PHOTOGRAPHY
& DIGITAL SMILE
ANALYSIS

MINI ME

Kois Center
ADVANCING DENTISTRY THROUGH SCIENCE

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Collecting patients' dentofacial esthetic data by hand is not difficult, but can be very time consuming. By taking just three photos while the patient is wearing the Facial Reference Glasses in your office, once the patient leaves, you will be able to digitally measure many critical aspects of their dentofacial esthetics. Through the Graphic app, you can layer their photos on top of one another and can calculate whatever data you need. For example, you can calculate their upper lip movement, measure their maxillary cuspid display in repose—even if it is not visible—measure the patient's tooth dimensions and more. This protocol will give you the ability to obtain these data without the patient present, saving you valuable chair time.
**Autodesk Graphic (formerly iDraw)**

1. **Graphic** is an app available on MacOS ($29.99), iPad ($8.99), and iPhone ($2.99). Please note, the iPad and iPhone apps are two separate app purchases. The iPhone app is not needed in conjunction with the iPad app.

2. To purchase, search “Graphic” in the app store (do not include “Autodesk” in the search criteria).

3. Look for the app icon on the right, and click on the price to confirm the purchase and installation of the app.
Setting up the Photography Stand

1. Take the tripod and spread the legs out as far as they can go, and pull the top platform up until it is sticking up straight. Set the tripod on a stable surface so it is standing.

2. Take the iPad Adapter and hold it vertically so the rounded edge is on the top and the upper and lower arms are facing you.

3. Using the buttons that say “Press” found on the top right, below the upper arm and on the backside of the lower arm of the adapter, spread the upper and lower arms of the adapter up and down to their furthest points.

4. Find the screw hole on the bottom of the adapter, under the lower arm. Screw the bottom of the adapter onto the tripod platform. Note that there is a nob underneath the platform on the tripod that you can use to tighten the screw, so you don’t have to turn the adapter to screw it on.

5. Once the adapter is attached to the mount, move the tripod platform down so it is at a 90° angle with the table, by pressing the two circle buttons on each side of the Platform Joint.

6. Remove your iPad from its protective case. Then, take your iPad vertically, and place the lower edge of the iPad onto the lower arm.

7. While holding it in place, push the button on the top right of the adapter and push the top arm down onto the top of the iPad, until it feels like it is secure.

8. To add a grid to your iPad camera to better assist you with aligning the patient’s head while taking photos, go to Settings > Photos & Camera > Grid and swipe the bar so it is green.

9. To get a feel for the setup, take a few photos. Note: You may notice that the setup is a little shaky, so to get the best quality photos, you can plug in your apple earbuds to the iPad and use the + or - volume buttons on the headphone cord as the camera shutter button.
Prepping the Patient

1. While the patient is standing and facing you, have them put on the Facial Reference Glasses. Adjust the glasses so they are level on their face from left to right.
2. Have the patient turn to the side and hold up a mirror for them to look at so you can check their head posture while they are looking straight ahead and ensure the glasses are level with the horizon of their face. If the glasses do not stay level, use gauze placed on the bridge of the patient's nose, under the glasses, to help stabilize them.
3. Have the patient sit in a chair and have them sit up straight.
4. Place the poster board behind them, and have them sit back on it. It may be at an angle depending on its size.
5. Next, put a 3 inch disk of 6 inch diameter foam behind their neck to help them maintain a straight posture and stabilize their head.
6. Ask the patient to adjust their head position until the glasses align with the grid on the iPad's camera.
7. Inform the patient about the type of photos you will be taking and ask them to practice saying “emma.”

Taking the Photos

1. Assist the patient with putting in the cheek retractors.
2. Using forceps, place 1/3 of a cotton roll between their upper and lower right second molars and have them close down on it. The cotton roll is used to ensure there is a gap between the upper and lower teeth so we can later measure their tooth lengths.
3. Make any final adjustments to their head posture so the glasses remain level, aligning them with the grid on the iPad, then take a photo of the retracted view. (Fig. 4)
4. Assist the patient in slowly removing the cheek retractors and cotton while keeping their head as stationary as possible, continually using the grid on the iPad to maintain their alignment.
5. Instruct the patient to say “emma” and take a photo of their lips in repose. (Fig. 5)
6. Ask the patient to give their biggest (Duchenne) smile and take a photo of their Duchenne smile. (Fig. 6)
Downloading the Digital Smile Analysis Template

1. Once the Graphic app is already downloaded onto your iPad, to download the digital smile analysis templates, open Safari.

