

Experiment HM-16: Form Over Function – Yoga Poses

Protect your Paraspinal Muscles

Lab written with assistance from: Plymouth State University – PhD PT Program

Equipment Required

PC or Mac Computer

IXTA, USB cable, IXTA power supply

Disposable electrodes

Yoga Mat

Optional - Metronome

Subject Attire:

It is important that the subject wear loose comfortable clothing that allows for the attachment of the ROAM onto the low back, and also allows freedom of movement. Bending, stretching, standing and lying down are all part of the exercise protocols that will be used. Comfortable, loose running shorts or yoga pants are a good choice.

EMG Cable Setup

1. Locate the ROAM and disconnect it from the dock.



Figure HM-16-S1: The TA and ROAM EMG.

Electrode Placement

1. Remove the ROAM from the dock.
2. Snap 5 electrodes to the ROAM as shown.
3. Place the electrodes so that the red and black are on the left side, brown and white are on the right side, and the ROAM is in the center.

Leave enough slack on the leads for moving and stretching into the various yoga poses.

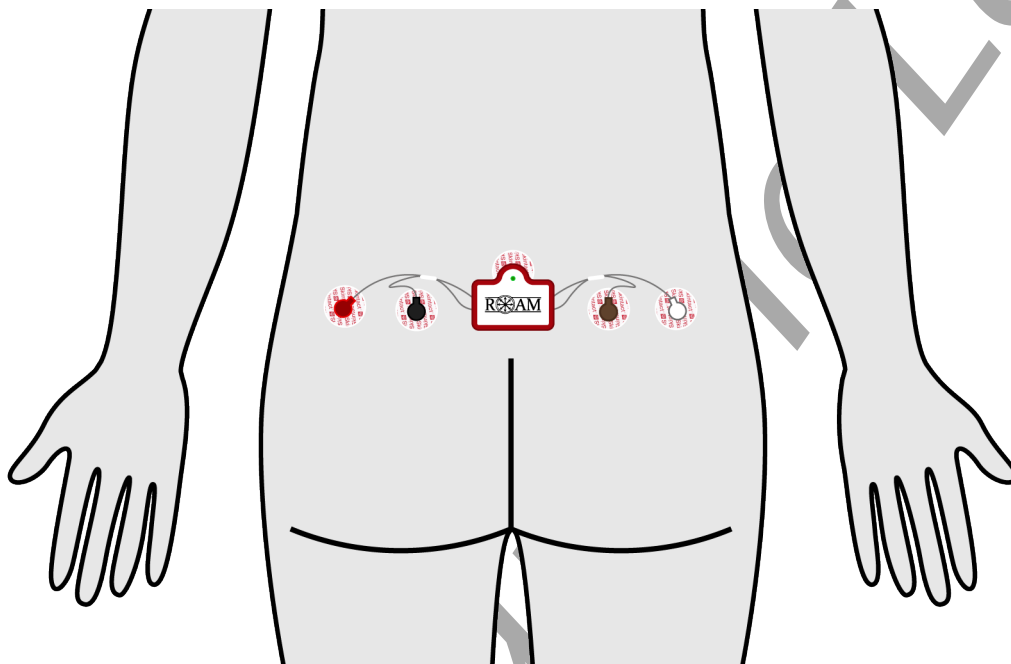


Figure HM-16-S2: ROAM EMG placement on the lower back.

Note – students will need to wear loose fitting clothing and go to the restroom to place the electrodes in the right location.

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NOTE – This lab is looking at proper form for various yoga poses. Incorrect form may result in stiffness or tightness of the muscle groups being worked on.

All of these exercises will be performed using the same steps.

Procedure for all Yoga Poses

- Poses will be held for 4 seconds
- Subject will perform 5 reps

Procedure for each Pose

- **Mountain Pose** – 4 seconds on, 4 seconds relax
- **Cat/Cow** – 4 seconds cat, 4 seconds cow
- **Downward Dog** – 4 seconds in pose, 4 seconds upright
- **Warrior II** – 4 seconds in pose, 4 seconds neutral
- **Child's Pose** – 4 seconds in pose, 4 seconds relax

Instruct the subject that they will be doing the following during this exercise:

- Before the recording begins, the subject should read and understand all the exercises that need to be performed during this lab activity.
- Make sure the subject has no known hip, lower back or knee injuries, issues or problems.
- All exercises will be performed in the same manner.
 - Each exercise will be held for 4 seconds;
 - There will be a 4 second rest period between repetitions (reps);
 - Each exercise will be performed for 5 reps.

Optional - Using a metronome set appropriately for 4 seconds while doing the exercises is helpful.

NOTE: You may need to reposition of the pose does not feel right or the incorrect muscles are being activated. The muscles being observed are the small muscles in the lower back.

