How to Get the Most Out of Your Digital Measuring Devices

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Why Computerized Measurements? (25 Minutes)

- Digital surfacing
- Advanced lens designs
- More measurements required, fewer assumptions.
- Accuracy
- Precision
- Consistency

Surfacing

- In conventional surfacing, a generator grinds away plastic on back of lens creating rough surface
- Final Rx on back surface is produced by rubbing against an aluminum tool and pad in fining and polishing steps

Digital Surfacing

- A natural diamond cutting tool produces a very smooth surface that requires only light polishing to create transparency
    - Digital Surfacing or Free Form Machining
- Each lens may require over 10 million calculations to generate the data file for the free forming machine to create the lens' surface
- The computer lens design is exact. Several companies use the same machinery. It is each companies computer program that determines the end product
- Control Off-Axis Astigmatism
- Perfect Curves for Sphere, Cylinder & Axis
- Create the Following Curves:
- Aspheric
- Atoric
- Progressive

Advanced Lens Designs

- Zeiss Individual 2
- Hoya MyStyle
- Essilor Varilux X
- Shamir Autograph III

Individualized/Personalized Lenses

- Adjustments made for “position of wear” or “As Worn”position.
- Aberrations reduced through incorporation of “position of wear” measurements.
- Mono pupillary distance,
- Segment height
- Vertex distance,
- Pantoscopic Tilt,
- Frame wrap
- Eye center of rotation distance

Measurement Assumptions

- Mono pupillary distance: “Just divide by 2”
- Segment height: Bifocal “Just put it 3mm below the datum line.”
- Vertex distance: “The exam was done @ 13mm”
- Pantoscopic Tilt: “Manufacturers put 8-10 degrees of tilt in the frame”
- Frame wrap: “Put their Rx on a higher base curve, if they want the style, they can live with a little distortion.”
- Eye center of rotation: “Gullstrand says it is 13.5mm.”

Problems with Traditional Methods

- Accuracy
- Precision
- Reliability
- Consistency

Accuracy and Precision in Lens Fitting

- Traditional fitting measurements are limited by
- *Accuracy:* the closeness of the result to the actual value
- *Precision:* the size of the smallest reliable measurement
- *Reliability:* the same result with repeated measurements.
- *Consistency:* the difference from one dispenser to the next

Traditional Measurements

- Monocular Pupil Distances
- Monocular Fitting Height
- Optimal Vertical / Horizontal Tilt
- As currently practiced, lens measurement is an art form
- It takes awhile to learn to do it well
- Everyone has his/her own method
- As a result, consistency can be an issue
- Especially if there are different levels of experience.

The Need for Accurate Fitting

- Even small errors in interpupillary distance (PD) measurement can restrict the apparent fields of view seen simultaneously through both lenses
- They can also make it difficult to locate the central viewing zones and corridor of the lens
- A 2 mm error in lens centration can reduce the binocular field of view by 25% or more

Traditional Measurement Methods

- Vertex Distance
- Distometer
- Pantoscopic Tilt
    - Guess
    - Manual

Lens Tilt influences the optics

- Most PALs are designed for about 8° vertical tilt
- Wrap brings the periphery of the lens closer

Modern Measurements

- Customized PALs may require additional measurements
- "As Worn"
    - Tilt, Wrap, Vertex
    - Head Cape, ERCd
    - Personal Visual Habits
    - Head / Eye Movement

"As Worn" Measurement

- Basic Concepts
- Lens position measured via markers
- Camera or Cameras to capture image
- Camera uses markers to determine lens position, eye position, & frame size
- Reference markers provide positional data
  for the frame, lenses, and eyes

Customization by Position of Wear using electronic measuring systems

- In order to give each patient truly optimal performance, customized lenses allow you to incorporate each person's unique measurements into his or her lens design.
- Computerized Measurements
- Bonus
    - Frame selection
    - Lens options
    - Patient education
    - Patient communication
    - High tech image enhancement

PC Based Computerized Electronic Measurement Systems (30 Minutes)

- Essilor: Visioffice 2
- Zeiss: iTerminal 2
- Shamir Spark Mi Up
- Zeiss VISUFIT 1000

