Science in your library with RiAus

RiAus has received some encouraging feedback from the past two library resource packs, and we are thrilled to be able to bring you this third instalment.

This ‘Be Active’ library pack is intended to provide a platform on which you can run a session for children 3–12 years old, and their families. Remember that National Science Week is held each year in August, which may be a great way to embed some science activities into your planning (scienceweek.net.au).

We have suggested two books chosen from the 2014 South Australian Premier’s Reading Challenge list. These can be used as story time readings, supplemented with further discussion and activities that are included as appendices.

We envisage that these activity sessions can be run in two main formats:

1. Formal session: Reading time as a group, followed by a discussion and activity. Selecting a couple of activities should cater for different ages.

2. Informal session: Set up a ‘drop-in station’ which has the books and activities set out. Parents and children can visit in their own time.

You may also choose to print take-home packs for families, rather than running a session at the library. You can download a PDF version of the pack at riaus.org.au/library-packs
Twist your way into this story that is a playful introduction to the world of yoga. There are nine child-friendly poses that are fun to practise and are linked to everyday activities through the unique story. The instructions are easy to follow, encouraging young readers to stretch their bodies and their minds.

**Discussion:**

An important part of yoga is balance! Which pose was the hardest to balance? Like any activity, practicing can make your balance better.

How long can you balance on one leg at the beginning of the session? Try again at the end, and see if there is a difference. You can keep practising at home. Try to balance every day for a week. How long can you stand on one leg at the end of one week of practice?

**Learn about how balance works in Appendix 1**

Balance is an important part of a healthy exercise and fitness program. It helps improve children’s motor skills and body control.

**Extra Activities**

- When you did some of the poses, did you find it easier on one side of your body? **Test your dominant side in Appendix 2.**
- When you wobble and are about to fall over, you will automatically put your hands out so you don’t hit your face. This is your body’s reflex system. **Test your blinking reflex in Appendix 3.**
- You can also train yourself to react quickly to certain situations. This is how sports players get so good at catching and hitting balls! The time it takes between seeing something happen and your body responding, is called your reaction time. **Test your reaction time in Appendix 4.**
- Even a relaxing activity like yoga can elevate your heart rate! **Make your own stethoscope in Appendix 5.**
- **Test your heart rate before and after doing some yoga poses, using the method in Appendix 6.** Is this different to more vigorous exercises?
Willy is kind and gentle, and bullied by the suburban gorilla gang who call him ‘Willy the Wimp’. Desperate to do something about his situation, Willy answers a bodybuilding advert and grows big and strong, determined no one will ever call him ‘wimp’ again.

Discussion:

‘Willy took up weight lifting, and gradually over weeks and months Willy got bigger and bigger and bigger’

To get more muscular, Willy trained hard and had a special diet.

Q) What food was in Willy’s special diet?
A) BANANAS! When people do a lot of exercise, they need to eat more food to fuel their body. Bananas are perfect for athletes because they contain more carbohydrates (the same stuff that’s in breads and pasta) than most other fruit. This makes them a great source of energy. But bananas are not JUST for athletes, everyone can benefit from them. Bananas contain high levels of vitamin B6 (good for your blood-sugar levels) and plenty of potassium (good for your heart). They are also a good source of fibre to help keep your digestive system healthy.

Q) Why did lifting weights help Willy get stronger?
A) Your muscles get stronger and bigger when you use them more, and when you lift heavier things. When you work out, you actually slightly damage your muscle fibres by causing tiny little tears. This is why you sometimes feel sore when you’ve done lots of hard exercise. Your body then repairs these little tears in the muscle, which ends up making the muscle stronger and bigger!

Extra Activities

- Boxing is a tricky sport that needs really fast reaction times. When your opponent throws a punch, you need to react quickly. Do you duck? Side-step? Block the punch? Professional boxers train for hours each week to keep their reaction times fast. Test your reaction time in Appendix 4.

- On the front cover, Willy is going for a run. Do you get puffed out when you run? Maybe you should give it a try. When you exercise your body needs more oxygen to feed your muscles. The amount of air you can take into your lungs is called your lung capacity. Test your lung capacity in Appendix 7.

