

# The Critical Links Between Vision and Overall Development

Glen T. Steele, O.D. FCOVD FAAO  
Professor of Pediatric Optometry  
Southern College of Optometry

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## Stretch

- Your job as a resident is to stretch what you know.
- It is not to be comfortable in where you are and stay there
- It's to make a stretch and increase your understanding of vision in in today's presentation on the link between vision and overall development and how you have access to such a powerful tool in the processes of overall development

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## Development

- What is development?
- What are developmental milestones for?
- What role does vision play?

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## How Does This...



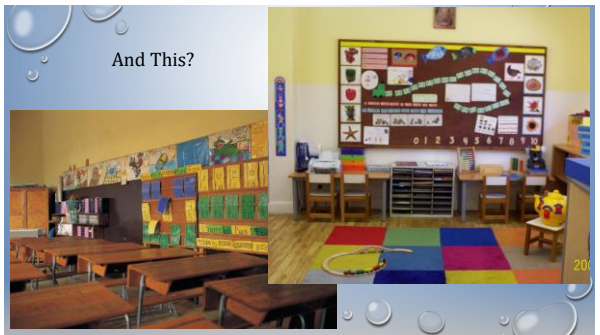
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## Relate To This?



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## And This?



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### It Starts Very Early

- A Developing baby writes their own story utilizing the processes of vision as the leader and instigator
- Five Steps
- Look – Attend – Focus – Identify – Engage
- And – they can opt in or opt out at any point in development
- 35,000 choices EVERY DAY

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### The Impact

- Visual concerns during development are more significant than have been reported
- Even after the initial 3% are identified, an additional **10%** need more careful follow-up prior to their first birthday



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### Optometry's Impact – or Lack Thereof

- Traditional - 3% (120,000/yr.)
- InfantSEE – 10% (400,000/yr.)
- See to Learn – 15% (600,000/year)
- School age statistics – 20% (800,000/year)
- Through High School – 25% (1,000,000/year)
- It grows every year - What we are doing is not working

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### Why is All This Important?

- Vision development is a leader and instigator in the activities of life
- Vision sets the stage for engagement in most actions of life
- Untreated children with vision issues become adults with vision AND developmental issues
- Because of the importance of vision in overall development, **early identification and intervention is critical**

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### Vision is Linked to All Aspects of Development

- Depending upon what they “practice,” the developing infant acquires abilities.
- If there is little to no **purposeful** interaction within the environment (passive development), eventual levels of function and performance are limited.
- This includes issues from academic performance, sports, work ethic, language development, social interaction, and contributes to such diagnoses as developmental delay and complicates issues such as autism.

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### Vision is the Leader in All of Development

- Learning to look is paramount to the overall process of development
- Learning to look is the first step in development of self-regulation and directing attention
- Think of the developing infant – the manner in which you find out how they are developing is through watching the manner in which they LOOK

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### Vision is the Leader in All of Development

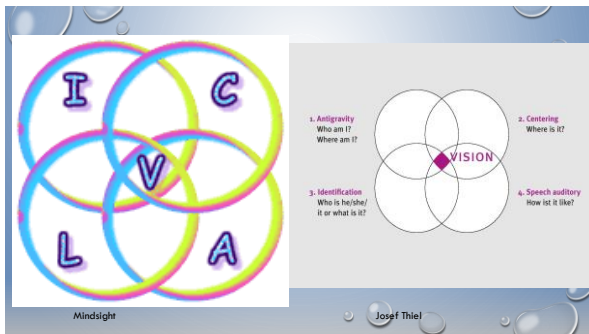
- "Vision therefore may become a key to a fuller understanding of the nature and the needs of the individual child. He sees with his whole being. **Eye care involves child care.** The conservation of vision, particularly in the young child, goes far beyond the detection and correction of refractive error:"
  - Gesell - Vision: Its Development in Infant and Child - 2018

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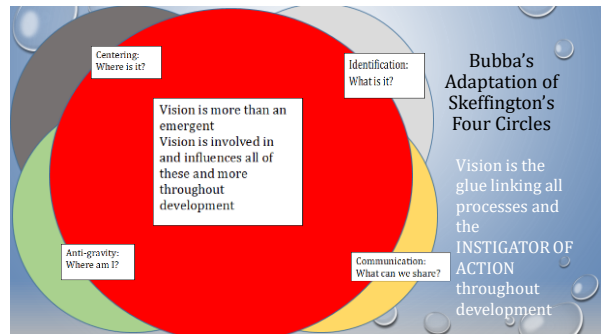
### Vision is the Leader in All of Development

- "Not one of the major fields of behavior: motor; speech-language, and personal-social is normally devoid of visual content or visual controls. So interfused are the vision and action systems, that the two must be regarded as inseparable.
- **To understand vision we must know the child; to understand the child we must know the nature of his vision."**
- Gesell -Vision - Its Development in Infant and Child - Hoeber 1949 - OEPF 1998 and OEPF 2018

