

# Fizzical Fizzicks Resource Guide

Dear Educator:

When you bring your students to see the *Fizzical Fizzicks* show, they'll see circus routines used to demonstrate some principles of physical science, and of motion in particular. Our goal is to instill students with both the thrill of the circus and the wonder of science. We've created this resource kit to provide some basic vocabulary and background information as well as a few simple classroom activities about both motion and the circus arts. Ways to explore the circus arts and the study of motion in the classroom are nearly unlimited. The following pages contain ideas that are fun and easy to try. If you have an activity that you'd like to suggest, we'd love to hear it. Our email address is: [info@fizzicalfizzicks.com](mailto:info@fizzicalfizzicks.com). Thank you for being the daily provider of the spark to ignite children's minds!

Greg and Kristi  
Fizzical Fizzicks

## Vocabulary & Audience Etiquette

### Some Fizzical Fizzicks terms explained:

- **Motion** is a natural event that involves a change in the position or location of something
- **Linear Motion** occurs when something moves from one place to another (changing its location). It is also called translation, locomotion or locomotor motion.
- **Rotation** occurs when something moves around its center (when something spins).
- **Vibration** is our catch-all term for repeating motion. We use it to describe both reciprocating motion and oscillation.
- **Reciprocating Motion** is a regular back-and-forth or up-and-down motion like a piston moving in a cylinder.
- **Oscillation** is a regular motion like the swinging of a pendulum or the vibration of a guitar string.
- **Friction** is a force which opposes motion when two objects touch each other.
- **Air resistance** is the push of air on a moving object.
- **Linear Momentum** is proportional to an object's mass and its speed. An object with more linear momentum (a heavier or faster one) is harder to slow down than an object with less linear momentum.
- **Angular momentum** is a different kind of momentum concerning things which are rotating. Heavy things which are spinning quickly have more angular momentum and are harder to slow down and also harder to tilt or tip over than objects with less angular momentum.
- A **Chinese yo-yo** (or **Diablo**) is a spinning prop that is propelled by the use of two handsticks connected with string.
- A **Rola Bola** is a balance prop that involves a performer standing on a board atop a rolling cylinder.
- **Devil Sticks** are a manipulation prop where one stick is tapped and twirled around between two hand sticks.

### Audience Etiquette:

Remember that a live performance is very different from a recorded performance (T.V. or video). Live performers can hear and see you and can become distracted by any talking or moving around in the audience. If you can concentrate on watching and listening, then the performers can concentrate on doing their very best. Here are a few pointers on being a good audience member:

- there may be points in the show that you want to talk to your friends about, but please save your talking and comments until the performance is over
- if the performers ask for volunteers, remain seated and raise your hand, not your voice (here's a tip: *Fizzical Fizzicks* performers only choose kids who are sitting)
- think about questions you might have for after the show
- if there are volunteers involved, remember to cheer everybody on!

## Possible questions to ask after the show

What was your favourite part of the show?

What was your least favourite part of the show?

What was the biggest surprise in the show?

What looked like that hardest trick? The most fun? The scariest?

Can you name 5 props that were used in the show?

Unicycle, pogo stick, stilts, spinning plates, balls, juggling clubs, diabolo, yo-yo, lasso, mini bicycle, rola bola, etc

What were the most clubs that were juggled by one person? By two people?

5 clubs by one person, 6 clubs passing between two people

What other careers involve performing for or talking to large groups of people?

Teacher, Actor, Dancer, Politician, Musician/Singer, etc

What are the three kinds of motion?

Linear motion, Rotation, Vibration

Can you think of examples of each kind of motion?

linear motion: a car driving along, someone walking, etc

rotation: wheels turning, a sprinkler spinning around, a spinning top, a carousel, etc

vibration: a swing set, a pendulum, waves, bouncing a ball, etc

What is another name for linear motion?

Translation, locomotor motion

What is another name for vibration?

Oscillation, reciprocation

What is another way to say "rotate"?

Spin

How many kinds of motion are possible at the same time?

All three kinds of motion can happen at once.

Why is it easier to balance on your bicycle when it's moving than when it's still?

The wheels resist tipping over while they're spinning (angular momentum)

What does it take to start something moving?

A force; a push or a pull. The force can be from a person, an engine, gravity, the wind, an elastic band, etc. SOMETHING must provide the force.

How long would a ball spin on someone's finger if there was no friction slowing it down?

