

# How Fast can Your Body React?

How fast do you think you are? Do you know what a reflex and a reaction are? This experiment tells all about the quickness of your nervous system and the muscular system, which the nervous system innervates, and uses the Reaction Timer and EMG devices to help you calculate your own reaction speeds!

**Time 1 - 1.5 Hours**

**Difficulty Intermediate**

## What will you learn?

Now that you've been introduced to reactions and reflexes, it is time to plug into our Reaction Timer and test your skills! In this experiment, you will compare reaction times using different stimuli: visual, auditory, and combination!

## Prerequisite Labs

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- [Getting Started with the Muscle SpikerBox](#)
- [How Fast Your Brain Reacts to Stimuli](#)

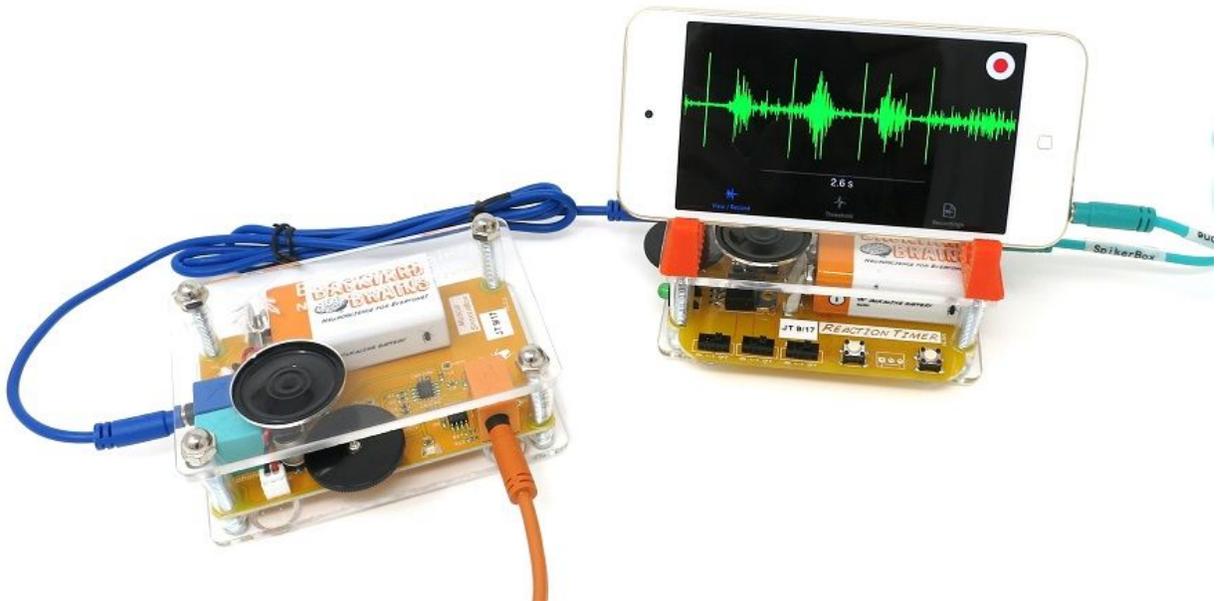
## Equipment

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[Muscle SpikerBox](#)