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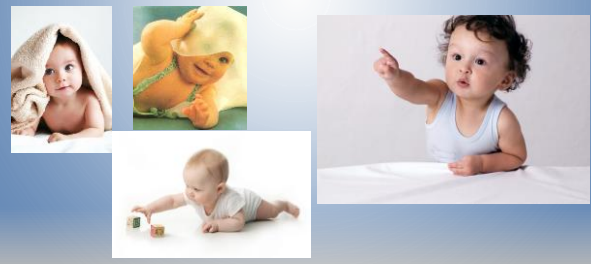


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### Some Are Active



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Some Are Passive



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### Judging Development

- Maintaining eye contact is a marker for social milestones and for autism.
- A smile is a means of social interaction.
- But how do they learn how to smile so big?
- Imitation – and imitation is primarily an active process of visual looking

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### Judging Development

- Gestures are considered a part of communication development.
- How do they know to gesture unless through imitation (triggered by vision) or through noting that when they point, the caregiver shares attention and responds (a visual action) by getting the object of attention.

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### Judging Development

- Find me a picture of a baby who is awake (eyes open) and alert (looking and searching) and I will show you a baby who is active and engaging in life using their visual process as demonstrated through Bubba's Nine A's

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### Judging Development

- Find me a baby who is awake – as judged by eyes open - who is not looking or searching and I will show you a baby who is having difficulty in life and has not activated, or has lost activation, of the visual process as demonstrated through Bubba's Nine A's of Looking
- Or the baby is in the process of going to sleep.

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### Judging Development

- This is important in overall development
- Early development in almost all areas is judged by how the baby is using vision to look.
- Let's go back to the gesturing baby – how effective is this child in LOOKING – ATTENDING - FOCUSING – IDENTIFYING - ENGAGING

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LOOKING  
ATTENDING  
FOCUSING  
IDENTIFYING  
ENGAGING



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### The Foundation

- **The infant is born with visual hunger.**
- "Although he resists excessive illumination by blinking, he very soon uses his waking time for the accumulation of visual experience and the exercise of ocular functions.
- Indeed, so fundamental is the sense of vision that it is the traditional criterion of wakefulness as opposed to sleep.
- An infant does not really wake up until he begins to look; and when he ceases to look, he goes to sleep."

• Quotes from Developmental Diagnosis – 1941 – Arnold Gesell

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### How Do We Know This is Important?

- Other groups use looking ability as a primary criteria:
  - To what do they attend - interests
  - How long they attend – sustained attention
  - How many times they come back to the same target
  - How they manage social contact – looking others in the eyes

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### How Do We Know This is Important?

- Gaze following in language development
- Gestures in communication development
- Overall Looking Behavior
- Milestones such as social, emotional, cognitive, language

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### Social And Emotional Milestones

- Shy or anxious with strangers
- Cries when mother or father leaves
- Enjoys imitating people in his play
- Shows specific preferences for certain people and toys
- Tests parental responses to her actions during feedings
- Tests parental responses to his behavior
- May be fearful in some situations
- Prefers mother and/or regular caregiver over all others
- Repeats sounds or gestures for attention
- Finger-feeds herself
- Extends arm or leg to help when being dressed

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### Cognitive Milestones

- Explores objects in many different ways (shaking, banging, throwing, dropping)
- Finds hidden objects easily
- Looks at correct picture when the image is named
- Imitates gestures
- Begins to use objects correctly (drinking from cup, brushing hair, dialing phone, listening to receiver)

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### Cognitive Milestones

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- Steven P. Shelov, M.D., Caring for your baby and young child – birth to five years - American Academy of Pediatrics

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### Vision in Language Development

- "The predictive correlation with comprehension at 18 months of age was particularly striking - infants who had a correct gaze+ and simultaneous vocalization at 10-11 months understood significantly more words ( $M = 337.37$ ) than did those who did not produce this act ( $M = 194.50$ ). Moreover, these effects were *not* the result of a child's general propensity to vocalize during the test at 10-11 months."
- Developmental Science 8:6 (2005), pp 535-543 The development of gaze following and its relation to language Rechele Brooks and Andrew N. Meltzoff

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### Meltzoff and Brooks

- Now, compare that to a later Meltzoff article on gaze following at 10.5 months and later testing at 2½ years, and 4½ years:
- Analyses revealed that infants with:
- **HIGHER GAZE-FOLLOWING SCORES AT 10.5 MONTHS**
- Produced **SIGNIFICANTLY MORE MENTAL-STATE WORDS AT 2.5 YEARS** and;
- Children with more mental-state words at 2.5 years were more **SUCCESSFUL ON THE THEORY-OF-MIND BATTERY AT 4.5 years**