- When you exercise, your heart beats faster. This is so that your body can pump oxygen through your blood to your muscles. Test how your heart rate changes due to different activities in Appendix 6.

- Box the air in front of you. Try these basic moves: jab, jab-cross and uppercut. Take note of which hand you automatically used first. Is this your dominant hand? Try the other activities in Appendix 2 to test your dominant side.
GO, BORIS! It’s Sports Day and Boris is ready to run like he’s never run before. He wants to beat Eddie, who always wins everything. All Frederick wants is not to come last - again. Who will make it across the finish line first? Ready, set . . .

Discussion:

Look at the drawings of Boris running at the beginning of the book (page 5). How do you think he is feeling?

At first, Boris gets really puffed out and tired when he races against his classmates. When you exercise, you need to breathe faster to get more oxygen to your muscles. The amount of air you can breathe in a single breath is called your lung capacity. Test your lung capacity in Appendix 7.

Q) How does the oxygen in the air you breathe travel from your lungs to your muscles?
A) Oxygen in the air you breathe is transferred into your bloodstream through your lungs. It is carried by your red blood cells. Your heart pumps this blood around your body. When you exercise, your heart must pump faster so that oxygen can be carried more quickly to all your muscles. Measure how your heart rate changes when you exercise in Appendix 6.

Extra Activities

- Watch this video of the beginning of a race (you can skip to 4min 30sec).

Notice how quickly the athletes have to start once the pistol sounds? The time between when they hear the pistol, and when they start running, is called their ‘reaction time’.

Usain Bolt Wins Olympic 100m Gold - London 2012 Olympics
YouTube user: Olympic
URL: youtube.com/watch?v=2O7K-8G2nwU

- Athletes train for hours every week to improve their reaction times. Test your reaction time in Appendix 4.

- Reflexes are even faster than reaction times! Learn about reflexes in Appendix 3.
INTRODUCTION: What is balance?

You feel balanced when your weight is distributed evenly around the part of your body, or object (like a bike), that you’re using to support yourself.

To achieve a sense of balance, your brain uses information from three main sources:

1) Your eyes
Your brain gets information from your eyes to tell it what direction you are moving, and how fast you are moving.

2) Body awareness:
Your body’s sense of where it is in space
This is your body’s ability to know where your limbs are in relation to the rest of your body. You know what position your arms are in, for example, without having to see it. Your brain needs this information to know what your muscles have to do to keep you balanced (ie to keep your centre of gravity).

FACT: ‘Proprioception’ is the scientific term for your body’s sense of where it is in space.

3) Your ears
Your inner ear (deep inside your ear) contains tubes that are filled with fluid. When your head moves, the fluid inside the tubes also moves. This tells your brain how fast your head is moving and in what direction. Nerves connected to the cells in your inner ear pass information up to your brain as electrical impulses.

Your brain collects all this information and then sends instructions back to your muscles, making them adjust so that you keep your balance even when you’re moving.

Practice makes perfect

The more you practice balancing, the better you get. This is because your brain gets more experienced at interpreting the information from your eyes, body and ears. You also become more sensitive to little wobbles, as your brain processes the information faster and more accurately and tells your body how to adjust.
EXPERIMENT: Test your balance

Test your balance by interfering with the three senses listed on the previous page.

**Your eyes**

1. Mark a spot on the ground about two metres in front of your feet.
2. Stand on one leg and focus on the spot.
3. Using a watch with a second hand, time how long you can stand on one leg before you lose your balance.
4. Close your eyes (or use a blindfold) and try to stand on one leg again. How long before you lost your balance this time?

**Body awareness**

5. Lean forward slowly while you stand on one leg. How long before you lost your balance this time?

Your body has to adjust to your weight shifting as you move, which in turn shifts your centre of gravity. You might notice that you naturally move your arms and lifted leg into different positions as you lean. This is your body trying to re-position your weight evenly above your grounded leg. Once you lean too far though, there is nothing your body can do to stop you overbalancing.

**Your ears**

6. Spin around in a circle three times. Now try to stand on one leg. Can you do it for even a second? You may notice that you can’t even stand still on both legs!