Forever. There is a little friction between the ball and the air (air resistance) and a lot of friction between the ball and the finger slowing the ball down. If there was no friction the ball would never slow down.

Which team had to work the hardest in the linear motion challenge (throwing a ball)? Why?

The last team had to throw the gigantic ball. The biggest ball has the greatest surface area, and therefore has the greatest air resistance so the last team had to use the most force (effort) to move the ball.

In the first challenge, the time was fixed (everyone had 20 seconds) and the number of throws was variable. In the second challenge, what was fixed and what was the variable? What unit was used to measure?

In the second challenge, the task was fixed (each team had to do the same number of spins and hula-hoops) and the time was the variable. The unit used to measure the time was seconds.

## Science Activities

### 1. Friction:

Have the students rub their hands together quickly for a few seconds. They will notice that they begin to warm up. The heat is produced as friction soaks up some movement energy and turns it into heat. Have the students observe what happens when they rub their hands while pressing them together more strongly and then less strongly. They should find that the changing pressure changes the friction. The students can also observe what happens to friction with wet hands and when soap is applied to their hands.

### 2. Linear motion:

It takes a force to start something moving, and there are lots of ways to provide that force. Have your students work together to come up with different ways to start a toy car moving, and discuss what's providing the force in each case. Some suggestions include: pushing the car with a finger (the force is provided by our muscles), letting go of it at the top of a ramp or just letting go of it in mid-air (the force is provided by gravity), blowing on it (the force is provided by the air pushing on the car), having another car or something else collide with it (the force is provided when the first object's momentum is transferred to the car), connecting it somehow with a stretched elastic band (elastic potential energy), holding a magnet near it if it's a steel car (magnetic energy), or placing the car in or on a vehicle which has an electric motor or a combustion engine (electrical energy or chemical energy).

### 3. Rotation:

One of the concepts explained in the *Fizzical Fizzicks* show is that rotating objects resist tipping over when they are spinning quickly, but they tip over easily when they slow down (they lose angular momentum). This can be demonstrated with spinning tops or hula hoops. Have the students try to balance a top or hoop without spinning it. Spin the hoop or top and time how long it remains stable before it topples over. Hula hoops can be rolled along the floor or spun on the spot. They can also time how long the object stays stable when the force is varied (have them throw it very gently and then with more force).

### 4. Vibration:

A wave is a kind of vibration that allows energy to move from one place to another. Try doing the "wave", the kind of movement seen at sporting events in stadiums. Have each student stand up and sit down in sequence across the classroom. It has the appearance of a ripple of movement even though each person has only moved up and down once. You can also demonstrate this kind of ripple wave with a rope lying across the floor (long skipping ropes work well). Have two students pull a length of rope while resting it on the ground. Now have one student flip one end sharply up and down without letting the rope go limp. You will see a wave travel quickly along it. Have the other student tell you what they experience when the wave reaches the other end of the rope. The students can experiment with ripple waves by using the rope to make a series of waves, waves at the same time, big waves, small waves etc.

## Art Activities

1. Draw or paint a picture or a series of pictures that illustrate the three kinds of motion.

2. Make a painting by moving your brush with one of the three kinds of motion (move the brush in a linear fashion, rotate it, or vibrate it).

3. Make a set of juggling balls (see separate page for instructions).

4. **Linear Motion Art: Make a Straight-Line movement picture**

Materials: 1" X 20" strip and 8 ½" X 11" card stock, scissors, pencil, craft knife and metal safety ruler, crayons or magazines



1. Cut a strip of card stock 1" wide by 20". In the center of the strip glue a picture of something that might move from one place to another (a boat, a car, a person, a ball). The students can draw the picture themselves or cut one out from a magazine.
2. On the 8 ½ X 11 card, cut a 1 inch vertical slit about an inch from the edge of the paper about 3" up from the bottom. Repeat on the other edge.
3. Thread the strip through the slits so that it slides sideways with ease.
4. Decorate the background with colored paper or crayons. Pull the strip and watch your picture move across the page.



## Art Activities



### 5. Rotation Art:

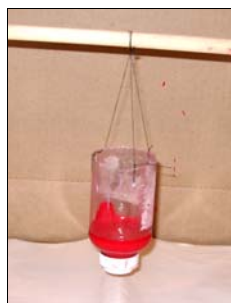
#### Make a design that spins around its centre

Materials: paper, card stock, brass paper fasteners, pencils.