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### Meltzoff and Brooks

- These predictive longitudinal relationships remained significant after controlling for general language, maternal education, and nonsocial attention.
  - Connecting the dots from infancy to childhood: A longitudinal study connecting gaze following, language, and explicit theory of mind  
Rebecca Brooks, Andrew N. Meltzoff, et al. – Journal of Experimental Child Psychology 130 (2015) 67–78
- Bubba – Performance at 4.5 years has a foundation in gaze following at 10.5 months – a part of LOOKING that can be observed in Just Look Retinoscopy
- Bubba – the processes of vision play a critical role in the very early stages of all of development and can be observed through Just Look Retinoscopy

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### Vision is More Than Seeing

- Observing the world is a more complex enterprise than the mere activation of the 'visual brain' because it implies a multimodal notion of vision.

The Multimodal Nature of Visual Perception: Facts and Speculations. Vittorio Gallese – The Kanizsa Lecture 2015

- Bubba - Observing may be little more than a sensory aspect of vision whereas LOOKING is an act of PURPOSE

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### Vision is More Than Seeing

- The result is a pattern of **visual foraging** that is likely to support efficient explorations of complex environments by facilitating the inspection of new locations in real time."
- Visual Foraging
  - Attentional Dynamics of Infant Visual Foraging; Robertson, Watamura, Wilbourn Salk Institute 2012
- Bubba - Visual foraging or LOOKING (Searching) is an action process whereas seeing is a passive process

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### Vision is More Than Seeing

- The results show that commencing training with blurred images creates receptive fields that integrate information across larger image areas and leads to improved performance and better generalization across a range of resolutions.
  - Potential downside of high initial visual acuity; Vogelsang, et.al. PNAS Oct 2018
- Bubba – It is better to start early development for everyone without trying for the "clearest" image as the baseline

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### Vision is More Than Seeing

- "When babies don't get what their growing brains need to thrive, they don't develop as they should. This leads to poor lifelong developmental, educational, social and health challenges."  
**Elizabeth DiLauro, Director of Advocacy, Zero to Three**
- Bubba – What is the primary function they must have for expanding overall development?
- The learned ability to visually reach outside their Circle of Understanding!

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### Vision is More Than Seeing

- Vision is not in the eye – the eye is an instrument of vision – **Al Sutton, O.D.**
- The visual hunger of cultural man is insatiable. He can never see enough. **Arnold Gesell, M.D.**
- Each of Us an Island – **William Lee, O.D.**
- **Gesell** - In the early months, looking is half of living.

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### The “Flu” Model

- “The ‘flu’ model does not apply to developmental and behavioral issues. Just as development unfolds (is developed) over a period of time, so do developmental and behavioral problems.
- **Unlike viruses, these issues get worse, not better, with time.**
- Excerpt from **Screening for Childhood Developmental and Behavioral Problems** – a PPT by Lynne C. Huffman, M.D.
- I am not sure the child gets “worse” but it appears that way due to the increasing gap between what they can do and what they are expected to do

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### Child to Adult

- “There is strong evidence that ... “adult vision is the sum total of the early development plus the organism's adaptation to and utilization of the demands of our culture.
- **There must then, be a continuous trend within visual behavior from infancy to senility that is observable by clinical methods.**

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### Child to Adult

- **The clinical methods to observe and explore visual behavior should likewise be continuous in purpose, differing in the complexity of the demand upon the patient.”**
  - **Getman** – OEPP Child Development vol 1 #12 – Sept 1951 – p 49
- **Bubba Summary** - Vision is a **CRITICAL** piece in Overall Development, in fact, it influences all of development
- Our responsibility is to develop our individual ability to recognize when development is on course and when it is off course – and provide appropriate management

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### Vision is Motor

- “Babies grasp the world first with their eyes and then with their hands. Vision is therefore a prime constituent in the development in the total child”
  - – Arnold Gesell, Infant Vision; Scientific American 1950
- “The seeing eye is a reaching, groping, grasping organ – a teleceptive prehensory apparatus” – ibid
- Vision has a motor component that is engaged long before the sensory process

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### Vision is Motor

- Pay careful attention to the following video- eyes, hands, body

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### Vision is Critical in Overall Development

- This video from many years ago demonstrates the need for optometrists to be involved very early in development
- When issues persist in early development, children do not gain the foundation necessary to fully engage in the expected activities of their age

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### Vision is Motor

- **"Gaze is accurate in order to see clearly; not because targets can be seen clearly"** - One fixates accurately *in order to see* clearly not *because* one sees clearly.
- Robert Steinman, Zygmunt Pizlo, Tatiana I. Foronova and Julie Epelboim – Spatial Vision: 2002