When you spin, the fluid in your ears begins to slosh around to tell your brain that you are moving. When you stop, the fluid keeps moving for a little while.

You feel dizzy because your eyes are telling your brain that you are standing still, while your ears are telling your brain that you are still moving! This is very confusing for your brain, and it can take a while before you regain your balance.

► Keeping your eyes focused on something stationary, when balancing, makes it easier to keep yourself stable, as this enables you to see when you are moving, compared to the thing you’re looking at.

► Having good strength in your core muscles (the muscles around your tummy and back) can help you keep your balance by preventing little wobbles, and holding your body in a stable position.

► You can demonstrate how the fluid in your ears keeps moving with a half-filled clear water bottle with water.

Hold the bottle on its side, and swoosh the water around. Note that the water keeps moving for a while once you stop moving your hands.
DISCUSSION: Tightrope Walkers

Can you imagine the balance you’d need to be a tightrope walker? Watch the video below of high wire artist Nik Wallenda walking on a tightrope across a gorge in Arizona.

Nik Starts His Grand Canyon Walk | Skywire Live
YouTube user: Discovery
URL: youtube.com/watch?v=b7d47IEg32E

Q) Why do you think he is carrying the long pole?
A) Tightrope walkers use really long heavy poles to help keep their weight balanced directly over the rope. If a performer leans too far to one side, they can shift the pole in the opposite direction to help to balance their weight. The pole also lowers their centre of gravity, which makes it easier to balance.

EXPERIMENT: Use your arms as a tightrope pole

1. Use masking tape to create a long, straight line across the room (you could also use a low wall/ledge if available).

2. Walk across the line keeping your hands pinned to your sides. Was it hard to stay on the line?

3. Now walk along the line with your arms stretched outwards. Was it easier to balance?

FACT: Cats use their tails in the same way that tightrope walkers use their pole! They can easily walk along narrow ledges and walls by using their tails as a counterbalance.
INTRODUCTION: What is dominance?

Most people are already familiar with side-dominance, particularly in relation to our hands. From a young age you know whether you are left-handed or right-handed based on your preference for writing, throwing a ball and other motor-skill tasks.

How far does side-dominance go? What about your feet? What about your eyes and ears? We’ll find out whether people generally like to do things with a particular side of their body.

Note: This activity requires children to know their left from right. If you are doing this with young children, it may be worth doing a quick refresher on left and right sides.

EXPERIMENT: Test your dominant side

*Modified from Scientific American

Materials:

- A pen or pencil
- Paper to write your findings
  NOTE: If you are doing this in a group, a whiteboard or butcher’s paper would work well.
- An empty tube (an old paper towel tube is good)
- A cup of water
- A ball
- A telephone or sea shell
- A coin

Method:

1. Draw a data table on your piece of paper, with each person’s name along the top. Going down the left-hand side of the paper write ‘Hand’, ‘Foot’, ‘Eye’ and ‘Ear’.
2. Perform the following tests, recording your results in the table on the next page.
  NOTE: This activity works well in pairs, with one volunteer setting up the experiments and recording, and the other volunteer being the ‘study subject’. It also works with an adult giving the instructions, and a group of ‘subjects’ performing the tasks.

FACT: Some people are ambidextrous, meaning they can use their left and right sides with equal skill. This is very rare. Only 1% of the population is ambidextrous.
**Hand Dominance Test**

Ask each volunteer to:

- Take a drink of water from the cup.
- Write their name.
- Throw the ball with one arm.

Which hand did they use the most? Record ‘Left’ or ‘Right’ in the data table in the Hand row, under the volunteer’s name.

**Foot Dominance Test**

- Place a coin in front of the volunteer. Ask them to step on the coin.
- Soccer kick the ball to the volunteer. See which foot they use to stop the ball with, and which foot they use to kick it back.
- Ask the volunteer to walk or run around the room, until you tell them to HOP on one leg.

Which leg did they use the most? Record ‘Left’ or ‘Right’ in the corresponding box.

**Eye Dominance Test**

- Ask the volunteer to look at a distant object through the empty tube.
- Ask the volunteer to wink.
- Ask the volunteer to look at an object through the microscope.