- i. Cut a simple shape from card stock. With a paper fastener, attach one end of your shape to the center of the sheet of paper (you may need to pre-punch a small hole in your card stock in order to get the fastener through).
- ii. Draw around the edge of your shape. Move the shape a short distance and draw around the shape again. Do this until you have a complete circular pattern. Remove the fastener and card stock shape.
- iii. Fill in the design with crayons or markers.
- iv. The finished design will depend how far you move your shape each time. You can experiment by moving the fastener to a different spot on the card and by using regular shapes like squares and triangles.

### 6. Vibration Art: Pendulum project

Materials: for this project you need to be able to suspend a dowel stick about 12" over the art paper. One method is to firmly attach a dowel stick through the sides of a cardboard box. This also helps to contain the paint. You will also need a dishwashing liquid bottle (or squirt bottle with a lid that closes), scissors, thread, paints and paper.

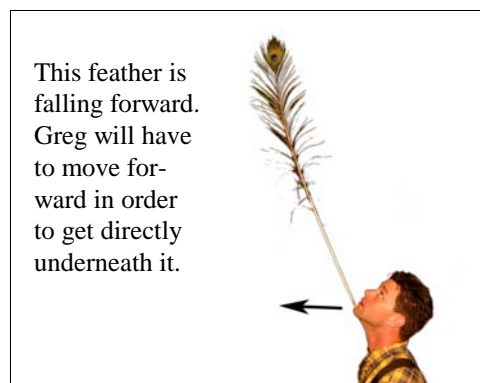
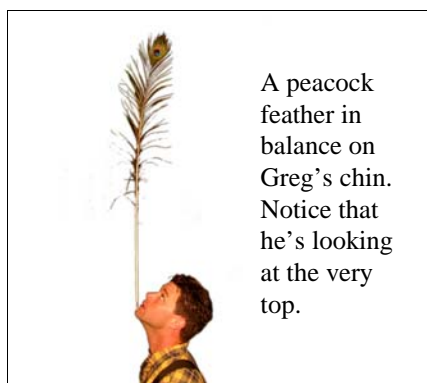


- i. Place a sheet of paper in the bottom of the box. Cut or fold to fit.
- ii. Cut the bottom off the dishwashing liquid bottle. This will be your paint dispenser.
- iii. Make three holes near the cut edge and through these tie three equal lengths of thread about 6" long. Tie the threads together and hang from the center of the dowel so that the bottle hangs evenly. This becomes your pendulum which you center over the art paper.
- iv. Put some paint inside your dispenser (with the lid closed!). When you're ready, open the lid and swing the bottle. Try swinging the bottle in different directions to make a full design. You can add different colors of paint or try shortening one of the threads to get different designs.
- v. Remember the lower the bottle is hanging from the dowel, the more swing it will have.

## How to balance an object

The easiest things to learn to balance are things which tip over slowly. This includes long objects (especially ones with weight at the top) like brooms, hockey sticks, golf clubs, pool cues, etc. and (if you're indoors) very light objects like peacock feathers or balloons on sticks. The light objects are also safer to learn with if you are in a crowd of people.

Start by learning to balance something on the palm of your hand. The important thing when trying to balance something is to ALWAYS LOOK AT THE VERY TOP OF THE OBJECT. You don't have to be able to see your hand. You only need to be able to see the top of the object.



When an object is perfectly balanced on your hand, the object's center of gravity will be directly above your hand. If the object starts falling forward, you must move your hand forward as well until it is again directly underneath the object. If the object falls to the right you must then move your hand to the right. The goal is to always move your hand directly underneath the object's center of gravity. At first most people have to move around quite a bit to do this, but as they get better they can do it without moving their feet. If you are having trouble, remember to always look at the very top of the object.

Once you are good at keeping the object in balance on the palm of your hand without moving around much there are some harder tricks which you can learn. Try switching hands. Pop the object STRAIGHT up and move your other hand into position underneath to catch it. You may have to glance down when you switch hands, but remember to look back up to the top right away. Try switching from the palm of your hand to the back of your hand and back. Try balancing on different parts of your body. Try your elbow. Try your chin or your forehead. Be careful when balancing an object on your nose — if it slips off it may land in your eye. One of the most difficult places to balance an object is on your foot because you must stand on one foot to do it which is a trick in itself and which makes moving around more difficult. It's impossible to maintain a balance somewhere on your body where you cannot see the top of the object (like the top of your head, your ear or your back).