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### Vision is Motor

- "Our visual system is not there to faithfully and simply record the image outside. It is there to give us the necessary information for us to behave appropriately."
- Basic Vision-An Introduction to Visual Perception; Snowden, Thompson, and Troscianko; Oxford University Press - 2012

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### Vision is Motor

- The motor part of vision development is reaching visually, long before body movements are developed sufficiently to be initiated.
- Development of the sensory aspect is dependent on how well the motor aspect develops.
- Motor LOOKING is the foundation
- **Development is a constant and dynamic interaction between biology and experiences, and influenced by culture.**

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### Vision is Motor

- Does introduction of the sensory aspect affect the motor looking aspect? Yes!
- As the infant and young child begins to delve more into the identification process, overall body processes slow in a corresponding manner – becoming more focused and less aware as interest in the object occurs.
- Not a one to one at any point but the looking has to start first. If not, "seeing" is a major surprise!

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### Vision is Motor

- So much of the manner in which development is assessed is determined through observation(s) of how the child uses vision, i.e., how they use the LOOKING process.
- When they are **looking**, they are determined to be:
  - Awake
  - Alert
  - Looking
  - Inquisitive
  - Curious

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### Vision is Motor

- When the infant and young child **does not engage in looking**, they are determined to be:
  - Asleep
  - Inattentive
  - Ignoring their surroundings
  - Disinterested
  - Indifferent
  - DELAYED

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### Vision is Motor - Bubba

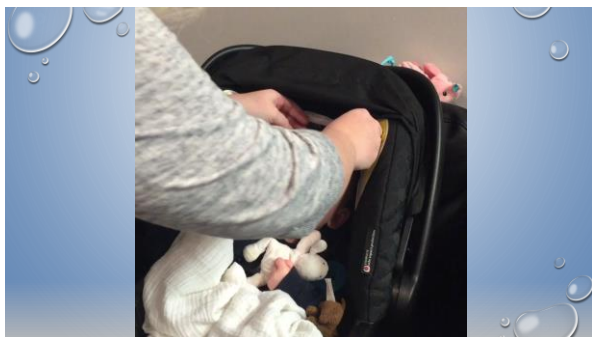
- **Diagnosis is a temporary endpoint.**
- The journey of development is an ongoing process. Diagnosis happened in the past, is happening in the present, and will continue to happen in the future.
- "LOOKING" is a critical part of the process of development and a foundation in the determinant of diagnosis

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### Vision is Motor

- What would be the impact on an infant or young child during development if they do not initiate the looking process.
- If the young child stops looking in any phase of development, that phase potentially stops or is significantly limited.
- For example:

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### Vision is Motor

- It is more than simply opening eyes to start the process of visual development; it is when the process of LOOKING is initiated
- **Looking equates to awake and alert**
- **Not looking equates to asleep and inattentive**
- So – do we first connect through our sensory processes?
- No – we connect by looking – primarily a motor process
- Following initiation of looking (motor), we recognize through our sensory processes

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### Becoming Awake and Focused

- Initially, all body functions are involved in the process of looking – i.e., a baby crying is a full body event
- Through development, bodily processes begin to become more sophisticated in terms of action
  - Reach toward target with eyes (look)
  - Physical reach with hand for target (hand)
  - Initiate physical movement to target (rolling, creeping, crawling)

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### Vision is Motor

- Engaging in the process of looking is the beginning of the process of developing overall focus
- Those inside and outside of eye care must understand this very critical link in order to have a basic insight into overall development

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### Vision is Linked to All Aspects of Development

“When your eyes move, so do your eardrums – Eyes moved right eardrums bulge left – happens 10 milliseconds before the eyes move almost as if the brain is saying – ‘ears get ready – the eyes are about to move.’” – Jennifer Groh, Duke University

- [www.pnas.org/cgi/doi/10.1073/pnas.1717948115](https://www.pnas.org/cgi/doi/10.1073/pnas.1717948115)

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### Bubba's Comments

- When eyes begin to LOOK, other processes are also activated
- They all engage in a motor reaching mode
- You don't see, hear, smell, taste, or touch by accident
- Looking, listening, smelling, tasting, touching, and kinesthesia are the active motor processes of development happening before the sensory

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### Bubba's Comments

- If any of these happen solely as a sensory process, EVERYTHING we see, hear, taste, smell, or touch would be a SURPRISE

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### Vision is Linked to All Aspects of Development

- “...that early gesture - the spontaneous gestures children produce to communicate before and as they are learning to use words can be used to identify which children with brain injury are likely to go on to develop spoken vocabularies within the typical range, and which children are likely to continue to experience language delay.”



