Script – 5 Reasons to Add a Smart Mirror, Part 3 Measurements

1. Welcome to Part 3 of 5 Reasons to Add a Smart Mirror to the eyewear selling process.

2. In this part, we continue to define digital technologies and describe how 5 measurements rather than the usual two of PD and fitting height can be better.

3. This is a 1 credit, ABO approved course, supported by an educational grant from ABS Smart Mirror.

4. My name is Mark Mattison-Shupnick. I am your instructor.

I am currently Director, Education and Training, for Jobson Medical Information LLC. A consultant to EnChroma LLC, a speaker at various national and international meetings in which I receive honoraria for teaching.

I have no financial interest in any products discussed

5. Our objectives are to:

1. Understand how 5 lens measurements can make better eyewear.

2. Then, Learn how to efficiently capture a set of digital measurements.

3. Know how to describe the entire digital, eyewear measuring, experience.

6. Now you might ask why we want to even take digital measurements for things that we already do so well like PD and height? Here are a few of my own reasons.

First are better fitting heights – did you know that height changes are reason for most progressive lens redo's. Shouldn't we want a way that measures where the patient is actually reading?

The best of digital lenses are better with personalized measurements

Patients notice, "No one's ever done this before"

A request for only a PD, for online eyewear, makes just an adequate pair of glasses

They help determine the opportunity for digital lenses

5 measurements makes great eyewear and separates you from the competition

7. So, by now you know which 5 measurements we are talking about.

Most important is a Monocular PD as well as monocular fitting heights. Why?

For PD and Height, monocular measurements center the corridor and the reading zone, both horizontally and vertically. After all, almost all patients have differing monocular PD's ***and*** heights. Using monocular values makes a difference in the way that progressive lenses work.

Now, lets talk about vertex, tilt and wrap. Look at the video, it shows how the design of progressives can be improved by position of wear measurements. Why?

The addition of these measurements allows the lab software to redesign the lens' periphery for the way that the lenses will be worn in the frame chosen. That's why they are required in personalized lenses.

Use this kind of demonstration to show why taking better measurements are important. It also helps to validate increased lens costs.

8. Taking measurements using an iPad is easy. Here are the steps…

1. Adjust frame to patient
2. Attach '**FRED'**
3. Take a far PD
    - Adjust frame markers
4. Take a near PD
    - Adjust frame markers
5. Record measurements

Now there may be a few new words you've seen. In fact there are 3 new things that I'd like to discuss when using an iPad and Smart Mirror to take a measurement.

9. First, meet FRED. That's short for Frame Reference Device.

FRED sits easily on the top of the frame's eyewire, a hook sits behind the eyewire and two legs down the front.

10. Notice that there are 3 black and white reference marks on the front of the frame reference device.

These will be used by the tablet's software for calibration of distances and angles. It's a very clever way to know frame and patient sizes.

11. FRED sits atop all kinds of frames. Acetate, metals, the video shows how easy it is to add the device to the frame. It hangs on the top, hooks behind the lenses and the long vertical feet rest against the frame/lens front.

In fact, you'll hang the device when the patient is wearing their frame, just 'hang' FRED on the frame and you're ready to take measurements.

For rimless (see photo #3). FRED rests safely on the lenses themselves without any worry of damage.

Photo #4 shows how FRED sits atop a wrap sports frame. I've turned the frame around so that you can see how it's attached from the back.

12. The next new thing I want to teach is why monocular PD's are different with frames.

In this photo, I've added a corneal reflection, the green circles.

Look at the red arrows – they suggest where the Pupillometer nose pads will sit.

What is this arrangement doing?

13. Here's what the Pupillometer is doing – it's creating an imaginary line along the middle of the bridge and measures the distance from that center point on the bridge to the corneal reflection.

As you move the thumb slides, the numbers change, as the hairlines are located over the reflections, right?

14. Now let's add a frame and look at monocular PD's.

I bisected the bridge and corneal reflection. Looks about right huh?

15. But, but, but what if the frame fits the nose like this, the monocular PD's are different.

16. If the frame fits the nose farther in the other direction the PD's are different yet again.

Now think about a metal frame with adjustable nose pads. How many different ways might the frame have been adjusted at dispensing?

That's why a patient's PD's should be taken with the frame well adjusted and on!

Just think of the way that the lens centering changes as the patient wears the frame and the frame loses its original adjustment. Doesn't vision efficiency change?

