

Building Blocks for Assessment & Treatment of Binocular Vision Disorders

Presenter: Brenda Montecalvo, OD

Duration: 1 hour

Category: Functional Vision

Description:

This lecture presents basic concepts for assessing and treating patients with binocular vision disorders: Posture and breathing, the use of lenses, prisms and occlusion to improve binocular conditions, and how to assess the 3 key areas of visual processing: Visual Motor, Visual Sensory and Visual Thinking, and how they relate to binocularity.

Objectives:

1. Understand how posture and breathing impact binocularity.
2. Learn to use lenses, prisms and occlusion to improve binocular conditions.
3. Discover how to assess 3 key areas of visual processing: Visual Motor, Visual Sensory and Visual Thinking.
4. Be able to identify what patient characteristics will influence procedures used for treatment.

Outline

I. Introduction

- A. Incidence rates
- B. Impact on daily living
- C. Vision versus Eyesight and Binocularity
- D. Definitions
- E. 10 Point Model
- F. Gesell's Vision Development Theory
 1. Skeletal
 2. Visceral
 3. Cortical

- II. Posture and Breathing - Understand how posture and breathing impact vision. Poor breathing function reduces the function of the visual process. Note the various studies that relate posture and breathing to brain function. Proper posture supports better breathing which allows for improved circulation. Peripheral retinal capillaries are dependent on good levels of oxygen in the brain. One of the early signs of lack of oxygen is tunnel vision. Note pilot experiences in the altitude chamber.

- A. Lack of oxygen from poor breathing impacts the function of the retina giving a sense of tunnel vision to the patient. This restricts the peripheral process which is important for supporting the quality of binocularity. Reference: The Neuroscience of Vision and Breathing by Leonard J. Press, O.D., FAAO, FCOVD July 15, 2021
- B. Vision and Breathing May Be the Secrets to Surviving 2020
 1. Stanford neurobiologist Andrew Huberman discusses the two things we can always control, even during a high-stress election and scary COVID pandemic.
 2. Andrew Huberman, a neuroscientist at Stanford University studied the visual system says that stress is not just about the content of what we are reading or the images we are seeing. It is about how our eyes and breathing change in

response to the world, as well as the cascades of events that follow. Both these bodily processes also offer us easy and accessible releases from stress.

- C. Your brain needs a constant supply of oxygen. The harder you think, the more oxygen and fuel your brain will use from your blood – up to 50%. Every minute, 750-1,000 milliliters of blood flows through the brain.
- D. 56% of students improve math performance when using good posture.
 - 1. Erik Peper, Richard Harvey, Lauren Mason, I-Mei Lin.
 - 2. Do Better in Math: How Your Body Posture May Change Stereotype Threat Response. *NeuroRegulation*, 2018; 5 (2): 67 DOI: 10.15540/nr.5.2.67
- E. Study by Harvard and Columbia: Improving posture can improve the brain's function, and thus your mood and memory levels.
- F. Rhythm of breathing affects memory and fear: Breathing is not just for oxygen, it's also linked to brain function. Breathing through nose vs. mouth, exhaling and inhaling, Dec. 2016, Northwestern University
- G. Deep abdominal breathing encourages full oxygen exchange, the beneficial trade of incoming oxygen for outgoing carbon dioxide. This type of breathing slows the heartbeat and can lower or stabilize blood pressure. Harvard Health Publishing, May 2009
- H. Amanda MacMillan, Northwestern University December 07, 2016, conducted research suggesting that “in through the nose and out through the mouth” breathing technique impacts brain activity—and can improve memory. Study included 100 young adults, some of whom were asked to make snap judgments about facial expressions that flashed quickly across a computer screen. Breathing did affect their performance. When people were inhaling through their noses, they were able to recognize faces that expressed fear.
- I. Objects flashed on a screen were more likely to be remembered if they encountered them during inhales, versus during exhales. When mouth-breathing, all these effects disappeared.
- J. Rhythm of breathing creates electrical activity in the brain, according to the report, which was published in *The Journal of Neuroscience*.
 - 1. Christina Zelano, PhD, assistant professor of neurology at Northwestern University Feinberg School of Medicine.
 - 2. The rhythm of memory: How breathing shapes memory function by Detlef H. Heck, Robert Kozma, and Leslie M. Kay, 24 JUL 2019 <https://doi.org/10.1152/jn.00200.2019>
 - 3. Breathing and Posture: H Krakauer 1, A GuilhermeAffiliations expandPMID: 11307345
- K. Correct Posture Improves Your Blood Circulation -
The body needs a constant flow of blood circulation, slouching or sitting incorrectly (poor posture) can really harm the flow of blood – it needs to flow upwards to return to the heart, which then pumps it around the body again to help regulate everything. Therefore, by sitting or standing in a slouching position, you're preventing your blood from flowing properly, making that uphill pump that much harder. This is why sitting with correct

posture, as well as being active – is so important – it helps your blood to move around your body, keeping your vital functions and organs ticking over as they should.

<https://www.uprightpose.com/blog/4-benefits-good-physical-posture/>

- L. Does breaking up prolonged sitting improve cognitive functions in sedentary adults? A mapping review and hypothesis formulation on the potential physiological mechanisms: BMC Musculoskelet Disord. 2021; 22: 274; Published online 2021 Mar
12. doi: [10.1186/s12891-021-04136-5](https://doi.org/10.1186/s12891-021-04136-5); PMCID: PMC7955618; PMID: [33711976](https://pubmed.ncbi.nlm.nih.gov/33711976/);
Baskaran Chandrasekaran,¹ Arto J. Pesola,² Chythra R. Rao,³ and Ashokan Arumugam

III. Optics

A. Lenses

1. Objects within focal point
2. Concave
3. Convex

B. Prisms

1. Prentice Rule
2. Ron Jones: Slant Optics
3. Linear perspective
4. Ophthalmic lenses
5. SILO versus SOLI

IV. Occlusion and binocular Vision Disorders

A. Bi-nasals

1. Eso-posture
2. Exo-posture

V. The Visual Process

A. Visual Motor

1. Dorsal Process
2. EOM Receptors
 - a. Visual Cortex
 - b. Cerebellum
 - c. Trapezius
 - d. Vestibular/Oculo/Neck Reflexes
 - e. Proprioceptive relationship
3. Oculomotor
4. Convergence
5. Divergence
6. Accommodative Flexibility

B. Visual Sensory

1. Ventral Process
2. Visual Acuity
 - a. Near
 - b. Intermediate

- c. Far
 - 3. Fusion
 - 4. Visual Fields
 - 5. Accommodation
 - 6. Other
- C. Visual Thinking
 - 1. Laterality
 - 2. Directionality
 - 3. Visualization
 - 4. Visual Memory
 - 5. Orientation of visual space
 - 6. Organization of visual space
- VI. Determining which procedures to use during treatment
 - A. Age
 - B. Binocular Status
 - C. Sensitivity
 - D. Executive Function Level
- VII. Systemized Programming
 - A. Home Visual Experiences
 - B. Office Vision Therapy Procedures