Visioffice by Essilor

- Eye position: Monocular PDs, fitting heights Wearing parameters: Vertex distance, wrap angle, pantoscopic angle
- Frame measurements: A and B measurements, DBL
- Varilux Physio, and Varilux "X" Series
- Eye Rotation Center: Each of our eyes rotates around a fixed point called the Eye Rotation Center (ERC). Visioffice measures the real 3D position of each eye's unique ERC to create the most individualized lenses possible.
- Natural head posture: Is unique to each person and can vary widely, impacting lens performance

"As Worn" Measurement

- Survey of 200,000 wearers in Europe shows that only 9% are accurate with the theoretical Gullstrand's eye model.
- Vertex = 12 mm
- Interior to ERC = 13.5 mm
- Tilt angle = 8°
- Wrap angle = 7°

Eye Rotation Center

- Most systems measure vertex distance and estimate ERCd (eye rotation center distance)
- Visioffice measures ERCd directly
- Eye Rotation Center (ERC) is a crucial point
- Point through which optical axis always passes
- Determines optical projection on the retina

- Best source of Hz / Vt positioning data

Head Cape

- "Head Cape" is the measurement of the natural resting position of the head
- Most people do not look "straight ahead"
- Each 2° of Head Cape results in 1mm horizontal shift
- 5° head cape = 2.5mm decentration of optical axis
- Studies show the *average* head cape is approximately 1.5°

iTerminal 2 by Zeiss

- Anatomically adjusted frame
- Patient stands or sits in relaxed, habitual posture
- System can compensate for accidental head rotation
- Unique, patented speckle image causes patient's eyes to relax for accurate distance PD measurement
- A precision digital camera captures front and side images of the patient in his or her chosen frame
- Sophisticated software makes all key measurements to an accuracy of 0.1mm
- Images reviewed by patient and dispenser
- Confirms that full reading area is available in frame
- (Offset is the result of compensation for accidental head turn)

- Measures:
    - Monocular P.D.
    - Fitting height
    - Vertex Distance
    - Frame Wrap
    - Pantoscopic Tilt

iTerminal 2 Consultation Module

- High resolution photo images allow patient to see clearly how they will look in their chosen frames
- Images can then be enhanced to show the appearance and effects of
- AR coating
- Photochromics
- Fashion tints

Shamir Spark Mi Up

- Your patient looks in the mirror when wearing their glasses, you simply click, and SPARK Mi™ Up captures the image.
- Just one picture is all that's needed for capturing measurements of all the required parameters

- Measurements Include: PD (Automatic Measurement), Fitting Height, Panoramic Angle, Pantoscopic Tilt, Vertex distance.

Zeiss VISUFIT 1000

- Measures:
    - Monocular P.D.
    - Fitting height
    - Vertex Distance
    - Frame Wrap
    - Pantoscopic Tilt

Tablet Based Measuring Systems (30 Minutes)

- Essilor: m'eyeFit & m'eyeFit Mirror
- Zeiss: iTerminal Mobil
- ACEP: Smart Mirror Mobile
- OptiKam: Pad
- Spectangle Optikam Pad

Essilor: m'eyeFit & m'eyeFit Mirror

- Measurements
- Frame Selection
- Lens Options

Zeiss: iTerminal Mobil

- ZEISS i.Com server for storage of patient data and interfaces to common PMS.
- Simple and fast usage through face recognition.
- Smaller and lighter than a pupillometer.

ACEP: Smart Mirror Mobil

- Measurements
- Frame Selection
- Lens Options

Spectangle OptiKam Pad recommended by Hoya

- Measurements
- Frame Selection
- Lens Options
- Augmented Reality

Optikam/Spectangle Measurements

- Pupillary Distance (PD)
- Seg Heights
- Pantoscopic Tilt (Panto)
- Vertex (RVD)
- Wrap
- Near PD

OptiKam Frame Selection

- Four Images
- Expand Images to Full Screen
- E-Mail Image to Others

Optikam Lens Selection

- Materials
- Tints
- Coatings
- Adjust for Patient's RX

Optikam Augmented Reality

- Video
- Water
- Skiing
- Golf
- Computer
- Lens Options
- Design
- Tint
- Coating

Comparison to Traditional Methods (10 Minutes)

Traditional Measurements

- Patient:
- Pupillometer PD:
- Marking Pen Fitting Height:
- Zeiss Tilt:
- Distometer V.D.

- Chart Frame Wrap:

Measuring Device (Optikam) Measurements

- Patient:
- PD:
- Fitting Height:
- Tilt:
- V.D.
- Frame Wrap:

Questions ? (5 Minutes)

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