17. So, this is a new learning… frames change monocular PD's.

If you go back and look again at the last three slides you can see why they are different, that patient's nose change the way frames are worn and a Pupillometer doesn't measure that.

Which is it? Is the Pupillometer, your mm ruler measurement or the digital measurement the correct one?

Let's wait to answer that question until we have more information.

18. The third new thing to learn is the technique for taking digital measurements with an iPad.

I've listed 6 basic steps. They are:

1. Be fluid and confident
2. Attach or hang FRED
3. Take the Distance PD
4. Take the Near PD
5. Measure Frame Wrap
6. Record results

19. Step 1

As we've learned, adjust the frame well. Be sure that it is straight and the patient is comfortable with the fit.

Then, ask the patient to stand and attach FRED.

Gently nudge the frame reference device (FRED) to as close to center as you can.

Remember, if you keep trying for the exact center and make a number of adjustments the patient will begin to lose confidence.

20. Step 2 – Measure Far PD, Distance Vision Fitting Points

I usually take a PD seated but always confirm fitting height measurements wit the patient standing. That ensures a more normal posture since it takes into account the ways that a patient's height and size affects posture and the way that they view their world.

Hold the tablet straight up and down with the red circle of the tablet's lens at the patient's eye height.

By doing this, it manages height differences between patient and optician.

Smile… That always softens any awkwardness that a patient might feel when getting photographed.

21. The patient stands and looks at a point at eye level across the office. This gets them in to right posture.

Ask the patient to close their eyes and raise the tablet so the patient's eyes are centered in the window. Ask them to open their eyes and look at the red circle, at the iPad camera.

With the horizontal reference line across eye centers, click OK.

The tablet will count, 1, 2, 3 and flash, and take the photo.

Look at this picture, number 1 – patient is standing up straight, good, 2. Perhaps their arms would be better at their sides if you think that this will change their natural posture and 3. Uh oh – the tablet is not parallel to the patient or perpendicular with the floor. And, since the tablet is not high enough, at eye level there would be a parallax error.

Look at number 4, that shows the error created so good technique means that the tablet is perpendicular to the floor and the red circle around the camera lens is at patient's eye height.

22. Jamie, our optician raises the tablet, Roger, our patient looks across the room straight ahead. She asks Roger to close his eyes, then, open them and look at the red circle around the iPad camera lens…

The patient is looking at the red circle on the back of the tablet surrounding the camera lens. You would see the patient's eyes are centered in the window. And, with the horizontal reference lined up with the eyes.

Jamie clicks OK, the tablet will count, 1, 2, 3 and flash, the photo is taken.

Ask the patient to be seated if the measurement looks perfect. The center reference mark should be about or at bridge center, there's good pupil reflexes… if not, take it again, "just to confirm the results".

23. This is what you see.

The patient's eyes, the frame and FRED.

The tablet is held with the horizontal locating line superimposed over the pupils.

When centered touch OK.

24. Here's a photo I've taken of Nancy.

If I touch the screen, I can ensure that each of the locating circles is centered over the light reflections in the pupil and over the reference device, FRED's markings. Then, touch the Arrow in the upper right for the next screen

Now, align the lens boundary lines with your estimate of the lens edge in the eyewire. Notice how the software magnifies the image to make alignment easy. Touching the corner where the horizontal and vertical meet, moves those two lines together, for convenience.

Once you have all edges aligned, touch the next screen Arrow in the upper right.

I've used this video where I have taken far and near measurements so all the boxes appear filled. When you do this, only the Far boxes become populated as well as the tilt.

Let's look closer at the details.

25. Follow me through the numbers, I've covered the Near info so that we don't get distracted.

1. Are **Monocular PD measurements;** from center of the frame's bridge to the corneal reflection, 31/33

2. Are the **monocular fitting heights** – you can see that the left eye is higher in the frame, by almost 2mm

3. Are the **lens' dimensions and DBL**

4. Allows you to set the **depth of the bevel** so that the device understands actual lens size when the frame box lines are placed at inner frame eyewire edges. In this way, you won't have to estimate where the actual edge of the lens stops in the frame. Toggle material, the choices are Acetate, Metal and Nylor as well as a variety of depths for the different frames you carry.

5. Is Pantoscopic **Tilt**; the change of vertical position, of the center reference marker to the temporal reference markers.

OMG, it's a negative number for Nancy.

Yup, that's correct for the way that Nancy wears this large frame and for her posture, The frame has been fitted virtually straight up and down so it clears eyelashes and her cheeks when smiling. So, don't think that the pantoscopic tilt number is always, always 5 or more degrees.

