

Pack it Light.
Wear it Right.



Teacher's Guide



“PACK IT LIGHT. WEAR IT RIGHT.” Public Awareness and Health Information Program, concepts and materials.

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Teacher’s Guide and Student Handbook Class Resource Kits based on the OCA "Pack it Light. Wear it Right." Public Awareness and Health Education Program, a cross-curricular program designed for grade 5 Ontario students. Used with permission.

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Introduction

This is a cross-curricular program designed to explore the design and use of backpacks and the implications on children’s back health. This program was a product of a multi-disciplinary research project conducted by the Queen’s Ergonomic Research Group and funded by the Ontario Chiropractic Association of Ontario.

Aim

The aim of the “Pack it Light. Wear it Right.” educational program is to empower grade 5 Ontario students with an awareness of their back health in relation to the design and use of their backpacks.

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“Pack it Light. Wear it Right.” Educational Program Resource Overview

Introduction

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Rationale

In recent years, there has been extensive discussion in the lay literature about backpack use and the potential results of back pain and spinal deformity (Mackenzie et al., 2003). In 2002, the Ontario Chiropractic Association conducted a telephone survey of 500 chiropractors. Seventy-six percent agreed that improper packing and carrying of backpacks is a leading cause of back and neck pain among school aged patients. A backpack weighing more than 10 to 15% of a child’s body weight is one of the factors associated with back pain in the biomechanical literature. Additionally, improper wearing of a backpack can result in changes of posture and gait (Mackenzie et al., 2003). Harreby et al. (1997) reported that adolescents with back pain are at an increased risk for experiencing back pain as adults. The economic impact of back pain is significant; it is a major cause of worker disability claims, and it is the most expensive to compensate (Scholz, 1996; Spengler et al., 1986).

Overloaded backpacks are becoming a broader health concern, like dental hygiene and balanced nutrition. The “Pack it Light. Wear it Right.” educational program addresses this broader health concern by promoting general back health principles. It also empowers students to make informed decisions when purchasing backpacks and provides the skills to use the backpacks properly. This program was planned for a typical Ontario grade five classroom and is to be delivered by the regular classroom teacher. As a result, the “Pack it Light. Wear it Right.” program is clear and easy to use and also includes the specific expectations from the mandated Ontario curriculum. The target age category of grade five was chosen for two reasons; the topic of backpacks and back health has an inherent fit with the Ontario Curriculum; and secondly, most biomechanical research on backpacks is being conducted on grade five aged students. The program will reach more individuals by having regular classroom teachers deliver the “Pack it Light. Wear it Right.” educational program. It will help students and teachers find strategies to reduce backpack loads together.

Objectives

Knowledge	Skills	Communication
<ul style="list-style-type: none">-students will know the anatomy of the back- students will understand the various biomechanical forces acting on the human body under a load- students will understand the strategies necessary to select and use a backpack properly	<ul style="list-style-type: none">- students will be able to manipulate a model in ways that represent scientific concepts- students will be able to use mathematics to statistically analyse collected data	<ul style="list-style-type: none">- students will be able to communicate their understanding of the human body, biomechanical forces and recommended backpack behaviours

Overall Expectations from the Ontario Curriculum

Science & Technology: Life Systems - Human Organ Systems

- demonstrate understanding of factors that contribute to good health

Science & Technology: Structures and Mechanisms - Forces Acting on Structures and Mechanisms

- demonstrate an understanding of the effect of forces acting on different structures and mechanisms
- design and make load-bearing structures and different mechanisms, and investigate the forces acting on them

Language: Oral and Visual Communication

- contribute and work constructively in groups
- create a variety of media works

Language: Writing

- communicate ideas and information for a variety of purposes (e.g., to present and support a viewpoint) and to specific audiences (e.g., write a letter to a newspaper stating and justifying their position on an issue in the news)
- use writing for various purposes and in a range of contexts, including school work (e.g., to summarize information from materials they have read, to reflect on their thoughts, feelings, and imaginings)

The Arts: Drama and Dance

- solve problems presented through drama and dance, working in large and small groups and using various strategies
- use different forms of available technology to enhance their work in drama and dance

Health and Physical Education: Active Participation

- follow safety procedures related to physical activity, equipment and facilities

Mathematics: Number Sense and Numeration

- select and perform computation techniques appropriate to specific problems involving whole numbers, decimals, and equivalent fractions, and determine whether the results are reasonable

Mathematics: Data Management and Probability

- use computer applications to record the results of data collected
- interpret displays of data and present the information using mathematical terms