Which eye did they use the most? Record ‘Left’ or ‘Right’ in the corresponding box.

**Ear Dominance Test**

- Give your volunteer the telephone or sea shell, and ask them to listen to it. Which ear did they use?

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<table>
<thead>
<tr>
<th></th>
<th>Lisa</th>
<th>James</th>
<th>Tania</th>
<th>Ben</th>
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<tbody>
<tr>
<td>Hand</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Foot</td>
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<td>Eye</td>
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</tr>
<tr>
<td>Ear</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
TEST YOUR DOMINANT SIDE [CONT]

DISCUSSION:

For each person, decide which is their dominant side – what was the most common side overall?

What is the most common side for the whole group?

In the wider population, about 90% of people are right-handed, 80% of people are right-footed and 70% are right-eyed.

In this activity you probably saw that if you are right-handed, you are probably also right-sided overall. But this isn’t always the case. Sometimes a right-handed person may actually prefer to use their left side for other activities, such as to see and to hear. Are there any people in your group that prefer different sides for different tasks?

What is 'sidedness'?

Your brain is divided into two sides; a left hemisphere and a right hemisphere. Different parts of your brain are used for different things, and many parts can work together at once.

When you are doing certain activities, such as reading, one side of your brain will usually work harder than the other. The side working the hardest is tied to using a certain side of your body.

The side of the brain that you are using to perform a task often links to the opposite side of your body. For instance you might write with your left hand, but the right hemisphere of your brain is actually doing most of the work.

FACT: If part of one hemisphere is damaged when a person is young, the other side of the brain can often adapt and compensate so the person can still function normally.

APPENDIX 2

Does it run in the family?

Sometimes sidedness can run in families. Try to find volunteers from different families and then group your results by family. Do different families have similar or different side-preferences? It may be fun for the kids to try this at home with their family, to see how similar they are.
TEST YOUR REFLEXES!

EXPERIMENT: Test your blinking reflex

This experiment will show how our eyes react automatically by blinking to protect us from physical damage.

Materials:
- A window or clear door
- Some light/soft objects (scrunched up paper towels, small stuffed toys etc)
- 2 volunteers

Method:
1. Send each volunteer to a different side of the window or door, so that they are facing each other through it.
2. Ask one volunteer to throw a soft object at the second person’s face.
3. Carefully watch to see if the second person blinks, or even moves their head.

DISCUSSION:
Have you ever touched something really, really hot? What happened? You probably pulled your hand back very quickly. You would have automatically pulled back your hand, before you even realised what was happening!

Our reflexes protect us from harm by automatically causing your body to react without having to think about it. This saves time, which is very important in dangerous situations. Reflexes are very difficult to override.

In this experiment, the person showed what is called a ‘blink reflex’. When your brain registers something coming towards your face, it automatically sends a message to your eyes to blink. This is to protect your eyes from being damaged. Even when a person knows logically, that there is a barrier stopping the object, like a window or door, they will still tend to blink.

FACT: The messages that get sent through your nervous system are electrical impulses!
**INTRODUCTION: What is a reaction time?**

Think about when you catch a ball. The time it takes from when your eye first sees the ball coming, to when your arm reaches up to catch it, is an example of reaction time.

When you see the ball, messages get sent from your eyes to your brain through your nervous system. Your brain then processes that information and sends more messages back to your arm, telling it to reach for the catch.

This is not instantaneous, but is still very quick. You can train your reaction times to be quicker. Athletes may spend hours practising every week to improve their reaction time.

This activity will use a simple experiment (the ruler drop test) to study reaction time.

**EXPERIMENT: What is your reaction time?**

**Materials:**

- 30cm ruler (or use the longer ruler template on page 16)
- Volunteers
- Table
- Chair

**Method:**

1. Ask your first volunteer (the catcher) to sit in the chair next to the table, with their elbow resting on the table, but their forearm extending off the edge.

2. Ask them to hold the bottom of the ruler between their thumb and index (pointer) finger, so that the ruler extends vertically above their hand. The number ‘30’ should be at the top of the ruler, and their fingers should be just below the ‘O’ mark.