26. Let's talk in more detail about the measurements that you see.

1. Shows the monocular difference of 2mm, good, that seems reasonable and when you look at the eye distances from bridge center and the black and white reference markers, this looks right.

Want PD's measured in 0.5mm increments, in Settings; you can change the calibration to 0.5mm if that works better for your office.

2. Shows a fitting height of 28.1 and 29.8mm respectively; 1.7mm difference for the way that this frame fits. If the frame is not straight before measuring, you can now see how it will change the final numbers.

3. Again, if the frame's "B" is 40mm this also looks right. BUT, I want you to think about how long the progressive corridor should be after all, what might this patient say to you if the reading area ended up at the frame's bottom?

4. Lists the tilt – I know, I know, a minus tilt but this is very possible with large, acetate, flatter fitting eyewear isn't it?

27. Near PD

Touch Near PD and the screen will change. Also, the tablet will be vertical to take the picture.

With FRED in place on the patient's frame, hand the tablet to the patient. Ask them to hold the tablet like their own tablet, a book or a magazine.

Look at the image on the slide.

Have them center their frames on the window and when ready press OK.

Ask the patient to look at the red circle when it appears – it will count 1, 2, 3, there's a flash and the picture will be taken.

That ensures that their eyes are wide open for the photograph.

28. In this video we again locate the reference markers for the light reflection in the pupils and over the frame reference markings. Then, toggle next arrow.

Locate the frame's nasal edges for monocular near PD and lower frame edges for height.

Then, next arrow.

The near vision red locating cross has recorded Nancy's reading line of sight. Now, if I toggle Near PD Design and we can simulate the available area for reading.

This is a 16mm corridor, which I can change to simulate a 14mm corridor and locate the reading area higher up for more available reading sooner.

Record the values on the patient's record.

29. Looking closer at the Near Vision values, here's what we have.

A near PD, number 1, of 27.1 and 29.6 respectively.

The next column, number 2 tells us the inset. Inset is the horizontal distance that the eye turns when changing from far to near vision.

Notice that the inset is different for right and left eye. Could it be the same? Why?

It is different if the patient's dominant eye causes a posture rotation during reading. Some newer free-from progressives allow different near PD's when ordering.

Look at the bottom center, number 3. People have head postures that relate to their dominant eye and Smart Mirror recognizes head posture, the way that patients turn their heads when looking far and near. If these were different, that would mean that Nancy reads with her head turned left or right so that eye converges less than the other eye.

Number 4 shows us that Nancy is holding her reading material at about 40cm or 16 inches.

The small red, cross, number 5, is the position on the lens through which Nancy is reading. Nice to know that, huh!

Having this information allows the use of those few progressives today that allow customizable corridor AND insets or use the reading distance to adjust inset. For example, SEIKO Superior allows custom length and inset; also talk to your lab about other lens availabilities.

Let's get back to the corridor questions.

If I toggle Near PD Design (number 6) to Show, Smart Mirror will add progressive contours for a depiction of the reading position.

30. See the position of the reading point (red cross) within the near checking circle of the ink marks. Now here's a great feature of this tool.

The near checking circle shows that the red cross, the reading point is lower in position.

If I touch corridor length, number 3…

31. I can open the list of possible corridor lengths, 12 to 20mm. Here 16mm is illustrated and reading is at the bottom of the reading area of the reading zone highlighted.

Let's choose 19mm for example and see what happens.

32. Ah, that looks better and we know that increasing corridor length also widens the intermediate.

I also added a yellow circle over the near checking ink marks to better show the near.

Is this the right choice for the reading position? I ask because it suggest that is what is correct but…

33. Higher adds usually make patients want to get to the reading area sooner since they have little reserve of accommodation. They need to read when they need to read. This illustrates a 12mm corridor

You can see that if the lab had used the entire fitting height, the reading would seem too far down. The patient might have said to me, "…with these new progressives, I have to tilt my head up, and look down through the bottom of my lenses – by the end of the day, my neck and back hurt".

So, this suggests that when taking measurements, the right question to ask the patient, "Is the reading area in your current glasses too low in the lens?"

If a patient has a +1.50 add, their reserve of accommodation allows them to read higher in the channel. They may appreciate longer corridors since that also increases the width of the corridor.

You can adjust corridor length on the screen and I call this 'manual intervention'. When ordering lenses you can make the lenses work just right. However, it requires a tool like this to make the right lenses for every patient.