2. To download the blank template, enter the following URL into the address bar:
   
tiny.cc/sym2017a

3. To download the template with Molly's photos pre-loaded, enter the following URL into the address bar:
   
tiny.cc/sym2017b

4. The links will lead to a Dropbox page, see the image to the right. In the top right corner, please tap “Download,” (4a) and on the dropdown menu, tap “Direct download” (4b).

5. On the next screen, please tap “Open in ‘Graphic’.”

6. You will then be redirected to the Graphic app library where you will see the “Analysis-Template” or the "Analysis-Template-Molly."

7. Tap on the template you want to use to open it.
Importing Photos into their Layers

1. **Background Information:** In this app, there are 9 labeled layers with layer 1 being the bottom most layer and the Measurements layer being the top most layer. The layers are necessary to isolate each step so we can go back and look at one thing at a time. To open the layers panel, tap on the Layers icon in the top right corner of the screen. When you tap on a layer, it will be highlighted in blue, whichever layer is highlighted is the one that you are currently working in, and anything you place on the canvas will go into that layer. To hide and unhide layers, tap the Eye icon. To lock and unlock layers, tap the Lock icon. To close the layers panel, tap on the in the top left corner of the layers panel.

2. Upon opening the template, use two fingers to zoom out of the black rectangular canvas, so you can see it clearly on the gray background.

3. Tap on the Layers icon in the top right corner (3a) to open the layers panel and tap on the 1. Duchenne Smile layer (3b) to select it.

4. Tap the Import Photos Icon (4a) in the toolbar to bring up the Photos Panel (4b). Tap on the Duchenne Smile Photo from your Camera Roll (4c) and it will be placed into the selected layer.

5. Next, tap on the 2. Repose Photo layer to select it, and repeat step 4 to import the Lips in Repose Photo.

6. Then, tap on the 3. Retracted Photo layer to select it, and repeat step 4 to import the Retracted View Photo.

7. To get a feel for the app, practice using the finger gestures and quick buttons, as seen at the bottom of the page. Once you are more familiar with them, press the undo button to go back to where you were at the end of step 6.

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**Finger Gestures and Quick Buttons**

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**Finger Gestures**

- **Use one finger, or a stylus, to tap and select tools and layers**
- **Use one finger, or a stylus to move an object in the layer, or use a selected tool**
- **Use two fingers to move the location of the screen, without moving the objects within a layer**
- **Move two fingers apart to zoom in on the screen**
- **Move two fingers together to zoom out of the screen**

**Quick Buttons**

- **Back to Library**
  - Upon exiting, you can choose “Save,” “Save a Copy,” or “Don’t Save” if hit on accident, touch anywhere on the screen to exit the panel
- **Undo**
  - Undoes the last action
- **Redo**
  - Redoes the last action
- **Delete**
  - While an object is selected, tap on this button to delete it
- **Copy/Paste**
  - While an object is selected, tap on this button to copy it and paste it within the same document or into a different document
Measuring and Calculating the Document’s Scale

