MUSCLE HUSTLE

There is a popular saying that goes, "Success is 90% preparation and 10% perspiration." When it comes to basketball and many other sports, the preparation involves a large amount of perspiration. In order for players in the NBA to succeed, they must be in top physical shape. This includes developing and caring for their muscles! We all know that muscles look cool and make us stronger and faster, but how exactly do they work?

Pro-tip: This activity can be done in a home or in a classroom. It can be done by an individual student, in a small student group, or by a family.

HERE'S WHAT YOU WILL NEED PER STUDENT OR STUDENT GROUP:

- **Rubber bands**
- **Tape**
- **Silverware or plasticware; two butter knives and one fork per project**
- **String or small rope**
- **Scissors**
- **Safety goggles or eye protection**

WARM-UPS

NBA athletes are very muscular. Caring for their bodies and staying in top physical shape is something they dedicate much of their time to during the season and offseason. Their bodies and their muscles are very important to their ability to play the game of basketball.

Caring for muscles and bodies is not just important for star athletes. We need muscles for everything we do, from smiling to going to the bathroom. Even our heart beats as a result of muscles. Muscles can be divided into three groups, and each of these three groups is made up of cells that are specific to the muscle type. **Cardiac muscle** only exists in your heart. It squeezes to push blood out of your heart and relaxes to let blood back in. Your cardiac muscle works constantly and never gets tired. Cardiac muscle cells are fairly rectangular in shape and are narrow and short. **Smooth muscles** exist all over your body and help you do many things involuntarily, from adjusting the focus of your eyes to moving food through your digestive tract. Smooth muscle cells are wide in the center and tapered at the ends. **Skeletal muscles** are attached to your bones by tendons and work to allow you to do everything from taking a deep breath to shooting a basketball, tying your shoes, or running. Skeletal muscle cells are striated, long, and cylindrical. Skeletal muscles are voluntary, which means you actively decide what they will do.

Though all muscles are important and necessary, in this activity, we are going to focus only on skeletal muscles.

Skeletal muscles have fibers that are parallel, meaning they are made of many muscle fibers all going the same direction. To illustrate this, grab several rubber bands and cut them once. The loop shape should now be a line. Pick up one cut rubber band and pull on it. Can you feel the tension as it tries to resist being stretched? Now, lay several of the rubber bands parallel with each other. Try picking up the group of rubber bands by both of the ends. Stretch them. How is this different than stretching a single rubber band? Now you can picture the benefit of having skeletal muscles that are made up of many muscle fibers running parallel to each other.

Notice that even though more muscle fibers, or in this case rubber bands, are added, the action the rubber bands make is always similar. Our skeletal muscles allow us to do all sorts of things. In order to accomplish this, skeletal muscles are paired.

GAME TIME

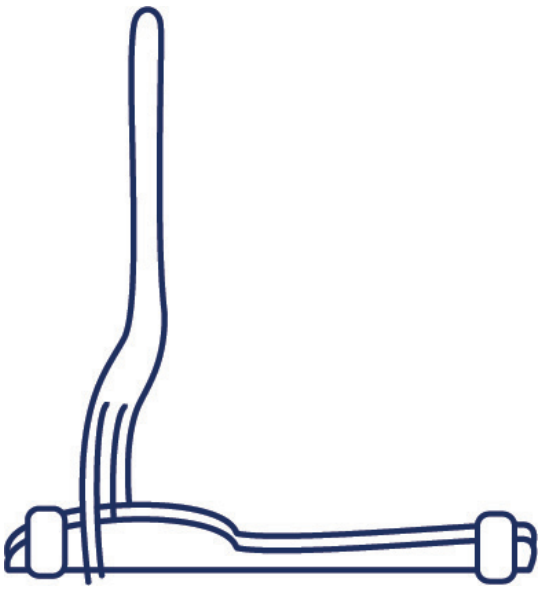
Let's explore how muscles are paired! To do this, pretend you are shooting a basketball. This works seated, but it works even better when standing. Imagine holding a ball in your hands. Lift it up in front of your face. Think about what your skeletal muscles are doing. You are controlling them with your thoughts. Because they are filled with blood and nerves, you can also feel them changing as you move. Concentrate on what your muscles are doing as you slowly shoot the ball through an imaginary hoop.

Shoot the imaginary ball one more time, but this time, focus your observations on your triceps, the muscles on the back of your upper arms. What do you notice?

Using some everyday supplies, let's build a simple model of your arm and these muscles.

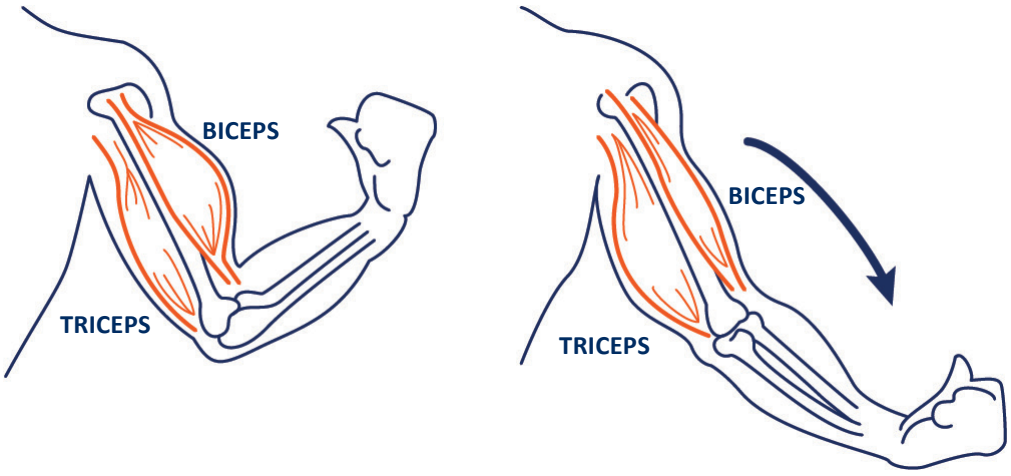
Pro-tip: Though we suggest using two butter knives and a fork, many things can be used. If you are doing this activity at home, silverware works great. If you are doing this activity in a classroom setting, plasticware also works well.