3. Ask your second volunteer (the dropper) to hold the top of ruler. The catcher should now release their grip, but ensure their fingers are still just below the ‘O’ mark.

**NOTE:** Your reaction time is different to your reflexes (Appendix 3). A reflex is an involuntary response to something, usually to protect your body. It occurs much faster than a reaction, because there is no conscious thought-processing involved. A reaction is a voluntary response, that can be trained to be faster with practice.
4. Ask the catcher to prepare to catch the ruler between their fingers, and that the ‘dropper’ could drop the ruler at any time.

5. Drop the ruler.

6. If your volunteer catches it, record the number on the ruler displayed just over their thumb. The lower the number, the faster their reaction time.

7. Conduct several trials with the same volunteer.

8. Use the reaction time ruler on page 16 to convert centimetres (where the volunteer pinched the ruler) to their reaction time in seconds.

9. Record the results in a table like this one:

<table>
<thead>
<tr>
<th>Volunteer Name</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
<th>Trial 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lucy</td>
<td>32cm = 0.26 sec</td>
<td></td>
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</tr>
<tr>
<td>Ben</td>
<td></td>
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</tbody>
</table>

10. Repeat the experiment with at least one other volunteer catcher. Did your times improve?

**DISCUSSION:**

‘Practice makes perfect’ is scientifically accurate in this experiment!

When we practise a skill, we can get faster and better at it. This is because our brain and nervous system learns from repetition. If you repeat a certain task, your brain actually increases the number of neurons that are dedicated to that task.

You can think of neurons like a network of roads, along which information travels between your brain and body. The more neural pathways you have, the faster information can travel (just like lots of roads between destinations makes travel faster).

This is why your reaction time improves with practice – the more practice you do, the more neural pathways are available to transmit information. This means that the time between when you see the stimulus, (in this case the ruler drop) and your ability to react (by pinching your finger) is reduced.

**FACT:** An athlete’s reaction time to the starting pistol in a short distance running race could mean the difference between first and last place!
► Cut the ruler out and stick the ends together on a cardboard backing. You can then use this ruler to convert your reaction time from centimetres to seconds.
FACT: Notice that the neurons have many branches. This allows them to make lots of different connections to other neurons, creating a network for messages to be sent as electrical signals.
INTRODUCTION: What is a stethoscope?

Have you ever been to see the doctor, and s/he listened to your heart beating? S/he would have used a stethoscope to help to clearly hear your heart.

Stethoscopes used by doctors have a chest piece, rubber tubes and earpieces. The chest piece consists of a diaphragm and bell which amplify the sound of the heart beating so the doctor can hear it.

Materials:

- Kitchen roll tube
- Gaffer tape
- Small plastic funnel (these are very inexpensive from discount / $2 shops)

Method:

1. Try to hear a friend’s heart beat with just the kitchen roll tube. Place the tube over your friend’s heart and listen from the other end. Can you hear their heart beating? 
   **NOTE:** Remember that the heart is positioned just to the left of the middle of your chest.

2. Tape the funnel to one end of the kitchen roll. There should be no gaps or spaces where the tube and funnel are taped together.

3. Listen to your friend’s heart again. Does it sound clearer? 
   *You must press the funnel firmly into your friend’s chest, so that there are no gaps around the funnel’s edge.
   **NOTE:** Thick clothing may make it difficult to hear the heartbeat, as can noise in the room.

DISCUSSION:

Sound is made up of vibrations which travel from the object making the noise, through the air, and to your ears.

When your heart beats, the vibration of this movement travels through your chest and hits the funnel in your home-made stethoscope. The sound then travels through the air in the cardboard tube until it reaches your ear.

The heartbeat is amplified by the funnel, which prevents the sound from spreading out in all directions and forces it through the narrow tube. As the sound vibrations bounce through the tube, they overlap and become bigger. By the time the sound reaches your ear it has been amplified, and will sound much louder.
WHAT RAISES YOUR HEART RATE?