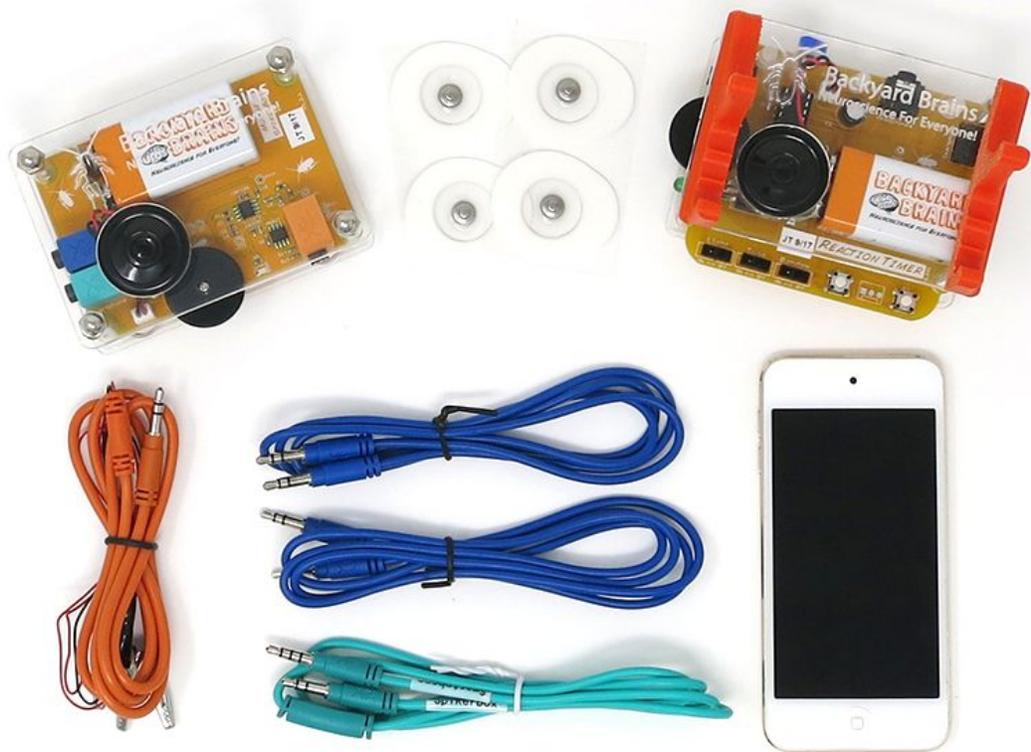
[Reaction Timer](#)

## Step 1: Setting up the Reaction Timer



**Note: The current Android version of the mobile app does not allow for actual calculation of reaction times, just visualizations. For Android users, a computer with our spike recorder app is currently required to measure reaction time.**

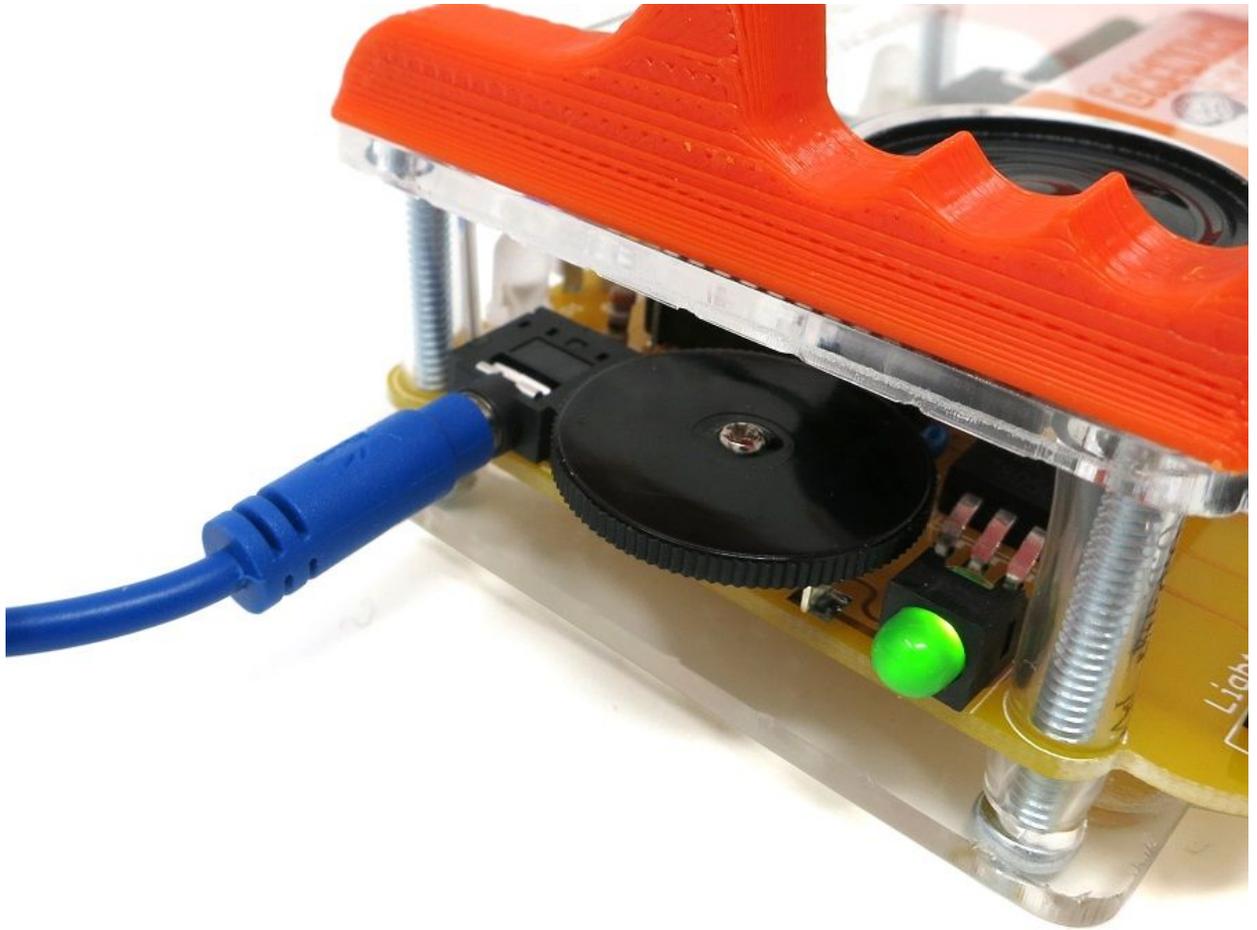
1. Begin by organizing your computer (or mobile device - smartphone/tablet), Reaction Timer, Muscle SpikerBox, and appropriate cables in front of you. You need either one blue Laptop Cable and one green Smartphone Cable, or two blue Laptop Cables.