Ontario Curriculum Specific Expectations

Activity	Ontario Curriculum Specific Expectations
Activity 1: It all started . . .	<p>Writing</p> <ul style="list-style-type: none"> - routinely introduce new words from their reading into their writing
Activity 2: It Can All Add Up	<p>Number Sense and Numeration</p> <ul style="list-style-type: none"> - mentally multiply decimal numbers by 10 and 100 - read and write decimal numbers to hundredths <p>Data Management and Probability</p> <ul style="list-style-type: none"> - design surveys, collect data, and record the results on given spreadsheets or tally charts - display data on graphs (eg. line graphs, bar graphs, pictographs, and circle graphs) by hand and by using computer applications - calculate the mean and the mode of a set of data - construct labelled graphs both by hand and by using computer applications
Activity 3: The Anatomy of It	<p>Life Systems</p> <ul style="list-style-type: none"> - describe, using models and simulations, ways in which the skeletal, muscular, and nervous systems work together to produce movement (e.g., make a model of the structure of the bones and muscles in an arm, using cardboard rolls and elastic bands) - use appropriate vocabulary, including correct science and technology terminology, in describing their investigations, explorations, and observations (e.g., use terms such as teeth, esophagus, stomach, and gastric juices in describing the digestive system) <p>Structures and Mechanisms</p> <ul style="list-style-type: none"> - identify the parts of a structure that are under tension and those that are under compression when subjected to a load (e.g., the wires in a suspension bridge are under tension; a ladder bearing a mass is under compression)
Activity 4: May the Force be with You	<p>Structures and Mechanisms</p> <ul style="list-style-type: none"> - identify and measure forces acting on a structure (e.g., mass, air pressure), and describe the effects of their application - use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g., use terms such as component, subsystem, and device when describing systems)
Activity 5: Packing it Light and Wearing it Right	<p>Life Systems</p> <ul style="list-style-type: none"> - explain how the health of human beings is affected by environmental factors (e.g., smoking, smog, and pollen affect the respiratory system)
Activity 6: Sharing our Knowledge	<p>Oral and Visual Communication</p> <ul style="list-style-type: none"> - use vocabulary learned in other subject areas in a variety of contexts - use tone of voice, gestures, and other non verbal cues to help clarify meaning when describing events, telling stories, reading aloud, making presentations, stating opinions, etc. - speak clearly when making presentations - contribute ideas to help solve problems, and listen and respond constructively to the ideas of others when working in a group - discuss with peers and teachers the strategies for communicating effectively with others in a variety of situations <p>Drama and Dance</p> <ul style="list-style-type: none"> - demonstrate awareness of audience when writing in role, and use the appropriate language, one of voice, gestures, and body movements when speaking as a character in a drama - identify the significance of symbols or objects in drama and dance, and use props appropriately

Activity 7: Have We Changed?	<p>Life Systems</p> <ul style="list-style-type: none"> - explain the importance of daily physical activity <p>Number Sense and Numeration</p> <ul style="list-style-type: none"> - mentally multiply decimal numbers by 10 and 100 <p>Data Management and Probability</p> <ul style="list-style-type: none"> - calculate the mean and the mode of a set of data
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The “Pack it Light. Wear it Right” Educational Program

The activities contained in the “Pack It Light. Wear It Right.” Educational Program can be implemented as independent activities, small group activities or whole class activities. It is important for the teacher to choose the best method for their current group of students.

The Teacher’s Guide provides additional information to the teacher. This information includes **background information** (the font of the background information is **bolded** and **green** in colour) and *sample answers* (the font of the sample answers is *italicized* and **red** in colour). Additionally, at the end of each activity is a table describing additional information, extensions and modifications for that activity. A complete activities chart for all of the activities, outlining the additional information, extensions and modifications for each activity can also be found on page vii in the Resource Overview.

Materials

<p>Activity 2 and 7: <u>Each student will need:</u> - post-it notes (the small kind) in two different colours - calculators (optional) <u>The class will need:</u> - a scale - a computer with QuatroPro installed (licensed to the Ontario Ministry of Education for use in all schools in Ontario)</p>	<p>Activity 3: <u>Each group of students will need:</u> - chicken wings - newspaper - scissors - tweezers - magnifying glass <u>Each student will need:</u> - coloured pencils - thin licorice laces* - fruit loops* - miniature marshmallows* - doubled pointed toothpick</p>	<p>Activity 4: <u>Each group of students will need:</u> - 3 tongue depressors - paper fasteners - magnetic strips (sticky backing is optional) - glue - a small level - scissors - graphics on cardstock (BLM in Teacher's Guide) - a ball of plasticene <u>The class will need:</u> - an overloaded backpack</p>	<p>Activity 5: <u>The class will need:</u> - "Pack it Light, Wear it Right" video</p>
<p>* If your school has a nut-free policy, please be sure to select nut-free products.</p>			

Additional Resources

Books	Websites
<p>* Collect a variety of books from your school or public library for a temporary addition to your science library.</p>	<p>1) http://www.brainpop.com</p>

Supplemental Resources

Please find an order form for supplemental resources from the Ontario Chiropractic Association following the Resource Overview or visit www.chiropractic.on.ca for more information.

