Continuing Education for Ophthalmic Medical Personnel Meeting

School of Ophthalmic Medical Technology Regions Hospital

Kris Fey, COMT
Program Director

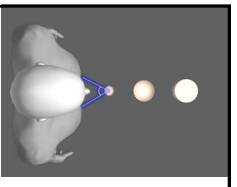
Do YOU See In 3D?

DEFINITIONS

BINOCULAR VISION:

– Vision using two eyes with overlapping fields of vision

STEREOPSIS:

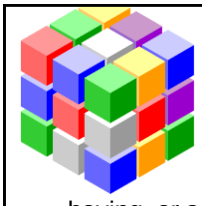


Binocular Depth Perception

Stereo = solid or 3 dimensional

Opsis = appearance or sight

Impression of depth that is perceived when a scene is viewed by both eyes by someone with normal binocular vision



3D= Three Dimensional

-having, or seeming to have, the dimension of depth as well as width and height

-simulating the effect of depth by presenting slightly different views of a scene to each eye

BINOCULAR VISION

BINOCULAR VISION IS

FUSED SIMULTANEOUS

Advantages of binocular vision

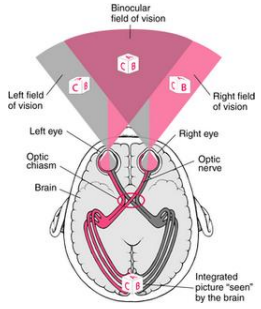
(vs. monocular)

Allows for more/wider horizontal visual field

Enhances ability to detect faint images

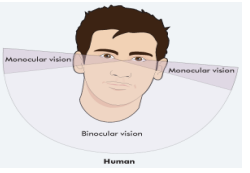
Gives stereopsis (depth perception)

BINOCULAR VISION



BINOCULAR VISION

- Normal Visual Fields – each eye individually
  - 60 degrees nasally
  - 100 degrees temporally
  - 60 superiorly
  - 75 inferiorly



Binocular Vision =

Maximum horizontal field of view = 200 degrees

About 120 degrees are binocular field of vision

BINOCULAR VISION

- Humans have eyes that both face forward.
- Similar to predator animals- tiger, lion, even your family cat.
  - This positioning allows for Binocular Vision/ Stereopisis/3D perception.

BINOCULAR VISION

- Deer,Rabbits, Horses are prey
  - Their eyes are located on their face/head so they can perceive danger from areas around them.

BINOCULAR VISION

- ViewMaster- invented in 1939
  Uses your binocular vision

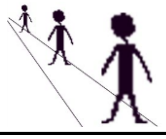
MONOCULAR VISION

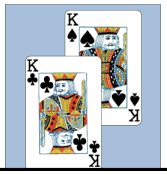
- MONOCULAR "CLUES"
  - Changes in textures, color, lighting occur in what we see. This helps tell about distances and positioning.

Monocular Clues

Apparent size – objects progressively increase in size as they move towards us

Interposition- relatively nearer objects tend to conceal or overlay more distant objects





Monocular Clues

Shading – light falling on solid objects causes shadows to be cast and on curved surfaces cause a gradiation in the intensity of the shadow

Geometric perspective:

STEREOPSIS

HISTORY

Charles Wheatstone (1802-1875)

1st described Binocular Vision in 1833

Charles Wheatstone (1802-1875)

Charles Wheatstone

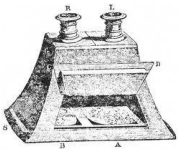
3D viewing instrument

The Stereoscope

Leonardo DaVinci

Painted with depth perception

1844 David Brewster created the next stereoscope – the first used for taking stereo photographs



vr.wikinet.org

STEREOPSIS

Stereopsis is not active at birth

Basic vision develops over the babies first 6 month of life.

Stereopsis may begin to develop after the first 6 months.

knowledgeoverflow.com

Functional stereopsis may begin at 2 years of age but continues to develop.

STEREOPSIS

Stereopsis Testing

Titmus Fly-

STEREOPSIS

TITMUS FLY

2 superimposed, nearly identical vectographic prints are shown- while the patient wears filtered glasses.

The patient identifies the item that "stands out" more than the others. The fly's wings, an animal on the line or one of the 4 dots shown.

STEREOPSIS

Stereopsis is measured in seconds of arc and is measured by determining the finest stereopsis accurately detected.

- Minimum is usually 30-40 secs of arc
- Bifoveal stereopsis is better than 67 secs/arc

Titmus Fly:

FLY = 3000 sec/arc

9th circle = 40 secs/arc

STEREOPSIS

Titmus Fly

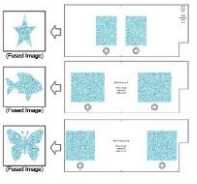
1st 3 circles and 1st animal can often be seen by using monocular clues

If you turn the Titmus book 90 degrees – there is NO stereo, but the monocular clues are still there.

STEREOPSIS

RANDOT E

Uses random dot backgrounds and polarized glasses for the patient to determine the figure on the card in the dots.