1. In the Layers Panel, tap on the Measurements Layer to select it and close the layers panel by tapping the .
2. Tap on the Line tool in the toolbar and then on the bottom left of the screen, ensure the measurement option is selected:
3. Zoom in on the Retracted Photo and draw a line between the centers of the circles located on both sides of the Facial Reference Glasses, points 3a and 3b on the photo below.
4. To adjust the line once drawn, select the Direct Selection tool on the top of the toolbar, and zoom in on each end of the line to adjust it accordingly and ensure the line is directly in the center of each circle. Then zoom out of the photo enough so you can see the measurement displayed in the middle (y).*
5. To calculate the scale, use a calculator to divide the “Actual Length of the Known Reference” (x) (AKA the distance between the circles on the glasses) which 140 mm, by the measurement of the line between the two circles on the glasses as displayed on the screen (y).
   See the \( x \div y = z \) Formula below.
6. Once calculated, tap on the Cog Wheel icon , in the upper right hand corner to open the Settings panel.
7. In the middle of the panel under Layout, tap on Units & Scale.
8. Ensure that millimeters (mm) is selected under both ‘Base Units’ and ‘Display Units,’ and that 1 mm = 1 mm.
9. Tap the textbox in the scale section and enter the scale (z), up to 8 places to ensure better accuracy. If the scale is less than 0, start with the 0 and a decimal.
10. The measurement line should now display the actual length (140 mm). Any measurement taken in this file is now to scale.
11. Tap anywhere on the screen to exit out of the settings panel.
12. Tap on the Layers icon to open the layers panel, and by tapping the Eye icon, hide the Measurements layer.

By using the Direct Selection Tool, you can adjust the measurement line.
With the Direct Selection Tool selected:
1. Tap the measurement line you wish to adjust.
2. A square will appear at each end of the line.
3. Tap and end point and drag it to the desired position.

*If the measurement text is not easily visible, please see page 15 and follow the instructions to change the measurement label settings.

Formula \( x \div y = z \)

\[ x = \text{Known Reference} \]
(In this example, the distance between the centers’ of the reference circles on the glasses is 140 mm)
\[ y = \text{Measurement of the distance in the app from point a to point b.} \]
(In this example, the measurement was 550.361 mm)
\[ z = \text{Document Scale.} \]
\[ 138 \div 550.361 = 0.25074451 \text{ mm} = 0.251 \text{ mm} \]
(The app will round to the nearest thousandths place)
Measure the Length of the Right Maxillary Central Incisor and Cuspid

1. In the layers panel, tap on the **4. Tooth Length layer** to select it.
2. Move the view of the screen down until you see the teeth clearly, you may also want to zoom in a bit.
3. Tap on the **Line tool** in the toolbar and then on the bottom left of the screen, ensure the measurement option is selected:

4. Draw a line from the gingival margin to the incisal edge through the center of the Maxillary Right Central Incisor.
5. Draw a second line from the gingival margin to the cusp tip through the center of the Maxillary Right Cuspid.
6. Select the **Direct Selection tool** in the toolbar to adjust the lines accordingly.
7. The final measurements listed are the lengths of the Maxillary Right Central Incisor and Right Cuspid.
Aligning the Repose and Duchenne Smile Photos

1. In the layers panel, tap the Eye icon to hide the 3. Retracted Photo layer, and the 4. Tooth Length layer (1a). Tap on the 2. Repose Photo layer to select it (1b).

2. Next, on the bottom of the layers panel, slide the opacity level bar down to about 60%, it is not important to be exact. This will better assist you in aligning the upper teeth with those in the Duchenne Smile photo. Then tap the to close the layers panel.

3. Select the Direct Selection tool in the toolbar and tap once on the photo to select it.

4. Then, by dragging one finger or a stylus on the photo, align the upper teeth in the Repose photo to those in the Duchenne Smile Photo. To fine tune the location of the photo, ensure the photo is selected and tap on the Ruler icon on the top right to open the panel as seen to the right. See the photo to the right for further details.

5. Open the layers panel again by tapping the Layers icon. To confirm the teeth are aligned properly, while looking at the incisal edges of the upper teeth, tap the Eye icon a few times to hide and unhide the 2. Repose Photo layer to compare the placement of the upper teeth to those in the 1. Duchenne Smile Photo layer.

6. Once they are aligned, change the opacity of the 2. Repose Photo layer back to 100% by using the opacity level bar on the bottom of the layers panel.

7. To lock the photos in place so they don’t accidentally get moved, tap the Lock icon on the 1. Duchenne Smile Photo layer and on the 2. Repose Photo layer.