For this activity, we'll use a fork to act as the bone in an upper arm, the humerus, and two butter knives to stand in for the ulna and radius, the two bones of the lower arm. Stack the two knives together. Then, with the curved part of the blades facing the fork handle, thread the knives so they slip through on either side of one of the inside prongs, tines, of the fork. Add a bit of tape at both ends of the knives to help secure them together.



Hold the fork in one hand and the two butter knives in the other. You can rock them back and forth in this configuration. The part where knives meet the tines of the fork acts as a joint.

Next, look at this model of the triceps and biceps of the human arm. These skeletal muscles are balanced.



Notice how the triceps and biceps are located in close proximity to each other but are positioned to perform different tasks. These muscles are paired.

See if you can turn your silverware model of arm bones into a working "arm" by attaching two rubber bands to act as the muscles. Use the diagram of the human arm as a reference for attaching your "muscles". Use tape to hold them in place. Test the arm's motion, and reposition the rubber bands as needed until you are happy with the results.

Pro-tip: If you have a teammate available, it is helpful to hold the rubber band ends in place while your teammate adds the tape.

ANALYZE THE REPLAY
What happened?

Did you find that you had to make several attempts at placement before your contraption worked like an arm?

Pieces of silverware and plasticware are certainly not bones and cannot work exactly like bones.

Did you make adjustments that were different from the diagram?

Were you able to pair the rubber bands so they could do the necessary functions?

What happened when the rubber bands were not paired?

The triceps and biceps are paired skeletal muscles. Your triceps will help you extend your arm, and your biceps will help you bring it back up. Remembering this will help you decide the placement of your rubber band connections and know when your rubber bands are properly paired. One rubber band will stretch much more when the contraption is more open, and the other will stretch much more when the contraption is more closed.

If you had more supplies, what adjustments or alterations would you make to improve the function of the contraption?

Are there any other changes or additions you would make to this model to make it more functional as an arm?

OVERTIME
Let's take it further

Let's scale up the model of the triceps and the biceps. In this model, you will focus on building the biceps, and you will feel the work of the triceps.

With string or small rope, make a loop large enough to go around your chest and tie the loop closed. With another string or small rope, make a similar but smaller loop that can go around your arm at the shoulder. Finally, make a third loop that is large enough to go around your wrist and wrap around one of your fingers. This loop can be of your own unique design, but it will need to stay in place at your wrist without being very tight.

Now it's time to put the loops in place on your body. The assistance of a teammate would be very helpful for the next few parts of this activity. One loop will go around your chest next to the loop that is around your shoulder. Use a bit of tape to connect these two loops. Place the third loop around your wrist and hand.

It's time to protect your eyes. Put on your safety goggles or other eye protection in case a rubber band breaks.

Bend your arm in a "V" and use a rubber band chain to connect the point where the shoulder loop and chest loop meet the wrist loop. Though not necessary, you may also want to use tape to secure the connections.

Pro-Tip: You can make a chain of rubber bands by laying one atop another so they overlap, then looping one rubber band over, through, and under the other rubber band.

The rubber band is now ready to be your example biceps. With your arm still bent in a "V," extend your arm as straight as possible.

Was it incredibly easy to do?

Did the rubber band biceps break?

Could you feel the effort provided by your triceps?

If the rubber band broke, what could you do to make better biceps?

If it was incredibly easy to change the shape of your arm from a "V" to fully extended, what changes would you make to cause your triceps to put forth more work?

Continue making adjustments to your new scaled up contraption until you feel you have become part of a well-paired skeletal muscle system.

COACH'S CORNER

Additional information and explanations for parents and educators

This activity barely scratched the surface of the importance of muscles in our daily lives. Athletes in the NBA take meticulous care of their muscles, from ensuring they get the proper nutrients through their diet to getting plenty of exercise and doing the correct exercises to optimize their muscles for the game of basketball. It is never too early to begin caring for our muscles and bodies. The Oklahoma City Thunder has fun ways to keep up with your fitness at **Thunder Youth Activities | Oklahoma City Thunder (www.nba.com/thunder/youth)**

Muscles are truly fascinating. Understanding their structure and how they work can help us when we are trying to stay in shape or get in better shape. Though this activity focused on our voluntary muscles, our involuntary smooth muscles and our cardiac muscle are just as essential!

DO YOU WANT TO LEARN MORE?

Research: Endomysium, epimysium, fascicle, mechanical system, muscle fiber, perimysium, striated muscle, tendon, tissue

OKLAHOMA ACADEMIC STANDARDS

STANDARDS	5th Grade	6th Grade	7th Grade
Science			
6.LS1.3: From Molecules to Organisms: Structures and Processes		●	
Physical Education			
S2.E4	●		
S3.M14		●	●
SM.M2		●	●