Assessment

Activity SIX, “Sharing our Knowledge” is accompanied by a rubric to assess students’ understanding and communication of knowledge. The rubric is contained in both the Students’ Book and the Teacher’s Guide. Additionally, because there are several activities that suggest cooperative work groups, a rubric has been provided to assess students’ learning skills.

	Needs Improvement	Satisfactory	Good	Excellent
Cooperation with Others	<ul style="list-style-type: none">- has difficulty accepting different opinions from their own.- must be encouraged to work with others	<ul style="list-style-type: none">- reluctantly listens to the opinions of others- reluctantly works with others	<ul style="list-style-type: none">- listens to differing opinions- willingly works with others	<ul style="list-style-type: none">- listens to, acknowledges and considers differing opinions- shows excitement in working with others
Class participation	<ul style="list-style-type: none">- chooses not to contribute cooperatively to the group- takes limited responsibility for the work assigned, forcing other group members to work harder	<ul style="list-style-type: none">- contributes to the group- requires assistance from other group members for work assigned	<ul style="list-style-type: none">- contributes cooperatively to the group- takes responsibility for assigned portion of the work	<ul style="list-style-type: none">- contributes cooperatively to the group and assists in conflict resolution and problem-solving- enthusiastically takes responsibility for assigned portion of the work

Activity Chart

Activity	Additional Information	Extensions	Modifications
Letter to Parents	Sign and photocopy the letter and send home.	The “Parent Pamphlet,” available from the Ontario Chiropractic Association, may be sent home in addition to or instead of the letter to the parents.	Add a small paragraph in your weekly or monthly newsletter to parents, in addition to or instead of sending the letter or pamphlet home.
Activity 1: It all started . . .	If part one of Activity TWO, It Can All Add Up, will be assigned as homework, remember to assign it today.	You could have students share their backpacks with the rest of the class.	
Activity 2: It Can All Add Up	CAUTION: It is very important that the students understand that their weight is a personal and private number and it does NOT need to be shared with anyone.	Create a class spreadsheet using Quatro Pro or MS Excel with each student’s percentage. You can then randomly weigh backpacks at the beginning or end of the day, throughout the unit. The students can then record their percentages in the spreadsheet under the same row. You could also use the spreadsheet to help calculate the mean, median and mode.	You may want to allow students to use calculators. If students don’t have a scale at home, provide a PRIVATE place in the classroom to weigh themselves.
Activity 3: The Anatomy of It	Be very cautious and make sure that safety precautions are taken to reduce the risk of salmonella. For example, cook the chicken and clean all of the instruments and desks with a strong cleaning solution or diluted bleach.		You may want to do the cartilage activity as a guided instruction centre, while the other students work on another activity.
Activity 4: May the Force be with You	Photocopy the graphics for the students.		You may want to punch the holes in the tongue depressors beforehand.
Activity 5: Packing it Light and Wearing it Right		You could have the students create posters summarizing some of the concepts presented in the video, to put up around the school.	

Activity 6: Sharing our Knowledge	Use page 18a to photocopy extra rubrics.	The class could hand out the activity sheets, available from the Ontario Chiropractic Association, to the primary students to take home after the presentation.	
Activity 7: Have We Changed?	CAUTION: It is very important that the students understand that their weight is a personal and private number and it does NOT need to be shared with anyone.	<p>Create a class spreadsheet using Quatro Pro or MS Excel with each student's percentage. You can then randomly weigh backpacks at the beginning or end of the day, throughout the unit. The students can then record their percentages in the spreadsheet under the same row. You could also use the spreadsheet to help calculate the mean, median and mode.</p> <p>You could do this same activity in a few weeks to compare their results and see if reducing backpack loads has truly become a habit.</p>	You may want to allow students to use calculators. If students don't have a scale at home, provide a PRIVATE place in the classroom to weigh themselves.
Activity 8: Homework			
Certificate	You may give the certificate to the students right after the program to take home with their booklets or you could wait and give it to them once they have handed in their completed homework slip.		