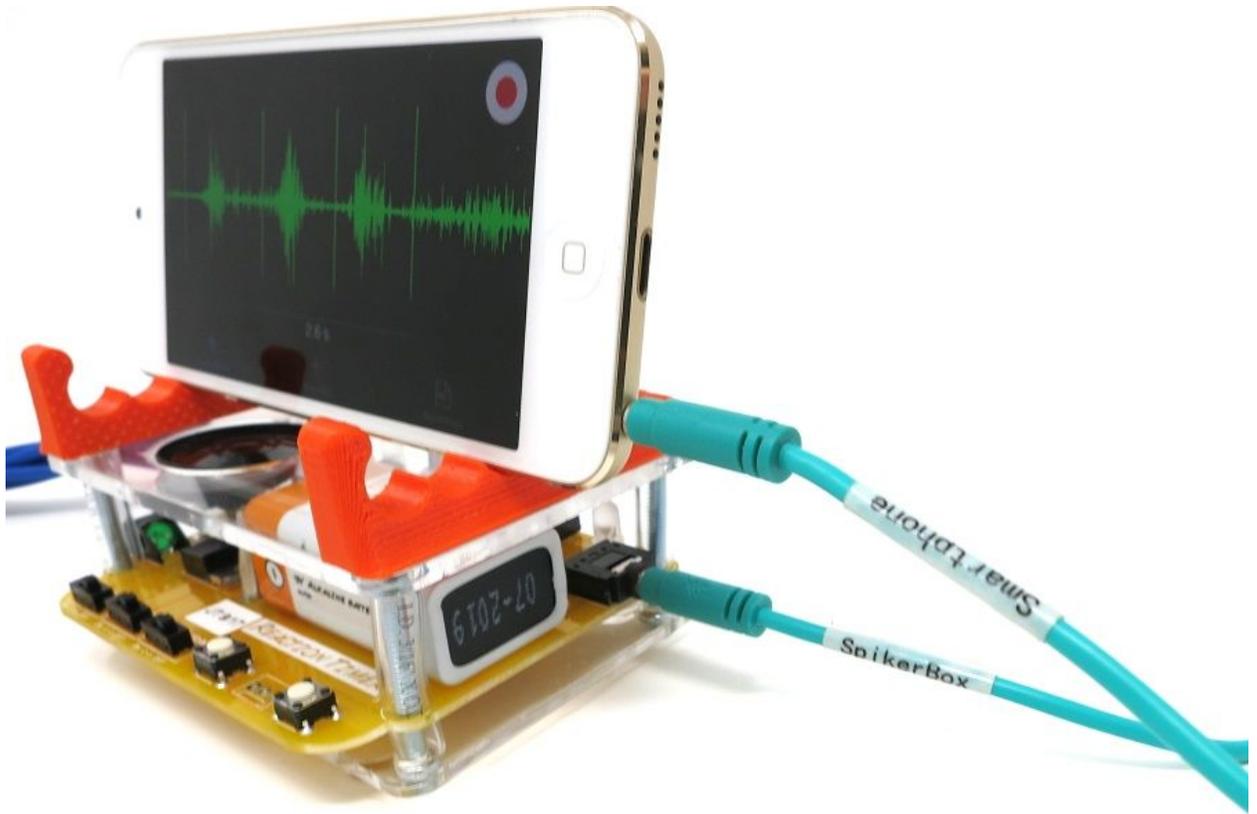
2. **For PC Users:** Use two laptop cables (blue) to connect your Reaction Timer to the Muscle SpikerBox and to your Computer. The first blue Laptop Cable connects from your Muscle SpikerBox to your Reaction Timer's "SpikerBox" port. The second blue Laptop Cable connects your computer's microphone input to the port labeled "Smartphone...." Yea, just trust us. Plug it into the SmartPhone port even when you're using a computer!