34. Maybe somewhere in between is better – you can test that with their previous glasses marking and estimating where they'd prefer to read.

Here, back at 16mm. This kind of tool makes you a better expert.

By toggling the Corridor Length button (3.) We can choose from a list of corridor lengths so that we answer the patient's reading habits with a very visible and defined solution. In fact, this supports the value of premium lenses in which you can vary the way that the Free-Form lens is fabricated to meet the personal needs of this one patient.

Personalizing a patient's pair of glasses is something only you can do in person. What an opportunity to show how different your skills and office are.

Next, number 4, Wrap Angle.

35. Wrap angle – important for personalized lenses – critical for prescription sports frames. Place the frame

Place the frame "without FRED" on the table, hold the iPad over the frame on the table, about 15 inches away (look at number 1).

Number 2 shows what you'll see, align the tablet angle perpendicular to the frame's top and bottom eyewires so that the bottom or top eyewire blocks the other. Press OK and take a photo.

36. Then using the wrap angle locators set the nasal marker at the nasal bevel edge, then the temporal marker. Do the other lens.

You'll get good at holding the tablet and taking good photos. When ready, touch Done.

Record all these measurements for your lab's lens ordering software screens or when filling out your lab's order form.

37. Next, to make lenses the right thinness, the lab needs an Effective Diameter, which is defined as twice the lens' longest radius. This tool shows a circle around the fitting point and by dragging it with your finger; you can make it the smallest circle that completely encloses the lens at the farthest corner of the frame's opening.

This is the smallest lens that will cut-out for the frame shape considering needed horizontal and vertical fitting requirements.

38. It's time to step back and talk about the gorilla in the room, it happens when digital measuring devices have been introduced in an office.

The most common thing you'll experience is, "the previous PD or the PD I measured with a Pupillometer or, the fitting height, is different!"

I know – I asked myself the same question.

Let me answer that in a number of different ways.

39. Did you know…

1. That PD's change over a lifetime – Yup, they get wider as we age. There are several studies published as recently as 2013, Clinical Ophthalmology or studies about stereovision for virtual reality devices…

2. When patient sit, posture is artificial, standing relaxes them especially if they have to look at something far away. A tablet photo allows a good measurement even when patient and optician are different height.

3. When you ask a patient to hold and look into a Pupillometer, you restrict natural head turn and posture. That changes the centering for some people and they tell us that they have to move just a little to see better.

4. As we saw, monocular PDs change when we take measurements with a frame on. Frame referenced PDs are more accurate.

5. Holding a tablet takes practice so initially we take measurements a couple of times. Then it becomes second nature – in fact less stressful than using a ruler, especially for fitting height.

6. Every new PD is a consideration of old and new. You'll quickly begin to adopt the digital as your expertise increases.

Fitting height is different though, it may require manual intervention. Here's why.

40. Look at the silhouettes on the slide.

Age also changes the need to manually intervene in the final fitting height ordered but the ability to choose the right corridor length minimizes the errors and need for redo.

Reading and therefore, a change to the fitting height is required, whether more reading is done at a desk or when standing. For digital devices is there more reading done at a

computer monitor or on a Smartphone or tablet. And, what about the position or height of that computer monitor or is it a laptop?

Asking questions, illustrating, discussing and choosing the right fitting height celebrates your optical skills. Can't do this with a ruler.

41. So let's review those special considerations where the Smart Mirror helps you shine.

The frame has a large "B" size; the patient's eyes are located high in the cutout.

Adjust the corridor length to be what the patient really needs – don't just let the lab fill the space because the default will be a longer corridor. The lab software creates 3-5mm of vertical reading area, the rest being corridor length.

A 22mm fitting height with 4mm of reading from the frame's bottom means an18mm long corridor. If the patient had a small "B" in their previous eyewear, their new eyewear experience is going to be very different. Ask the questions about reading are location first.

Don't forget to also consider add power – higher adds need shorter corridors, lower adds get away with longer ones.

42. The same opportunity presents itself when a narrow "B" frame has been chosen.

Is this add in the right pace for a +2.25 add wearer? The corridor length is 18mm

43. Or, should it be a 16mm corridor length?

44. Here's 16mm, that looks better doesn't it?

Again, what was the patients experience in their previous eyewear, what do they want to do most with their new glasses – NOW YOU HAVE ALL THE INFORMATION TO MAKE A BETTER DECISION.

45. Now it is possible for a tilt measurement to be negative.

In this case, normal posture and the way that the frame fits, top of bridge, height of tops of the ears… all combine for this effect on the lenses.