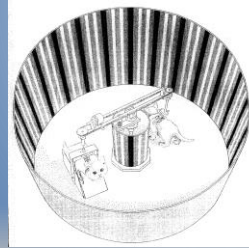
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### Vision is Linked to All Aspects of Development

- "The importance of the finding is that this diagnosis can be made before language delays appear in speech, thus opening the door for earlier and more targeted interventions."
- Susan Goldin-Meadow, Susan C. Levine, Larry V. Hedges, Janellen Huttenlocher, Stephen W. Raudenbush, Steven L. Small. **New Evidence About Language and Cognitive Development Based on a Longitudinal Study: Hypotheses for Intervention.** *American Psychologist*, 2014;
- Bubba – How do kids know how and where to gesture if the looking process has not been engaged at some level?

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### Held and Hein Scientific American Nov 1965



Active kittens developed normal sensory-motor coordination; Passive kittens failed to do so until after being freed for several days.

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### Neural Networks 2005

- What does this say about carriers, baby strollers, and walkers?
- Babies should have the opportunity to develop under active conditions!
- WHO recommends 3 hours a day of movement



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### Neural Networks 2005

- In accordance to experimental observations of kitten, we show that the receptive fields and behavior of the robot developed under active conditions significantly differ from those developed under passive conditions.
- The Contribution of Active Body Movement to Visual Development in Evolutionary Robots - [M. Arbib](#) ; [D. Haffner](#); [L.A. Di Paolo](#); *Neural Networks, Volume 18, Number 5*, July–August 2005, Pages 656–665

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### Vision is Linked to All Aspects of Development

- There are notable differences between developmental and adult neural plasticity. For a developing organism, although the general structure of its nervous system is in place at birth, **extensive experience-dependent refinement is essential for the normal maturation of its neural circuits**
- Experience-Dependent Plasticity in Adult Visual Cortex *Uma R. Karmarkar and Yang Dan Neuron*. 2006 Nov 22;52(4):577-85
- Bubba's Take – Development will not be at it's best if the child passively sits and watches the world go by

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### Vision – the Instigator

- LOOK
- ATTEND
- FOCUS
- IDENTIFY
- ENGAGE
- The is an opt-in and an opt-out aspect of each of these

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### Vision is the Leader in All of Development

- With vision being curious and as the leader in overall development, one can look farther, go farther, and enjoy the journey more.
- Looking at the target
- Gestures toward the target with sounds emitted
- Following a caregivers gaze
- Moving to the target
- Manipulating the target with eyes and then mouth, hands, and feet

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### Vision is the Leader in All of Development

- Connecting the target in the hand with a target at a farther distance and push, drop, throw, move it toward the farther target.
- Watch as the targets come into the same "visual space" and go out of the same "visual space"
- Visual curiosity is the impetus for the child to move
- And we are still not to the point where the name of the object can be verbalized

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### Vision is the Leader in All of Development

- Visual curiosity is the reason a four-year-old wanders away
- Visual curiosity is obviously linked to clothing and hair styles during the teenage years
- Visual curiosity is the foundation for unique skill development in adulthood

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### Vision is the Leader in All of Development

- But it does not start on the day the patient is sitting in your chair
- Bubba - An efficient visual process will allow things to be done more quickly and with less effort while maintaining accuracy

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### Obstacles are Always Present

- Abnormal visual experience early in life can have negative consequences for audiovisual integration that persists into adulthood in people with amblyopia.
  - **Audiovisual Perception in Adults With Amblyopia: A Study Using the McGurk Effect**  
[David G. Thompson](#), [Michael Yanni](#), [Herbert A. Geyer](#), [Mina Gammam](#),  
[David Thompson](#), and [Agnes M. F. Wong](#)<sup>1,2</sup> *Invest Ophthalmol Vis Sci*. 2014 Apr 24;55(5):3158-64.

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### Obstacles are Always Present

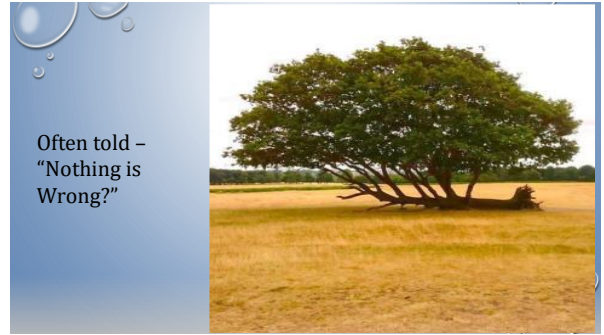
- Such being the case, the child, the adolescent, and the adult will come to the office with a myriad of **substitute performances** beautifully developed to disguise and conceal the really basic problem
- — Skeffington – Practical Applied Optometry

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Often told –  
“Nothing is  
Wrong?”