3. **For Mac or Smartphone/Tablet users:** Use a laptop cable (blue) to connect the Muscle SpikerBox to the Reaction Timer's "SpikerBox" port.



4. Then connect a Smartphone Cable (green) from the Reaction Timer's "Smartphone" port to your Mac or mobile device (keeping in mind the labels on the cable).



5. Hook an arm up to the Muscle SpikerBox! The two red clips attach to the stickers on the user's forearm, and the one black clip attaches to the sticker on the back of the user's hand.
6. Turn on and test your devices! PC users open up the [SpikeRecorder app](#) and check to see that you are receiving input from your Muscle SpikerBox when you flex your muscles. If the signal is too small, turn up the black volume wheel. If it is too large, turn it down! Adjust until your flexes just barely fill the screen!
7. Next, test the Reaction Timer. Make sure the Light and Tone switches are in the on position, and the random switch is in the off position, and then press the first button on your board! You should hear a sound, see an LED light up, and in SpikeRecorder you should see that a tick mark has been placed in your recording at the exact moment you pressed the button.



## Troubleshooting your set up:

If you don't hear any sounds through the speaker, make sure your the tone switch is in the on position, the black volume wheel is turned up all the way and that nothing is plugged into the headphone jack located in between the LEDs at the front of your board.

If you are not seeing any activity on your recording device, your laptop or mobile device, make sure you are using the appropriate cables. Remember, for Mac and Mobile device users, you need to use a Smartphone Cable which has designated ends: one end for your Muscle SpikerBox, one end for your recording device