How does this happen? Look at number 1., most frames fit like this.

46. In illustration number 2., here's a patient with a flat nose bridge and cheekbones; the frame is adjusted flat up and down to clear the cheekbones.

47. For illustration 3., think about of the new large ‘B’ frames, fit on a short patient (most of their world is above them). The patient has a flat bridge with high, protruding cheekbones.

To adjust the frame, we’d splay the nose pads, then, decrease the pantoscopic angle so the frame clears the cheekbones, especially when they smile.

In the extreme, the frame’s front will have no tilt, in fact it will be tilted slightly out. That’s called retroscopic tilt or negative pantoscopic tilt, and, the tablet will measure it and show it as a negative number.

It’s OK and doesn’t mean that the measurement is wrong.

48. In this slide I’d like to talk about pantoscopic angle versus pantoscopic tilt – *they are different.*

Look at the bottom left illustration. Pantoscopic angle is the angle between the frame front and the temple – there’s no patient here.

Now add a patient… and the tilt angle of the frame front is a combination of the pantoscopic angle and the way that front sits on the bridge of the nose and the temples rest on the tops of the ears. This result is the way that the frame front becomes angled to the horizontal eye axis.

Ok, look at the top illustrations – look at the way that the temples are angled to the frame fronts – they’re all different. It depends on the way the frame fits after you’ve adjusted it and the patient’s posture.

This is the tilt measurement that makes the difference in so many prescriptions. So, use the tilt measurement that you get and confirm it by looking at the patient in their natural posture.

49. Let me change gears here now that you understand how to measure.

Know this person?

I must admit – when I first saw these devices I thought, “I could do the same with a mm ruler, penlight and protractor. Dots work, I can do tilt, I can do wrap… I don’t have time to do this with every patient… I’m and ”

OK, so what!

I quickly understood that the measurements and the use of a highly technical measuring tool became an extension of my own skills and was a good advertisement of my use of new technologies. Patients noticed it.

And, regarding the time it takes – well I suggest that digital or tablet measurements are done for all patients. First, that makes you really fast at it, as expertise develops. It also highlights odd things about the way that frame's fit and lenses are positioned that should be considered.

Lastly, it's very different than the way your patient might order on the Internet when they ask for only for the PD and you can say – Oh, we take 5 measurements to fit lenses. Online can't do what we do when I'm able to fit you personally.

50. Still thinking negative? You're boss bought the tablet and software for you and is asking…

I talked to a number of office owners and they're asking

- Why aren't we doing this 100% of the time? Are you being selective about use? To make it part of the process – measure and record results for every patient.
- Is there some criteria choosing which patient? No criteria, it's important for all.
- Why did I buy this? How do you answer your boss when they believe in technology, changing identity and improving your own skills?
- If one optician is using it, another not, does the patient wonder, "why not me?"
- Don't these help defend our lens design choices? It opens the opportunity for the best of free-form lenses.

51. Look at this infographic from Bain.

Customers increasingly expect a convenient, easy and special experience. I believe that the tablet as a tool does this.

Exceeding customer experience expectations improves revenue and that's because patients become more loyal and tell the story of their experience at your office.

52. Therefore, for the best customer experience…

Marking pen and ruler or use a digital device and augment it by the traditional tools that you've used.

53. Last point about those things you might still be skeptical about.

Like with any new device, the accuracy of the device is in the hands of the holder, the operator – that's you.

Practice, use, and attention to detail, build your expertise. In fact, it's your expertise and skepticism that will make the tablet sing for you and patients.

It's up to you and I have every faith that you'll be proud of the results.

54. You can stop here and take the exam if you're after ABO credits.

Or, for the technically minded, here's an Appendix for the optically inclined.

55. The Far and Near measurements are considered by the Smart Mirror algorithms for solving for PD and Height using the known separation of the reference markers on the frame reference device relative to the frame edge locators positioned by the users and the corneal reflection markers.

For back vertex distance, it is measured through Eye Rotation Center measurements.

Two images are used, far PD and near PD photos to construct stereoscopic information about the eye rotation centers positions. On both photos, corneal reflections are indicated; iPad distance to patient is measured as well as pantoscopic tilt.

Far PD and near PD measurements can be superimposed and, using an average eye size and average corneal parameters, a good approximation of the eye rotation center value "D" is calculated

56. With the known D" value, and the fixed values of the FRED dimensions plus average eye radius and average corneal parameters, the back vertex distance BVD is calculated.