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### Obstacles are Always Present

- The problem, however, is that all “diagnoses” **occur long after the actual “barrier” came into play.**
- It happens during the journey, not at the “temporary destination” or diagnosis
- Determine the origin of the issue
- Where along the journey might this have occurred

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### Obstacles are Always Present

- A strong foundation begins early and is able to manage through times of disruption
- A process that is fragile is more likely to be disrupted
- The potential to show such disruption starts early when the foundation is in the process of development – not when the condition is “diagnosed”

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### Obstacles are Always Present

- This is why it is so critical that we follow along during the journey from the very early stages of overall development.
- A disruption in development does not have to end in bankruptcy!
- **The process of development does not expire.**
- It may become more difficult to manage, but it does not expire

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### Visual Assessment

- The assessment of vision should be less about the eyes and more about the journey of visual development.
- The evaluation becomes an observation of the journey – some things obvious and others not so obvious.
- As the layers of development are peeled away, one becomes more aware of the not so obvious in the initial assessment.

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### Visual Assessment

- The current endpoint then becomes an assessment of readiness for further development whether using Just Look Retinoscopy or other testing and not refraction.
- The observations are as important as the tests and in some cases, more important than the tests.

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### Visual Assessment

- **In early development, the assessment of the process – action – motor – looking - is more significant than an endpoint of visual acuity or refraction**
- Too often endpoints indicate we are finished, and we stop looking – i.e., we reach a diagnosis.
- But a diagnosis is only a picture of the past, not what might be possible in the future

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### Visual Assessment

- ALWAYS CONSIDER WHAT MIGHT BE POSSIBLE IN THE FUTURE
- The options you provide might not seem much to you but could be huge for the parents and families you serve
- Be forward-focused toward the future

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**Cover the sides to go slower, cover the middle to go faster**



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### Circle of Understanding and Expanding Development

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### Steps to Engagement

- Involvement in activities beyond their Circle of Understanding - LOOK, ATTEND, FOCUS, IDENTIFY and ENGAGE

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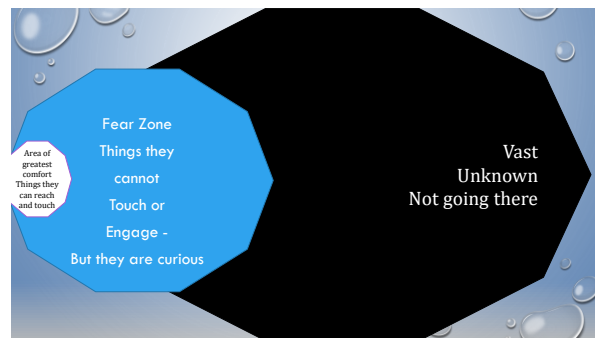
## Bubba's Circle of Understanding A Volume of Space

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## Circle of Understanding

- Development must always be considered as an ongoing and expanding process
- As our Circle of Understanding moves beyond that which we can touch, vision takes on a higher priority as the child moves through each stage

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## The "Comfort" Zone or Circle of Understanding



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## Circle of Understanding Examples Just Look Retinoscopy

- +1.00 inside Circle of Understanding
- +4.00 after crossing outside the Circle
- +1.50 inside Circle of Understanding
- -1.00 after crossing outside the circle
- Both have different areas in which they have not sorted out
- The second one is much more reluctant to venture into that area of unknown

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## Bubba's Nine A's of Development

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## Bubba's Nine A's

- A means of simple organization of the stages of development
- Every person goes through these stages as they broaden their Circle of Understanding
- Applies to any type of development from infants through adulthood
- Includes TBI/ABI
- This is a more detailed look at Getman, et. al., Reach-Grasp-Manipulate-Release

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## Bubba's Nine A's

- **Activation** – when born, the process does not/cannot differentiate- everything gets equal input through a “sensory” process – there is no differentiation, no awareness of differences, and no discrimination
- Ah, this waking up brings a new day

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## Bubba's Nine A's

- **Awareness** – as the baby begins the process of “looking,” they become aware that there are high contrast objects in their surroundings
- Ooh, where did all this come from?
- Beginning of the visual “reaching” stage from Getman

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## Bubba's Nine A's

- **Attention** – this awareness stimulates the “looking process” toward specific targets and the baby attends to these for longer periods. They become aware of differences and discriminations.
- I see that – what is it? Beginning of “focus”
- At this stage, everything is within their Circle of Understanding, but they may not be able to physically reach with hands
- Beginning of the “Grasp” stage from Getman

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## Bubba's Nine A's

- **Anticipation** – as the baby begins “look” at particular objects, the process of wanting to get there begin. It happens throughout the body however; it was stimulated through the “looking process” – an awareness outside their present Circle of Understanding
- Whoa – I want that!!
- Crude “Manipulation” stage from Getman – looking and manipulating with vision but not yet with hand movement
- All of this is visuo-motor – don't limit motor to hand or body movement

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### Bubba's Nine A's

- **Action** – slowly, the baby begins to reach for the object with their hand, very inaccurately at first – responding to their internal curiosity
- I'm gonna get that!