## Step 2: Collecting Data

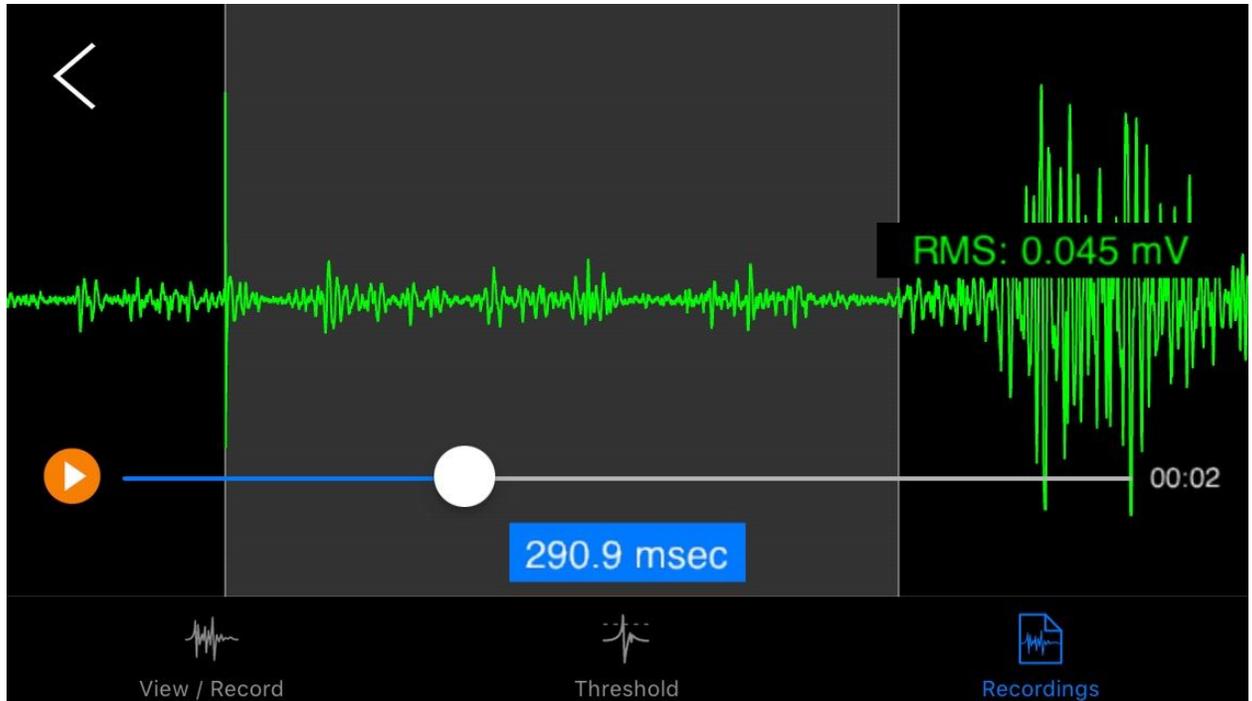
For this step, you will need a partner! One of you will be the controller, the other the subject.

1. Have the subject hook up to the Muscle SpikerBox and direct their attention to the Reaction Timer. Tell them their objective is to flex their muscle as fast as they can in response to hearing a sound or seeing an LED light up. For this experiment we will start with just the sound switched on and the controller will strictly use button 1 (leftmost of the two buttons).
2. Start recording.
3. The controller will press the button 10 times at random intervals. The subject will flex in response to the stimulus as quickly as possible.
4. After the subject's reaction time has been tested 10 times with sound switched on, end and save the recording.
5. Repeat the above steps using light as the stimulus. Then repeat again using both sound and light turned on! You want to end up with three different recordings, each with 10 reactions.