STEREOPSIS

Random Dot Tests

Advantage over Titmus Fly
usually have NO monocular clues
Disadvantage:
Harder to see
the images

Factors that would limit binocular vision/ stereopsis

Refractive Error not corrected

Factors that would limit binocular vision/ stereopsis

Strabismus

Exotropia

Factors that would limit binocular vision/ stereopsis

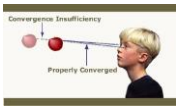
Amblyopia

Treatment of amblyopia includes patching of "stronger" eye.

drpatch.ca

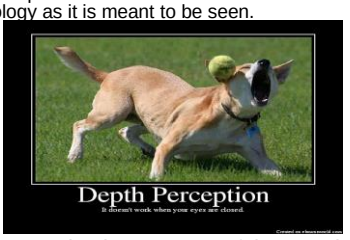
Factors that would limit binocular vision/ stereopsis

CONVERGENCE INSUFFICIENCY



STEREOPSIS

People with poor or no stereo will not be able to view 3D technology as it is meant to be seen.



This affects only about 5-10% of the population.

3D

In the late 1800's stereoscopic image viewers were popular

3D

- The 1st 3D movie was a French titled film in 1903
- More commonly known is the 3D movie in 1922- the Feature Film by Nat Devrich

Power of Love

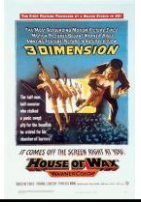
And the first feature length film ***Bwana Devil*** in1952

3D

1st form of 3D movies used ANAGLYPH 3D

3D

1950's had a boom in 3D movies. However the viewing experience was not comfortable and the producers of these movies and companies limited their use



3D

NEWER TECHNOLOGY

In 2000 the digital cinema technology began changing the experience in making movies and increasing the viewers comfort level

Passive polarized glasses

3D

- Passive Polarizing
  - 2 different methods of filtering
    - Linear
    - Circular

    - Circular polarization is the standard for theatrical releases and theme park attractions

- http://www.sciencelearn.org.nz/Contexts/Light-and-Sight/Sci-Media/Video/How-we-see-3D
- Dr Adrian Dorrington
- Position:Senior Lecturer
- Field:Optics, time-of-flight 3D-camer
- Organisation:University of Waikato

Active shutter technology is the most current

Active Shutter Technology

PROS:

Color neutral can be used with the full color spectrum

Synchronization with video equipment may be through infrared or radio frequency (Bluetooth)

CONS:

Expensive

Slightly darker in viewing- due to polarized lens and the shutter cutting out more light

May not be compatible with different makers even thought the shutter methods are similar

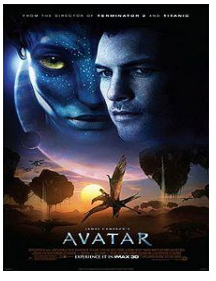
Shutter Technology

Best for use in smaller spaces

Such as home theater and classrooms

3D

2009- The best 3D film to date that brought 3D back full force into movies is



3D

The Olympics in 2008, 2010, 2012 and some 2018 were broadcast in 3D

Gaming systems are available in 3D

What's Next?

Home theater- HDTVs come 3D ready

However- due to lack of interest many of the largest TV manufacturers have quit making 3D TVs.

2016-

MIT's Computer Science and Artificial Intelligence Lab (CSAIL) has created movie screen technology, Cinema 3D, that lets you watch 3D movies without the stupid glasses.

What's Next?

-Glasses Free 3D TV

-Teaching using 3D technolgy in the classroom

LEON KERR

Leon Keer, Peter Westerink, Ruben Poncia Remko van Schaik

- Julian Beever- 3D chalk artist

Is ALL of this 3D GOOD for our EYES?

Eyestrain

Headaches

Dizziness

Eye Fatigue

Is This Good For Our Eyes?

- 2 primary reasons for causing side effects:
  - Unusual use of our eyes separately
  - Mismatch between convergence and accommodation- due to the images perceived in front of or behind the screen

These conditions are not totally unavoidable

Usually temporary

Watching 3D Movies

- A 2011 survey cited in an eight-year study into the side effects of 3D glasses found only a third of viewers have no trouble, while two-thirds feel some form of discomfort, including 7 percent that report terrible headaches.
  - » https://motherboard.vice.com/en_us/article/8q8xy3/why-are-3d-movies-still-a-thing

Head Positioning

Is ALL of this 3D GOOD for our EYES?

HEADLINES:

Does 3D Hurt Your Eyes? Yes, Says Science

Who Could Have Guessed: 3D Hurts Your Eyes

3D: Harmful To The Eyes?

Is ALL of this 3D GOOD for our EYES?

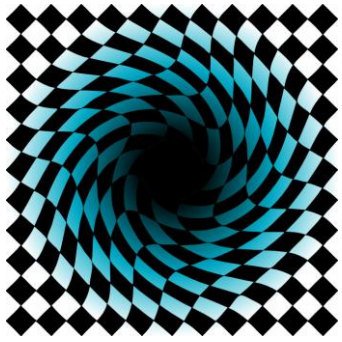
It is recommended that children under the age of 3 not be exposed to 3D movies,gaming, etc while their eyes and brains are still being developed.

Is ALL of this 3D GOOD for our EYES?

- There are few studies, and therefore not enough scientific evidence, regarding the positive or negative effects of 3-D media on visual development to date

Erin Stahl, MD, OSN Pediatrics/Strabismus Board Member

- The American Academy of Ophthalmology and the American Association for Pediatric Ophthalmology and Strabismus both responded with statements noting the lack of scientific evidence to support such a claim.
- "The general reaction [among ophthalmologists] was there's really no scientific evidence backing up their concerns,"



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3D University .net

Technology Review; Does 3D Hurt your Eyes? Yes, Says Science, Daniel Zax
http://www.technologyreview.com/view/424864/

Penn State University: The Medical Minute: Are 3D movies and games bad for your eyes?

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