developmental Domain: LLD — Language and Literacy Development**

**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:**

<table>
<thead>
<tr>
<th>Responding</th>
<th>Exploring</th>
<th>Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earlier</td>
<td>Later</td>
<td></td>
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<tr>
<td>Earlier</td>
<td>Middle</td>
<td></td>
</tr>
<tr>
<td>Earlier</td>
<td>Middle</td>
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<td>Earlier</td>
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<td>Middle</td>
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<td>Later</td>
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<tr>
<td></td>
<td>Earlier</td>
<td>Middle</td>
</tr>
<tr>
<td></td>
<td>Later</td>
<td>Last</td>
</tr>
</tbody>
</table>

**Possible Examples**

- **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).**

- **Names at least one letter and communicates that it says “cat” (letters may not be written accurately).**

**Additional Notes:**
- 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
**Developmental Domain: ELD — English-Language Development**

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

Child shows an increasing understanding that print in English carries meaning

Mark the latest developmental level the child has mastered:

<table>
<thead>
<tr>
<th>Discovering Language</th>
<th>Discovering English</th>
<th>Exploring English</th>
<th>Developing English</th>
<th>Building English</th>
<th>Integrating English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrates awareness that pictures or objects can represent people or things</td>
<td>Demonstrates awareness that symbols carry meaning or that print in home language carries meaning</td>
<td>Demonstrates awareness that print in English carries meaning</td>
<td>Demonstrates understanding that English print consists of distinct letters with names in English</td>
<td>Identifies several English letters; and Recognizes own name in English print</td>
<td>Identifies at least ten English letters; and Identifies a few printed words frequently used in English</td>
</tr>
</tbody>
</table>

Possible Examples:

- **Discovering Language**
  - Shows an adult a book and requests, "Mô ci thỏi/dòi cho con nghe quay thể sách này không?" ("Can you read me this book?" in Vietnamese).
  - 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.

- **Discovering English**
  - Points to a picture of a bird in a book after seeing or hearing a bird outside.
  - 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 'flowers.'"
  - Points to the title of a book about trucks and communicates to an adult, in home language, "This book is about trucks."

- **Exploring English**
  - 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 cobby 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).
  - 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.

- **Developing English**
  - 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-e-o-p" (using English letter names), while pointing to a stop sign to a Spanish-speaking peer.
### Developmental Domain: ATL-REG — Approaches to Learning—Self-Regulation

#### 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:

<table>
<thead>
<tr>
<th>Developmental Level</th>
<th>Responding</th>
<th>Exploring</th>
<th>Building</th>
<th>Integrating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earlier</td>
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<tr>
<td>Later</td>
<td>Participates in a simple activity briefly</td>
<td>Selects activities, but switches quickly from one to another, even with adult support to help focus on one activity</td>
<td>Continues self-selected activities with adult support, even though interest briefly shifts to other activities</td>
<td>Works through challenges on own while engaged in self-selected activities</td>
</tr>
</tbody>
</table>

**Possible Examples**

- 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.
- 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.
- 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.
- 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 noiselessly nearby.
- Starts to get ready to go outside with other children, and asks for adult assistance with fasteners when putting on shoes.
- 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.
- 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

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**Engagement and Persistence**


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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
Focus on Eye Health
National Summit
A Lifetime of Vision
July 17, 2019 | National Press Club | Washington D.C.