### Step 3: Quantifying Your Data

#### iOS Users

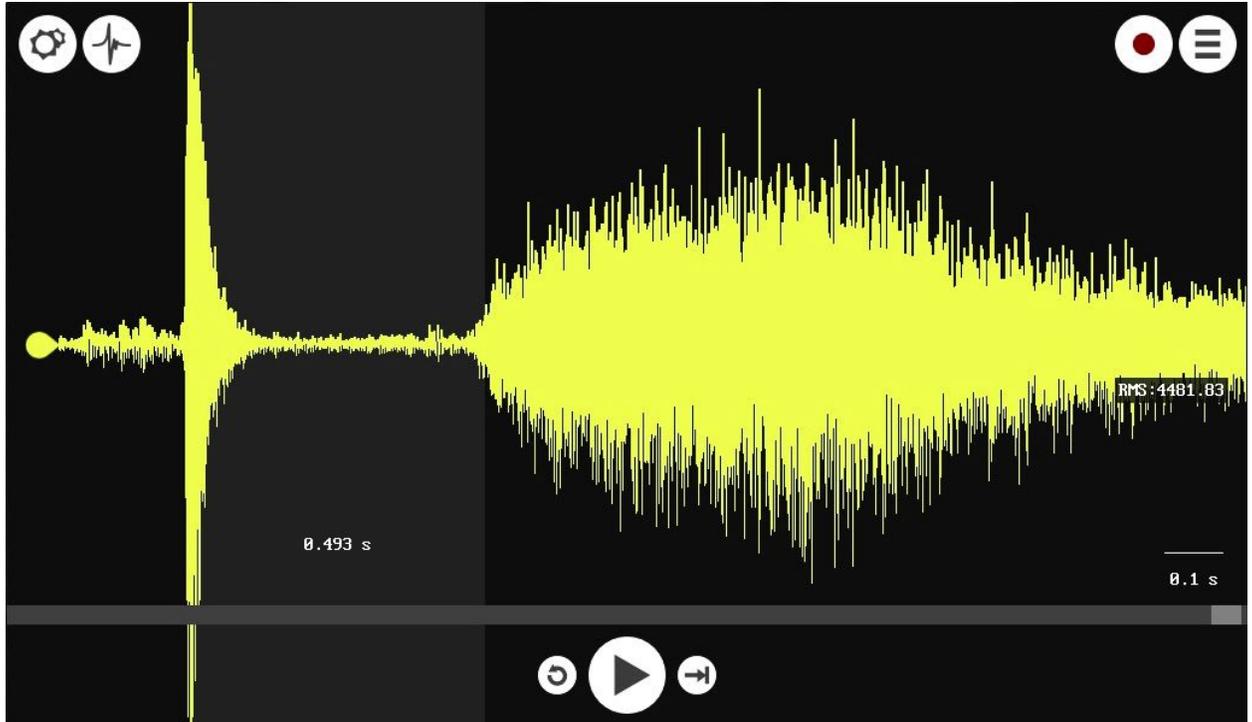
1. Open up your first recording in the app.
2. Search for the tick marks. For each tick mark, click and drag from the tick mark to the beginning of the subject's muscle activity to measure the reaction time. For Apple Smartphones, do this by long-pressing on the screen at the tick mark, then dragging to the beginning of the flex!



3. Record the reaction times and fill in the chart below!

## PC Users

1. Open up your three recordings in SpikeRecorder.
2. To find your reaction times, look for the tick marks which indicate the moment the stimulus was presented to the subject and zoom in on these.



3. Click on the beginning of this tick mark and then drag the box until it reaches the beginning of the flex. Look at the bottom of your screen and you can see the temporal length of your selection in milliseconds. For each stimulus, record the reaction time in the table below.

	<i>AUDIO</i>	<i>VISUAL</i>	<i>BOTH</i>
<i>1</i>			
<i>2</i>			
<i>3</i>			
<i>4</i>			
<i>5</i>			
<i>6</i>			
<i>7</i>			
<i>8</i>			
<i>9</i>			
<i>10</i>			
<i>AVG.</i>			

4. Average your results! Then perform again and again! Change the variables! Test light, sound, random, ...

# Discussion

Talk about your results. Did your subject react quicker to the light, the sound, or the combination of both? When did your subject react the fastest and the slowest? Why do you think you got the results you did? Find more test subjects to create a larger sample size!

Come up with your own ideas! You can take advantage of the different tones and lights in your own experiments. You can also see if different conditions make the reaction times faster or slower. A sleepy subject may be slower than a well-rested subject. Also, where you place your electrodes may make a difference: can you flex your right arm faster than your left? Can you clench your jaw faster than you can flex your thigh? Conduct your own experiments and share your results with us at [hello@backyardbrains.com](mailto:hello@backyardbrains.com)!

## Questions to Consider

1. Why do you think touch and audio stimuli have a faster reaction time on average?
2. What do you think could explain differences in reaction time between different types of stimuli?
3. Would you expect a difference in the average reaction times between a male and female? What about a more athletic person compared to a more sedentary person?
4. Could you redesign the experimental setup to test tactile reaction times?