EXPERIMENT: Test your heart rate

Materials:

- Stop watch
- Calculator
- Pen/pencil
- Notebook/paper
- Simple exercise equipment - skipping rope, bicycle, ball, hula hoop etc.
  NOTE: You could use a heartrate monitor instead of a stop watch and calculator.

Method:

1. Determine your partner’s resting heart rate. To do this, locate a pulse point on the person’s wrist after they have been lying still for a few minutes.
   Use two fingers to press lightly on the pulse point so that you can feel each pulse clearly. Each pulse represents a heartbeat. See page 18 for more information about pulses.

2. With your other hand, start the stop watch. Count how many times the person’s heart beats in 10 seconds. Multiply this number by 6 to calculate how many times their heart beats per minute (you can use the calculator for hard numbers).

3. Record their resting heart rate (beats per minute) on your sheet of paper.

4. Choose 2-4 physical exercises to perform for one minute. Choose some that you find hard, and some that you find easy. For example: skipping for one minute; jogging for one minute; star jumps for one minute; or throwing a ball for one minute.

5. After each exercise, measure the person’s pulse by repeating step two. Record each activity and the person’s pulse on your piece of paper. You need to check for pulse quickly, because it can start to slow within 15 seconds of stopping the exercise.
   NOTE: Make sure the person’s heart rate returns to ‘resting’ between each exercise.
   NOTE: You could first make a stethoscope (Appendix 5), and use this to listen to the heart beating instead of using the wrist pulse method.
Results:

Take a look at the results you wrote down for this activity.

• Which exercise increased your heart rate the most?
• How did your heart rate compare to other people doing the same activity?
• Why do you think your heart beats faster when you exercise?
• Why does strenuous exercise increase your heart rate more than easier exercise?
• What else did you notice when you exercised? What happened to your breathing? Did you get hot, or start to sweat?

DISCUSSION

When you exercise your heart rate goes up because your muscles need more oxygen and more food, so the heart pumps faster to deliver more blood that carries those vital components.

The oxygen from the air you breathe is transferred into your bloodstream through your lungs. Your heart pumps this blood around your body to your muscles. Once the blood delivers the oxygen, it collects the waste CO₂ (carbon dioxide) produced by your muscles and takes it back to your lungs.

The heart rate in people who exercise regularly usually will not increase as much, and will return to normal quicker, than someone who doesn’t exercise. The more you exercise, the better your body gets at pumping oxygen and CO₂ around- it becomes more efficient. Your heart gets stronger, and you even get more blood in your body - that means more blood cells to carry oxygen.

What is a pulse?

As your heart beats, it pushes blood through your body. It acts like a pump, sending the blood out in bursts as it contracts and releases (think of a bicycle pump - air only comes out when you press down on the handle). These bursts of blood are what you can feel pushing through the veins of your wrist: your pulse. It’s easy to feel the pulse in your wrist because the veins are very close to the surface under your skin - you can even see them as bluish lines.
EXTENSION: The surprise factor

Test whether loud noises also elevate your heart rate. You could do this by sneaking up and dropping a heavy book next to a person, or maybe even popping a balloon. Test their heart rate after the loud noise.

DISCUSSION:

The elevation in your heart rate when you get a scare, or detect danger, is part of the body’s reflex system. This is not something you do on purpose, but is something your body does on its own, to protect you from harm. An example is when you touch something extremely hot, and you pull back your hand very quickly. You would have automatically pulled back your hand before you even realised what was happening!

During your reflex response, your body releases adrenaline into your system, which makes your heart start to pound. You may also get goose bumps or even feel a bit clammy. This is your body preparing in case you need to fight against the danger or run away (flight). Your heart pumps faster so that it can send more oxygen to your muscles, which helps you run away or fight.

Test your reflexes in Appendix 3.
WHO HAS THE MOST AIR IN THEIR LUNGS?

