“Sync” the Shot

Thunder players are some of the world’s greatest athletes. They spend hours building strength, skills, speed, and technique. Their reactions seem effortless. During clutch time they rely on good shooting form which is developed from many hours of practice.

These activities focus on how consistency comes with practice and good form.

Here’s what you’ll need:

- **A meter stick**
- **Five rubber bands**
- **Nine craft sticks**
- **Two plastic spoons**
- **Two identical small soft projectiles like ping pong balls or marshmallows**
- **Journal**
- **Marker or pen**
- **Tabletop**

This activity can be done in the classroom or at home with a partner.

WARM-UPS

Reaction time refers to how long it takes for your brain to process information and then transmit a signal for a response. With proper training your reaction times can be improved.

Ask a friend to help you with this activity if you are doing this at home. Set your elbow and forearm of your dominate hand on the table with your hand hanging off the edge. You want to be able to hold your hand in place without being able to move it downward. Hold your index finger and thumb about an inch apart. Have a friend hold one end of the meter stick where it hangs down vertically between your finger and thumb, but not touching them. Make note of the point on the meter stick that is in between your fingers. Now ask your friend to drop it without any warning, and you are going to close your fingers to catch it a soon as you see it start to drop.

After your partner drops the meter stick, keep record in your notebook the distance between where the meter stick started between your fingers, and the point where you caught it. The smaller the distance that the meter stick fell, the quicker the reaction time. Do this test ten times and record all ten in your journal. Did you see any improvement in your reaction time as the tests went on?

Next switch to your non-dominant hand and try the experiment again. Do you notice any difference in reaction time between your dominant and non-dominant hand?

Use the table at the end of this activity to find your reaction time from the distance on the meter stick.

GAME TIME

Doing things with both hands at exactly the same time takes skill and practice. To prove this, try tapping on the table with one finger from each hand and see if you can hear the difference between tapping with one finger and two fingers.

For this next activity, you are going to use what you now know about reaction times to see how difficult it is to do something that requires precise timing with both hands at the same time.

In basketball, the difference between a win and a loss often comes down to free throws. Having a good free throw percentage is important. Usually players follow a routine at the line so they can shoot their free throws consistently. The shot almost always looks the same: bend the knees, elbow straight, follow through, and swish.

There have only been a few players who tried something different such as the “granny shot”. Granny shots use both hands in an underhand motion that may look kind of silly, but even a NBA Hall of Famer used it to rack up one of the top career free throw percentages ever.

You could go to the court to test this yourself. Shoot 10 or even 100 free throws with your own routine and then shoot the same number with a granny shot and see which type of shot goes in the most. A granny shot takes two hands while a typical shot uses primarily one hand. Knowing what you know about reaction times and how your dominant hand compares with your non-dominant hand, do you think you will be better using one hand or two hands for a shot?

To test this out you are going to build a double catapult that uses both hands to launch two things at the same time. We will see if you can get both hands to work together!

STEP 1: Stack two craft sticks together and wrap them with a rubber band at one end (Stack 1). Repeat this with two more craft sticks (Stack 2).

STEP 2: Stack the remaining five craft sticks together and wrap a rubber band at each end (Big Stack).

STEP 3: Pry open the two sticks from Stack 1 to make a "V" and slide one side of the Big Stack between the sticks as far as you can towards the rubber band. Do the same with Stack 2 on the other end of the Big Stack.

STEP 4: Criss-cross a rubber band where Stack 1 meets the Big Stack to hold both stacks together. Do the same with Stack 2 at the other end of the Big Stack.

Step 5: Place a plastic spoon on the top of Stack 1 where the bowl of the spoon is resting on each stick. Repeat with Stack 2.

Step 6: Attach the spoon on Stack 1 with two rubber bands – one at the top by the bowl of the spoon and one at the other end behind the Big Stack. Repeat with Stack 2.

These make springy levers so when you push down on the spoons and let go, you can launch whatever is in each spoon.

To use the double launcher, you need to load a marshmallow or small ball in each spoon, hold it down on a table with your other fingers, then press down on one spoon with one thumb and the other spoon with the other thumb. Pull your thumbs away so the spoons pop out and up, and the projectiles go flying.

Pro tip: For ultimate consistency, use your fingers to press the launcher down on the table and move just your thumbs to launch. Keep the launcher pressed firmly against the table and have a friend collect the projectiles and reload the catapult so you can keep everything in the same place for the next shot.

Take a few practice shots with each spoon one at a time to see how well they launch. Set up a target "basket" like a trash can or small bucket and try to make it in. If you can hit the target consistently with one spoon and miss consistently with the other the spoon, you can adjust the launch by changing how far the "V" made by the spoon and craft stick is pushed onto the stack of five craft sticks. Take your time with this adjustment, and you can have both launching very close to the same spot.