Good luck, have fun, and KEEP LOOKING AT THE VERY TOP!

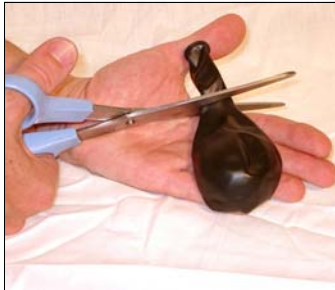
# How to make a Juggling Ball

## What you'll need:

- 1/2 cup of rice
- 1 small sandwich bag (not the zip-lock kind)
- 2 (or more) balloons
- scissors
- a measuring cup



**Step 1**  
Measure 1/2 cup of rice into the sandwich bag and tie it shut.



**Step 2**  
Cut the neck of the balloon right off.



**Step 3**  
This is the hard part. Stretch the balloon open and work it over the rice



**Step 4**  
Keep stuffing that bag in. You may need some help here.



**Step 5**  
Now you have a balloon with a bag of rice inside!



**Step 6**  
Cut the neck off another balloon.



**Step 7**  
Add the second balloon being sure to cover up the hole in the first one.



**Step 8**  
If there is some rubber sticking out, trim it off



**Step 9**  
You're done! To make your bean bag stronger, you can add more balloons.



## Learn to Juggle: Intro

### **Who can learn to juggle?**

By about the age of 10 almost all children in a classroom are able to learn to juggle. Many are ready earlier, but if the whole class is going to learn it is best to wait until the later elementary school years.

### **Why learn to juggle?**

Juggling is a great activity for all kinds of reasons. First of all, it's fun! It is something that anyone can learn. It combines both left and right brain functions as well as using both sides of the body together. It rewards commitment and determination, and it creates confidence. Individuals can continue to challenge themselves by learning new tricks with no end. After the initial stage of learning to juggle is over, juggling becomes a relaxing, almost meditative activity which helps people refocus. Juggling tends to be quite unlike other phys. ed. activities so it can also be a nice way to add variety to gym class; and, of course, it's fun!

### **What do I need?**

Bean bags are great because they don't roll away when they fall (you can't learn to juggle without dropping a lot along the way). There are instructions in this package on how to make beanbags with rice and balloons. Tennis balls are a nice size but are too light to make good juggling balls.

### **Where should I learn?**

You need a fairly open space with room to move around. Gymnasiums are much better than china shops. Outdoors is fine, too.

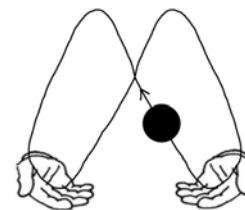
### **So how do I learn to juggle?**

There are a series of steps to learn which lead to three ball juggling. If you take your time and learn each step along the way you will learn to juggle. The first step involves just one beanbag, so set the rest down and turn the page.

## Learn to Juggle

### Step 1

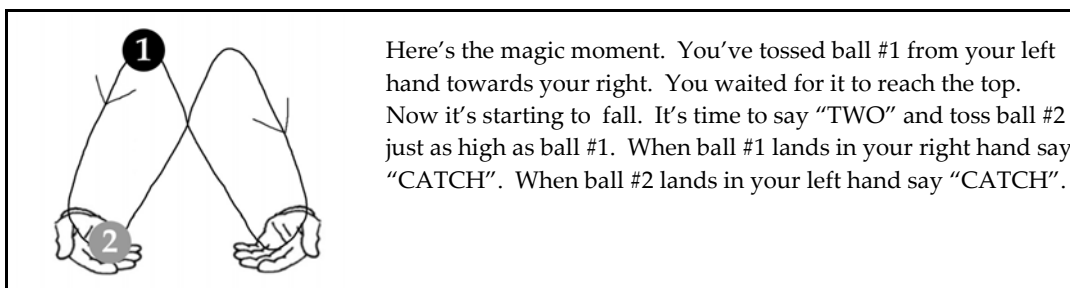
Always stand up when learning to juggle– it is much easier. Stand with your elbows at your sides and your hands held in front of you waist-high with the palms facing up. Practise throwing one ball back and forth from hand to hand. The ball should go a little higher than your head. It's important that the ball goes the same height in both directions. If one of your hands is throwing the ball higher than the other hand, now is the time to correct that. When you can do 20 throws back and forth without dropping or without moving your elbows from your sides, then you're ready for step 2.