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### Bubba's Nine A's

- **Adjustment** – after each few attempts to reach the object, the baby begins to make adjustments in order to more accurately reach the object, eventually reaching it and going through the process of learning all about it through handling and manipulating through several "discovery" processes –
- Whoops, didn't get it. Let's try again

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### Bubba's Nine A's

- **Accomplishment** – after making a number of attempts and adjustments, the infant and young child will complete the task or reach a stage of accomplishment – I got it!!
- Got that – now what do I do with it???

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### Bubba's Nine A's

- **Adaptability** – once the initial task is accomplished, there follows a significant amount of time comparing texture, size, etc., through all processes – manipulation – the stage of quality development
- OK, let's play with it to see what I can do with it
- This was identified as "Manipulation" stage by Getman
- But each begins with the process of the previous seven steps from activation though accomplishment.

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### Bubba's Nine A's

- **Acquittal** – after reaching accomplishment and adapting over many times, the baby lets this go and moves on to the next object
- The "Release" stage from Getman
- Done with that! What's next?

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### Bubba's Nine A's

- **NOW** – think about what happens in development is vision does not become the leader and instigator!!
- And optometry's primary mission when dealing with kids is to ensure engagement in the world – not kjust make them see
- Seeing emerges out of the looking process

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### Bubba's Nine A's – Cliff's Notes

- LOOK
- ATTEND
- FOCUS
- IDENTIFY
- ENGAGE

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### Bubba's Nine A's

- Recent support for these concepts:
- **Anticipation** – "...cognitive process that takes place prior to an event of interest or importance and is focused upon it." Berg and Donohue ch. 3 in **Attention and Information Processing** by Campbell, Hayne, and Richardson - 2014

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### Bubba's Nine A's

- **Attention** – "...the ability to deploy the resources of the brain so as to optimize performance towards behavioural goals." Atkinson and Braddock

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### Bubba's Nine A's

- **Attention** has more components than simple on and off. Casey and Richards have shown this related to heart rate:
  - Pre-stimulus – variability in heart rate
  - Pre Attention – even before actual attention, there is a move to show less variation
  - Attention – marked reduction in variability of heart rate over the course of the stimulus

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### Bubba's Nine A's

- Pre-release of attention – a change toward the pre-stimulus variability prior to full release
- Termination of attention – return to pre-stimulus variability of heart rate

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### Bubba's Nine A's

- **Acquit** - "From about 4 months of age, infants start to show cortical control in disengaging to switch between competing targets." **Atkinson and Braddock**
- **Bubba's Nine A's cycle throughout life in an ever-increasing level of sophistication**

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### Guidance and Rehabilitation

- Earliest Identification and Intervention
- Getting the earliest start on rehabilitation provides the patient with an opportunity to reach higher degrees of overall function and sophistication.
- Lack of intervention(s) cause the child/patient to develop in an alternative manner in which order for them becomes chaotic and difficult.

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### Guidance and Rehabilitation

- VISION MUST EMERGE AS THE LEADER AND EVEN THE INSTIGATOR OF ACTION

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### Guidance and Rehabilitation for Parents

- **Look them in the eyes FROM BIRTH** – develops social interaction and the beginnings of communication
- **Teach them to look** – through joint attention, they learn to “read” what others might be looking at and thinking and how they might be thinking about it
- **Teach them to follow your gaze** – gaze following also helps them begin to think about what is of interest to you and how to read your face and eyes to see what is of interest to you

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### Guidance and Rehabilitation for Parents

- **Teach them to look over, under, behind, etc.** – through gaze following and joint attention, they learn the beginnings of laterality and directionality including up/down and side to side
- **Teach them to find hidden objects** – object permanence – that things still exist even though they may not be able to see them at the moment
- **Teach them to look beyond their reach** – the beginnings of motivation to move which leads to crawling, walking, running, bike riding, and driving

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### Guidance and Rehabilitation for Parents

- **Teach them to follow print in a book by pointing to the words as you read with them** – the purpose is not to teach words but to establish the looking patterns necessary for reading
- **All of this involves parent engagement with a child** – development does not passively happen
- **Give your child a better chance in life. Teach them to LOOK!**

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### Prescribing

- Least amount of lens power to initiate the process of ENGAGING
- Don't depend only on instrumentation as you must know WHERE the child is looking
- The Retinoscope is a great tool
- TRUST YOURSELF

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### Bubba Summary

- The process and sequence of development has not changed over the years - Gesell's Developmental Cycles recently revalidated
- More and different obstacles are present today that require adaptation, i.e., use of technology, that require us to look differently at performance levels
- Substitute performances can be forming or already formed into a habit
- We call these habits "diagnoses"

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### Bubba Summary

- We have options for management from guidance to lenses to vision therapy that affects more than the visual process – it affects the whole patient."
- We have the opportunity to observe development of substitute performances at an earlier stage
- As we make these observations of real-time development, we have the opportunity for earlier intervention

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### Why is All This Important?