For More Precise Alignment

By pressing the - or + icons next to the X and Y axes, the photo will move left and right, or up and down, respectively. Continue moving the photo accordingly until it is adequately aligned with the guides. You can also use this panel to adjust the angle. Manually change the rotation by tapping on the text box and entering a number.
Creating the Duchenne and Repose Upper Lip Outlines

1. In the layers panel, tap on the 5. Repose Outline layer to select it.

2. Tap the Pencil tool in the toolbar (2a). To change the color and make the line more visible, tap the black ring on the bottom left of the toolbar (2b) so the Line Color menu appears. Tap on the white box, and tap anywhere on the screen to exit the line color menu. Next, on the bottom left of the screen, change the width to 4.0 and the Smoothing to 0%.

3. Next, use two fingers to zoom in on the mouth and trace the outline of the bottom of the upper lip in repose. Please note, if you need to move the photo while using the pencil, you can use two fingers to slide the photo to change your view.

4. Next, tap the Eye icon to hide the 2. Repose Photo layer and the 5. Repose Outline layer, then tap on the 6. Duchenne Outline layer to select it.

5. The Pencil tool from the toolbar should still be selected and the settings should be the same, but ensure the color is white, the width is at 4.0 and the smoothing is at 0%.

6. Trace the bottom of the upper lip in the Duchenne smile photo.
Measure the Upper Lip Dynamics

1. In the Layers Panel, tap the Eye icon to unhide the Repose Outline layer.
2. Tap on the Lip Dynamics Layer to select it.
3. Tap on the Line tool in the toolbar and then on the bottom left of the screen, ensure the measurement option is selected.
4. Draw a line from the Duchenne Smile outline to the Repose outline going down the center of the right cuspid.
5. You can adjust your line by selecting the Direct Selection tool in the toolbar and moving the ends accordingly so they line up exactly on the Duchenne smile and repose outlines.
6. The final measurement listed is the upper lip movement at the right cuspid (Duchenne – Repose).
Measure the Display of the Right Maxillary Cuspid in Repose (Visible)

If the Right Maxillary Cuspid is visible (positive display) in Repose:

1. In the Layers Panel, tap the Eye icon to hide the 5. Repose Outline layer, the 6. Duchenne Outline layer, and the 7. Lip Dynamics layer.

2. Then, unhide the 2. Repose Photo layer and tap on the 8. Repose Display layer to select it.

3. Tap on the Line tool in the toolbar and then on the bottom left of the screen, ensure the measurement option is selected.

4. Draw a line from the bottom of the upper lip to the cusp tip of the Right Maxillary Cuspid through its center.

5. Select the Direct Selection tool in the toolbar to adjust the line accordingly.

6. The final measurement listed is the display of the Right Maxillary Cuspid in Repose.
**Measure the Display of the Right Maxillary Cuspid in Repose (Not Visible)**

If the Right Maxillary Cuspid is NOT visible (negative display) in Repose:

1. In the Layers Panel, tap the Eye icon to hide the 5. Repose Outline layer, the 6. Duchenne Outline layer and the 7. Lip Dynamics layer. Then, unhide the 2. Repose Photo layer.

2. Tap on the 2. Repose photo layer and change the opacity level to about 60% at the bottom of the layers panel so you can see the Duchenne Smile below.

3. Tap on the 8. Repose Display layer to select it.

4. Tap on the Line tool in the toolbar and then on the bottom left of the screen, ensure the measurement option is selected.

5. Draw a line from the center of the cusp tip of the Right Maxillary Cuspid to the bottom of the upper lip in Repose.

6. Select the Direct Selection tool in the toolbar to adjust the line accordingly.

7. The final measurement listed is the negative display of the Right Maxillary Cuspid in Repose.
Adjusting the Measurement Line Label

1. Upon opening a document, tap the **Line tool** in the toolbar and then on the bottom left of the screen, ensure the measurement option is selected:

2. Draw a line anywhere on the page.

3. Tap on the **Information icon** in the top right corner of the screen.

4. In the middle, tap on **Label**.

5. On the Label screen, tap on **Text Style** on the bottom.

6. On the Label Style screen, change the **font size** to **25 pt** (6a), the **background color** to **white** (6b), and the **corner** to **6 px** (6c).

7. Tap anywhere on the screen to exit the information panel.

8. All measurements done in this app from now on will use these label settings.