NOTE – There are no mathematical measurements for this lab.

Exercise 1: Mountain Pose

Aim: To study the EMG activity in the Paraspinal muscles when doing Mountain Pose

Approximate Time: 15 minutes



Procedure

1. Make sure to engage core muscles and follow the directions as shown in this video [How to Do the Mountain Pose](#).
2. When you are ready to start recording, type the name of the first exercise, **Mountain Pose**, in the Mark box. Instruct the subject to get into position to perform this exercise.
3. Click the Record button. Click on the Mark button to label the recording.
4. As soon as the record button is clicked, have the subject complete 5 reps of the “Mountain Pose” exercise.
5. After the 4 second rest period after the 5th rep, click Stop to halt the recording.
6. Click AutoScale on all channels to show the complete EMG activity.
7. The recording should look similar to what is shown below.

If this position is done correctly, there should be very low activation of the paraspinals. Incorrect posture, such as lumbar arching, no core activation or locked knees will show an increase in paraspinal activation.

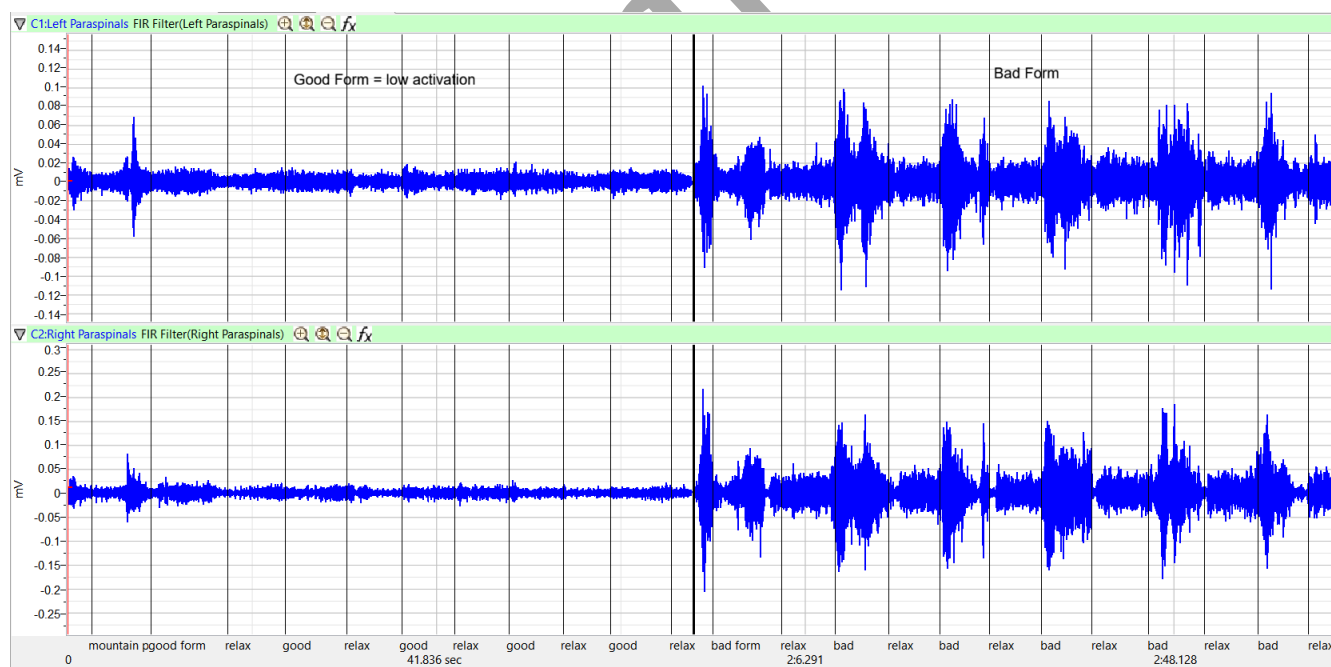


Figure HM-16-L1: Muscle EMG activity as the subject is performing the Mountain Pose.

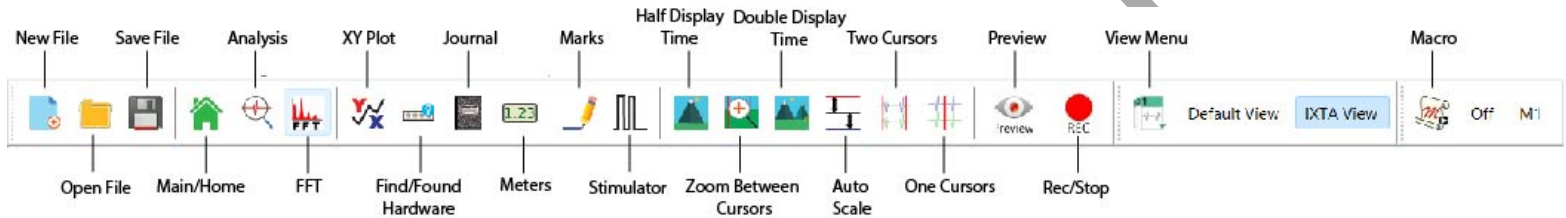
Data Analysis:

1. Click the double display time to see all the reps on the screen.
2. Look at the amount of EMG activity between good form and bad form.