- Vision development is a leader and instigator in the activities of life
- Vision sets the stage for engagement in most actions of life
- Untreated children with vision issues become adults with vision AND developmental issues
- Because of the importance of vision in overall development, **early identification and intervention is critical**

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### Bubba Summary

- Show me a baby who is awake (eyes open) and alert (looking and searching) and I will show you a baby who is active and engaging in life using their visual process as demonstrated through Bubba's Nine A's and has a greater chance to reach full potential

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### Bubba Summary

- Children with untreated vision issues become adults with more than vision issues – their whole process of performance is limited
- Sue Barry –
- "I designed my whole life around not having to drive a car."  
Stereo Sue – Fixing My Gaze

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### Bubba Summary

- **Don't be focused on how well a developing child can "see" – be focused on how well they can LOOK! - and the "seeing" will come.** Bubba

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### Bubba Summary

- A student stated it so nicely when he "got it" –
  - "Case histories transformed from grocery lists to a personal story"
  - "Tests and instruments became extensions of myself"
  - "Spectacle prescriptions transformed into insights of human development and behavior"
  - "A transcendence of knowledge molded data points into a living, breathing portrait that taught me to treat not just the visual system but the patient as a whole."

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### Bubba Summary

- Development starts early
- Development progresses throughout one's lifetime
- Development never expires – it may slow down but never expires

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### Patient FM – 2 ½ months old male

- Born pre-term at 36 weeks
- Put on CPAP machine at hospital due to lack of oxygen
- Mother felt he was not "developing normally" as he was not following or social smiling – she had four others
- He would only turn his head in response to voices
- Pediatrician recommended ophthalmology consult, MRI, and early intervention

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### Patient FM – 2 ½ months old male

- Initial examination – 4/18/18
- Did not fix or follow lights, toys or faces
- Brückner showed equal reflexes
- Just Look showed no brightening or reflex changes over several seconds and numerous non-sound targets - visual reflex not in activation stage
- Anterior and posterior segment findings appeared normal with dilation

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### Patient FM – 2 ½ months old male

- Recommendations
- Initial response until proven otherwise was delayed visual maturation per Duckman (Duckman article given to parent)
- SIMPLE activities given to parent in order to activate the visual process
- RTC 3 months

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### Patient FM – 2 ½ months old male

- Follow-up – 7/30/18 – 5 mos. old
- Parent reported he had more than one exam by ped OMD who referred for MRI which was negative
- Her words – "they didn't know what was wrong or what to do"
- When I entered the room, he looked up at me with bright shiny eyes – and a look of "Who are you?"

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### Patient FM – 2 ½ months old male

- Mother reported that around four months of age, he started fixating and following with his eyes and reacting to bright high color contrast toys
- He was now smiling and making eye contact

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### Patient FM – 2 ½ months old male

- During examination
- Fix and follow
- Equal Brückner
- Just Look was now reactive to visual targets and showed +1.00
- More articles and activities given to parent

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### Patient FM – 2 ½ months old male

- Follow-up – 10/29/18 – 8 mos. old
- Mother's first statement was that she believes FM's vision is now "normal"
- He can see and locate small objects and pick them up with a "pincer grip"
- Brückner showed equal reflexes
- Just Look Retinoscopy was quickly reactive as targets were introduced

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### Patient FM – 2 ½ months old male

- He looked at every person that came into the room – in the eyes
- Gross stereo noted with keystone Basic Binocular
- Quickly engaged when small toys and lights were used for fixation
- The best
- Parent asked the student if she had read the Duckman article – when told no, the parent encouraged her to do so right away

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### Patient FM – 2 ½ months old male

- Notes
- Definite Delayed Visual Maturation
- What if we had waited?
- Does it matter if the child might never have started looking?

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### Patient FM – 2 ½ months old male

- The child gave the appearance of being "blind" but through basic guidance activities and a mother who was aware of what he should be seeing, the baby is much farther along than if we had waited
- 6/29/2021, annual exam – findings within expected for age. Annual exam recommended

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### Early Identification - Early Intervention

- When intervention is delayed, it takes four times as long to intervene in fourth grade as it does in kindergarten because of brain development and because of the increase in content for students to learn as they grow older.

National Institute for Child Health and Human Development

- They are talking about reading but this applies universally

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### Early Identification - Early Intervention

- Behind these statistics, as one military expert notes, lies a “demographic surprise”: The current pool of qualified high school graduates is neither large enough nor skilled enough to supply our nation’s workforce, higher education, leadership, and national security needs.
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Thank You!!  
gsteele@sco.edu

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