Dear Parent or Guardian,

We are very excited about starting our cross-curricular unit about backpacks and back health!

The aim of the “Pack it Light. Wear it Right.” educational program is to empower Ontario students with an awareness of their back health in relation to the design and use of their backpack.

Throughout this program, your child will be exploring back health and learning healthy backpack habits. These healthy backpack habit topics include:

1. What you should look for when selecting a backpack
2. How to pack your backpack
3. How you should pick up and put on your backpack
4. Strategies to reduce the load in your backpack

You can support your child’s healthy backpack choices, at home, by helping them implement the strategies to reduce their backpack loads.

For more information on healthy backpack choices and the “Pack It Light. Wear It Right.” public awareness and health information program, please visit the Ontario Chiropractic Association website at: www.chiropractic.on.ca. In addition to the “Pack It Light. Wear It Right.” information, you’ll find useful hints on back health issues such as snow shoveling (“Lift light, shovel right.” program) and gardening (“Plant and Rake Without the Ache” program).

Sincerely,

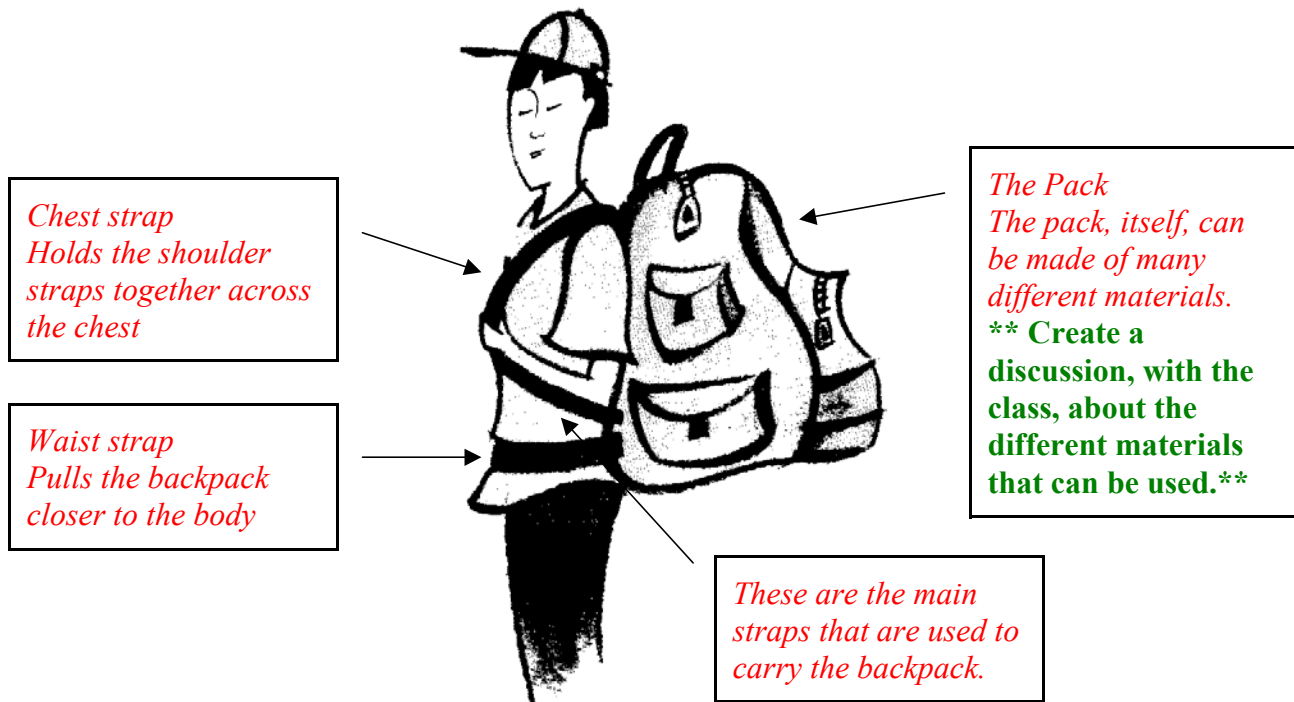


It all started . . .

Forty years ago, people did not use backpacks. Instead, they carried their books by hand. Carrying backpacks to school became more common in the 1970's when students discovered the “day pack,” a small backpack that campers used for day long hikes. In the 1990's, backpacks became an everyday accessory in school life. Backpacks are a convenient way to transport belongings because it leaves both arms free to do other things (like open doors).