Optional - Data Analysis



- Click the Analysis icon.



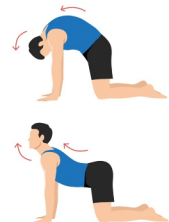
- Click and drag the cursors to either side of the first EMG (muscle activity) burst. Absolute Integral (Abs. Int) is the relative amount of the electrical activity causing the muscle activity and grip strength.
- Repeat for the next EMG burst.
- Compare good form vs. bad form.

Exercise 2: Cat / Cow

Aim: To study the EMG activity in the Paraspinal muscles when doing Cat/Cow Pose

Approximate Time: 15 minutes

1. Make sure to engage core muscles and follow the directions as shown in this video [How to Do a Cat Cow Stretch: A Guide from Physical Therapists](#)
2. Repeat the same steps above.
3. Click AutoScale on all channels to amplify signals. The recording should be similar to Figure 2.
4. Select Save As in the File menu, type a name for the file. Click on the Save button to save the data file.



If this position is done correctly, there should be very low activation of the paraspinals in the cat position. Cow will have higher EMG activity. Incorrect posture, such as hyperextension of the low back will have increased paraspinal activation.

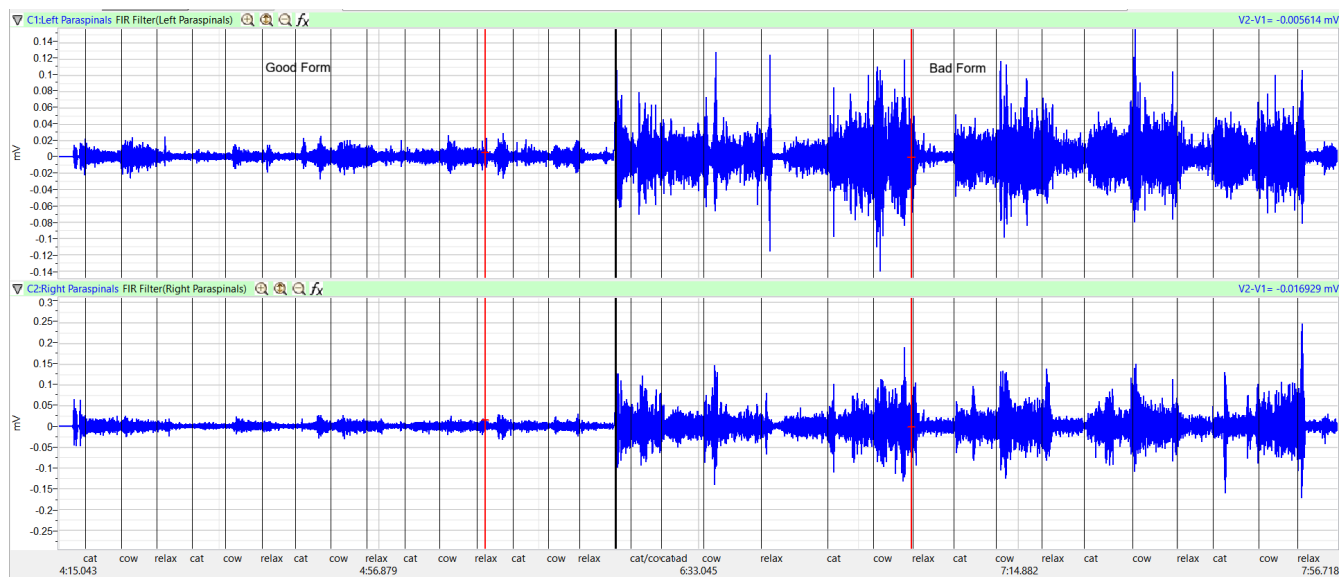


Figure HM-16-L2: Recordings while doing Cat/Cow Pose.

Data Analysis:

Repeat as stated in Exercise 1.

Exercise 3: Downward Dog

Aim: To study the EMG activity in the Paraspinal muscles when doing Downward Dog Pose

Approximate Time: 15 minutes



shown

1. Make sure to engage core muscles and follow the directions as in this video [How to do Downward Facing Dog | Yoga for Beginners Pose Tutorial](#)
2. Repeat the same steps above.
3. Click AutoScale on all channels to amplify signals.
4. Select Save As in the File menu, type a name for the file. Click on the Save button to save the data file.