EXPERIMENT: Test your lung capacity

Materials:

• 1 big bowl
• 1 large empty soft drink bottle
• Pack of bendy drinking straws (the bend in the straw is important)
• Water
• Thin permanent marker pen

Method:

1. Half fill the bowl with water.
2. Fill the bottle with water and put on the lid.
3. Turn the bottle upside down, and place it in the bowl of water so that the lid touches the bottom of the bowl.
4. Holding the end of the bottle, gently unscrew the lid (Note: the lid-end of the bottle should remain in the water).
5. Place the short end of the bendy straw in the bottle.
6. Take a big breath, and blow into the other end of the straw.
   The air will force some of the water to come out of the soft drink bottle and flow into the water bowl. This will create an air-bubble in the end of the bottle.
7. Mark the line where the air bubble and water meet in the bottle, and add your initials.
8. Fill the bottle again, and repeat for each child. The child who puts the most air into the bottle has the biggest ‘lung capacity’.
WHO HAS THE MOST AIR IN THEIR LUNGS? (CONT)

DISCUSSION:

When you breathe in, you fill your lungs with air. The oxygen in the air moves into your bloodstream through your lungs. Your heart pumps this blood around your body, taking oxygen to all your muscles and organs so that they can work properly.

Having a big ‘lung capacity’ means that you can fit more air in your lungs in every breath. The bigger your lung capacity, the faster oxygen can be sent around your body.

As you grow up, your lung capacity will get bigger, naturally.

The effect of exercise

Remember Boris, Frederick and Alice in the book Ready, Set, Boris? They got fitter and faster the more they trained.

When you use your muscles a lot, such as when you run, they need a lot more oxygen. They also produce a lot more carbon dioxide (CO2). To deal with this, you breathe faster and your heart rate speeds up, so that blood is pumped through your lungs and body faster, carrying the extra oxygen and CO2.

The more exercise you do, the better your body gets at pumping oxygen and CO2 around. Your heart gets stronger, and you even get more blood in your body - that means more blood cells to carry oxygen.

FACT: Oxygen goes in, carbon dioxide goes out. When your body uses energy, it produces a gas waste product called carbon dioxide (CO2). The CO2 is carried back to your lungs in your blood, and you get rid of it when you breathe out!
**ACTIVITY SUGGESTIONS:**

**OPAL (Obesity Prevention and Lifestyle) 'Be active' campaign**
sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/healthy+living/be+active

**Nature Play SA:**
natureplaysa.org.au/

**Raising children network activities for young children**
raisingchildren.net.au/articles/activities_for_younger_kids.html/context/216

**VIDEOS:**

**What happens to your heart when you exercise**
By Science.TV (2010)
youtube.com/watch?v=O8ttt3M8qZM

Legendary rugby coach, Mark Bishop explains how your heart works - and how to make it work harder. Diagrams show how your blood flows though the chambers of the heart to the lungs.

**Fit Kids Exercise your heart**
By KSPS TV
youtu.be/BQdnd4oAyDI

Did you know your heart is a muscle, working hard and pumping blood every day? This video looks at aerobic exercise, and how it affects your heart.

**How to walk a tightrope**
By DNews (2013)
youtu.be/9SaShn8OkJI

Nik Wallenda is going to tightrope walk across the Grand Canyo. So how will he do it? What sort of tips, tricks, and equipment will he use to complete the feat successfully? Join Anthony as he breaks down the physics of tightrope walking.

**Improving Sprint Start Technique**
By Teach PE (2009)
youtube.com/watch?v=Drdm1WsRQwA

International athlete, sports model and presenter Jenny Pacey talks to TeachPE about her Sprint Start Technique.
EVALUATION FORM

We need your feedback to help us improve future library packs, and ensure we can continue to produce useful and relevant library resources. Please provide your candid thoughts. You can also email Lisa Bailey, Programs Manager at RiAus directly with your feedback: lbailey@riaus.org.au

Did you use this pack to run a Be Active session? Please describe your activities and attendance (numbers, age group etc).

What did you find useful, and what did not work?

Do you have any suggestions for future packs?

Thanks for your help! If you would like to receive more education and library resources from RiAus, please provide your details below:

Library/School: __________________________ Email: __________________________

Contact name: __________________________ Telephone: __________________________

Please return to: RiAus, PO Box 3652, Rundle Mall SA 5000 (a reply-paid envelope enclosed with the pack. E: science@riaus.org.au T: (08) 7120 8600