### Step 2

Step two uses two balls. This is the hardest step for many people. Start with one ball in each hand. Throw the ball from your subordinate hand (for right-handers that's your left hand) just like before. As soon as you release the ball, say "ONE" in a loud clear voice. When that ball hits its peak and it starts to descend, throw the second ball and say "TWO". The second ball should go underneath the first (rather than around it). Say "CATCH" as you catch each ball in turn. Bow gracefully and accept the applause. Just kidding. Bend over, pick up the two balls from the floor, and try again. Here's some points to keep in mind:

- Really talk! It sounds silly. It may embarrass you in a crowd. Do it anyway. You'll learn faster. Guaranteed. "One. Two. Catch. Catch." "One. Two. Catch. Catch."
- Wait for it... don't throw that second ball too soon. It's not a race. There's lots of time.
- Don't pass across. After throwing the first ball, some people automatically pass the second ball directly into their first hand, ready to juggle in a circle pattern. This is sometimes a hard habit to break. It really helps to make the first throw with your subordinate hand to correct this common problem.



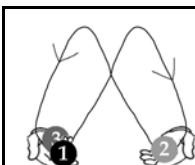
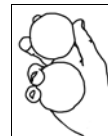
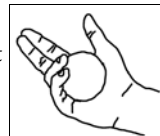
Here's the magic moment. You've tossed ball #1 from your left hand towards your right. You waited for it to reach the top. Now it's starting to fall. It's time to say "TWO" and toss ball #2 just as high as ball #1. When ball #1 lands in your right hand say "CATCH". When ball #2 lands in your left hand say "CATCH".

Once you can do "One. Two. Catch. Catch" most of the time, start practising the exact same thing starting with the other hand first. If you were doing "Left. Right. Catch. Catch." try doing "Right. Left. Catch. Catch". It won't take nearly as long to learn that. Once you can start on either side, continue practising for a while alternating the starting hand each time. Once you've got the hang of that, move on to step three.

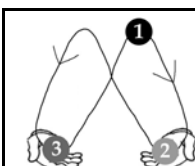
## Learn to Juggle

### Step 3

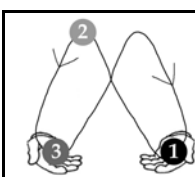
Step three uses three balls. Before you start juggling with three balls, you should take a moment to learn how to hold two balls in one hand. The first ball is pinned against the palm by the two smallest fingers. That leaves the thumb, index and middle fingers to hold the second ball.



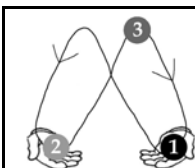
Put two balls into whichever hand you prefer to start step two with (usually your dominant hand). Put one ball in the other hand, holding it normally. For the purposes of this description, I'll assume you're starting with two balls in your right hand.



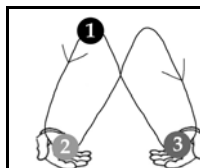
Throw the first ball towards your left hand and say, "ONE". When it hits the top and starts to come down, throw the second ball underneath it towards your right hand and say, "TWO". So far, this is exactly like step 2.



This time, when the second ball hits the top, throw the third ball from right to left underneath the second ball and say, "THREE".



When the third ball hits the top, throw the left hand ball and say, "FOUR".



When that ball hits the top, throw the next ball and say, "FIVE"...

#### Keep throwing and keep counting. That's juggling!

Here's a list of things to keep in mind while learning:

- Turn off your brain. Just relax and try it. You don't have to know exactly how the whole thing works before you throw your first ball.
- Whichever hand is holding two balls needs to make the first throw.
- The balls always go the same height, and always alternate hands (left-right-left-right-left-right).
- Throws always go to the other hand, and always pass underneath the incoming ball
- Throws should go a little higher than your head when you're learning. Throwing too low means fast juggling and throwing too high means the balls tend to be less well aimed.
- Don't get discouraged by drops; you can't learn to juggle without dropping lots of balls.
- Count out loud! It helps you gauge your progress, it sets a rhythm, and it gets your mind off the throwing a little bit. If you prefer, you can say "Right. Left. Right. Left." instead.
- Try not to move your hands forwards and back; keep your elbows at your sides and your fore-arms parallel to the floor.
- If you are throwing the balls forward try practising while facing a wall.