If this position is done correctly, there should be very low activation of the paraspinals. Incorrect posture, such as rounding of the back or shifting your weight too far forward, will have increased paraspinal activation.

Data Analysis:

Repeat as stated in Exercise 1.

Exercise 4: Warrior II

Aim: To study the EMG activity in the Paraspinal muscles when doing Warrior II Pose

Approximate Time: 15 minutes



Note this is a more complicated pose to try.

1. Make sure to engage core muscles and follow the directions as shown in this video [How To Do Warrior II Pose | Virabhadrasana II Tutorial for Beginners](#)
2. Repeat the same steps above.
3. Click AutoScale on all channels to amplify signals.
4. Select Save As in the File menu, type a name for the file. Click on the Save button to save the data file.

If this position is done correctly, there should be EMG activation of the paraspinals. Incorrect posture, such as leaning forward over the front knee or low back collapse will have a decrease in EMG activity. The paraspinals are stabilizers in this exercise.

Data Analysis:

Repeat as stated in Exercise 1.

Exercise 5: Child's Pose

Aim: To study the EMG activity in the Paraspinal muscles when doing Child's Pose

Approximate Time: 15 minutes



1. Make sure to engage core muscles and follow the directions as shown in this video [Child Pose](#)
 - Note – only hold for 4 seconds
2. Repeat the same steps above.
3. Click AutoScale on all channels to amplify signals.
4. Select Save As in the File menu, type a name for the file. Click on the Save button to save the data file.

If this position is done correctly, with an elongated spine, there should be low activation of the paraspinal muscles. Reaching too far forward, bowing your back, not getting low enough over your heels will increase the paraspinal activity.

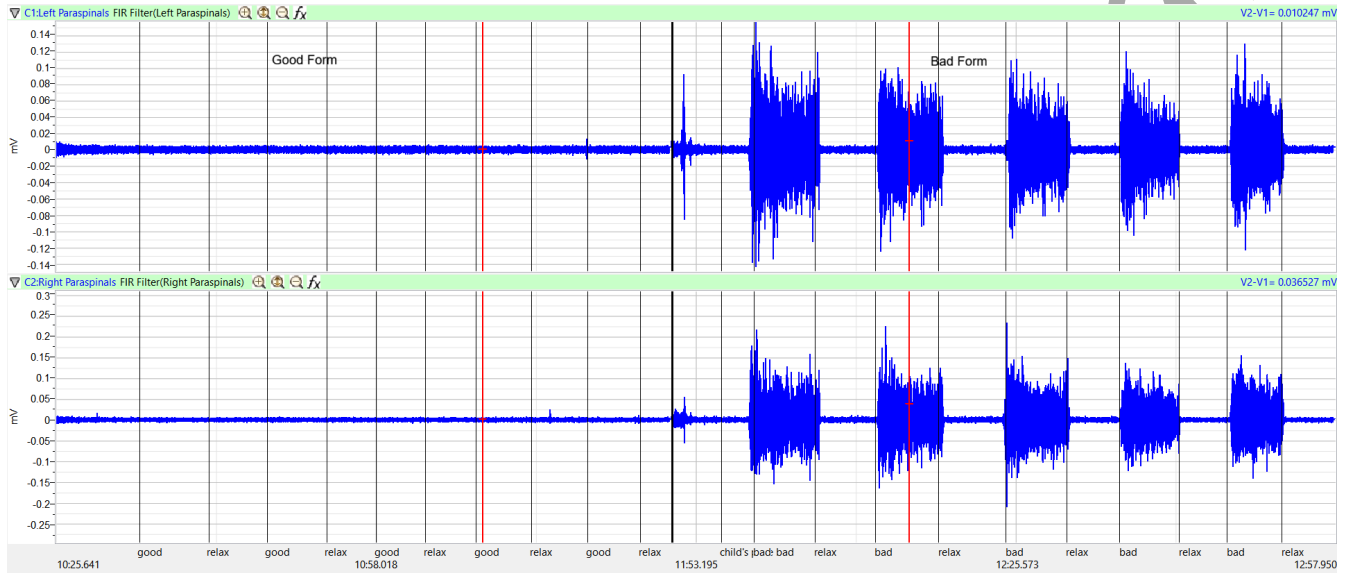


Figure HM-16-L3: Recording during Child's Pose

Data Analysis:

Repeat as stated in Exercise 1.

Questions

1. Why is it important to have correct form when doing any yoga poses or physical therapy exercises?
2. Can muscles be “trained” to work correctly? How would you go about doing this?

Optional Activities:

Move the ROAM unit to the gluteus maximus or the quadriceps muscles to see how these act when doing the poses in proper form. You may need to research how these muscles are activated during the various poses.