Once you know how well your catapult can launch things individually, it is time to double the fun. Load up both spoons, with one thumb on each spoon, try to launch both at exactly the same time and see if you can make both projectiles fly from spoon to target side by side. Your brain tells your thumbs what to do, but if the signal going to one thumb is slightly slower than the other thumb, your shots will be out of sync with each other. Tiny differences in timing at the launch can easily be seen as the projectile gets further and further away from each other as they travel.

Try this many times. In your journal create a table to record how far each projectile lands from its target. Look for trends for each launcher or each hand. See how efficient you can get at the double launch.

ANALYZE THEREPLAY

The Warm Up activity shows that your body has some limitations on how fast you can respond and move. The Game Time activity shows just how difficult it is for your dominant hand to act in perfect unison with your non-dominant hand. It also shows how practice can improve things.

When the meter stick fell in the Warm Up activity, a very rapid sequence of events happened. Light travelled from the ruler to your eye, where it was turned into electro-chemical signals that travelled along nerves from one nerve cell to another all the way to your brain.

Your brain interpreted what you saw then sent a signal along different nerves to your finger and thumb, where the muscles picked up that signal and moved causing your finger and thumb to close. This happens so fast you may think it is instantaneous, but in reality, these steps take a tiny fraction of a second. Human reaction time is usually in the neighborhood of 0.15 to 0.30 seconds or between 1/7 and 1/3 of a second.

OVERTIME

Use your launcher to calculate your shot percentage. With your launcher and target, record the number of times you hit the target and the total number of times you launched. Take the number of times you hit the target and divide by the total number of times you launched and multiply by 100 to turn it into a percent to find your shot percentage. For example: In 15 launches, I hit the target six times.

6 divided by 15 is 0.4
Multiply by 100 to get 40.
Your shot percentage is 40%.

Create a routine that you follow every time and see if that improves your shot percentage. An example routine would be something like position your hands carefully on the launcher, your feet shoulder width apart on the floor, relax and take a deep breath, press down with your thumbs, count to five as you let your breath out, and then launch.
Set this experiment aside for a few days and then come back to it to see if you retain any of the skills you developed after time has passed.

COAH'S CORNER

Nerves send impulses through the body extremely quickly. Very fast nerves can transmit messages at 275 mph.

How fast you get the message to your body is indirectly proportional to how far the signal has to travel. Your brain can get a message to your fingertip more quickly than to your toe simply because the signal doesn't have to travel as far.

This means that shorter people, not taller, have an advantage when it comes to nerve conduction velocity. But don't worry, these things still happen faster than you can blink. Even if you grow to be 7 feet tall, you really won't notice any difference.

Your body has nerves that get signals from your brain to your body as quickly as possible. These nerves take short paths in large bundles from your brain, and they don't split off until the signal gets close to the destination. The size and coating of nerve bundles can affect the speed at which nerve impulses travel. In much the same way that a whole team can pass the ball from one end of the court to the hoop much faster than a single player can move, thick bundles of nerves allow electrical impulses to travel more than three times faster than impulses traveling in individual nerve cells.

DO YOU WANT TO KNOW MORE?
Research: Synapse, Neurons, Nervous system, Reaction time.

REACTION TIME TABLE:

Distance	Time	Distance	Time	Distance	Time	Distance	Time	Distance	Time
1 cm =	0.05 s	8 cm =	0.13 s	19 cm =	0.20 s	35 cm =	0.27 s	55 cm =	0.34 s
2 cm =	0.06 s	9 cm =	0.14 s	21 cm =	0.21 s	38 cm =	0.28 s	59 cm =	0.35 s
3 cm =	0.08 s	10 cm =	0.15 s	23 cm =	0.22 s	40 cm =	0.29 s	62 cm =	0.36 s
4 cm =	0.09 s	11 cm =	0.16 s	25 cm =	0.23 s	43 cm =	0.30 s	66 cm =	0.37 s
5 cm =	0.10 s	12 cm =	0.17 s	28 cm =	0.24 s	46 cm =	0.31 s	69 cm =	0.38 s
6 cm =	0.11 s	13 cm =	0.18 s	30 cm =	0.25 s	49 cm =	0.32 s	73 cm =	0.39 s
7 cm =	0.12 s	14 cm =	0.19 s	32 cm =	0.26 s	52 cm =	0.33 s	77 cm =	0.40 s

Pro tip: The table uses the acceleration of gravity to calculate the reaction time from the drop to the catch. Notice the distance between each time interval get larger and larger because the meter stick picks up speed as it falls.

OKLAHOMA ACADEMIC STANDARDS

STANDARD	4th GRADE	5TH GRADE	6TH GRADE	7TH GRADE
LS1.1 and LS1.2 cells	●		●	
LS1.8 nervous system			●	
PS3.1 energy and projectile motion.		●		●