In North America, early Native Americans strapped their belongings to wooden boards and fastened the boards to their backs. In Europe, up until the 18th century, most women carried their belongings in pouches that were sewn into their under garments. When new fashion trends prevented access to these pouches, purses were developed. Men’s clothing typically had pockets to carry around their belongings.

Today, there are a wide variety of backpacks on the market, in different colours and styles. As a class, let’s identify, label and describe the different parts of the backpack in the diagram below:



In the box below, draw what your backpack looks like:



	<p>Does your backpack have a Chest Strap? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Do you wear it? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Does your backpack have a Waist Strap? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Do you wear it? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
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<p>What do you like about your backpack?</p> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>What would you like to change about your backpack?</p> <hr/> <hr/> <hr/> <hr/> <hr/>
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As a class, let's create a graph displaying the various backpack colours found in our classroom. Use the graph paper below:

Title: _____



It Can All Add Up

For homework tonight:

At home, weigh yourself in kilograms and record your weight on the post-it note provided. Please note that this number is personal and you do not need to share it with anyone else.

**** You may want the students to put this post-it note in their agenda to transport it back and forth, between school and home. CAUTION: You may want to discuss that body weight is personal and private with the students. Some students may feel embarrassed about their weight, as a result of their changing bodies. If they do not have a scale at home, provide a private time for them to weigh themselves in class.****

The next day:

****As students enter the class and before they unload their backpacks, have them weigh their backpack in kilograms on a scale. Write the weight of their backpack on a different coloured post-it note.****

- 1) Place the post-it note with the weight of the backpack in box A.
- 2) Place the post-it note with your weight in box B.

A

(weight of back pack)

B

(your weight)

3) Complete the operation of $A \div B$

$$\underline{\hspace{2cm}} \div \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

What kind of number is your result? *Decimal*

4) A percentage is a number that represents the number of parts in every 100, where by 100 represents something complete. So, 14% would be 14 parts of 100. To find a percentage we take the decimal we found in question 3 and multiply it by 100.

$$\underline{\hspace{2cm}} \times 100 = \underline{\hspace{2cm}} \%$$

This is your backpack percentage.



Scientific literature recommends that your backpack weigh no more than 10% of your body weight.

How much would 10% of your body weight be?	
Answer the question that describes your situation:	
If you were over 10%, how much weight do you need to take out of your backpack?	If you were under 10%, how much more weight are you allowed to carry?

**** Create a place for students to write down their backpack percentages (this number does NOT reveal their weights and is ok to be shared, however, you may want to remind them that their actual weight is personal and private).****

As a class, let's write down our calculated backpack percentages (this number is ok to share because it does not reflect how much we weigh). We are now going to calculate the mean, median and mode of our class. First, let's define these three mathematical terms:



Term	Definition	How do we calculate it?
Mean	<i>A number that represents the average of a group of different amounts.</i>	<i>1) Add up all the numbers. 2) Divide your total by how many numbers there are.</i>
Median	<i>The middle number in a group of sequentially ordered numbers.</i>	<i>1) Order the numbers from smallest to largest 2) Find the middle.</i>
Mode	<i>In a group of numbers, it is the number that occurs the most often.</i>	<i>1) Order the numbers from smallest to largest. 2) Find the number that appears the most often.</i>

As a class, let's calculate the mean, median and mode of the classes' backpack percentage and record the results in the chart below:

Mean	Median	Mode

Is the mean larger or small than the recommended 10%? _____

How many students are above 10% ? _____

How many students are above the mean? _____

How many students are above the median? _____

How many students are above the mode? _____

In what ways do these numbers describe our classroom backpack habits?

Additional Information	Extensions	Modifications
CAUTION: It is very important that the students understand that their weight is a personal and private number and it does NOT need to be shared with anyone.	Create a class spreadsheet using Quatro Pro or MS Excel with each student's backpack percentage. You can then randomly weigh backpacks at the beginning or end of the day, throughout the unit. The students can then record their backpack percentages in the spreadsheet under the same row. You could also use the spreadsheet to help calculate the mean, median and mode.	You may want to allow students to use calculators. If students don't have a scale at home, provide a PRIVATE place in the classroom to weigh themselves.



The Anatomy of It

Your back consists of bones and muscles. Together, this group of bones is called the vertebral column (you may have heard it called a spine). Each individual bone is called a vertebra. The vertebral column is divided into five sections; the cervical section has seven vertebrae; the thoracic section has 12 vertebrae; the lumbar section has 5 vertebrae; the sacral section is one bone that plays an important role as the weight bearing arch of the hips; and finally the vertebrae of the coccygeal section are fused and can vary from 1 to 5 vertebra.

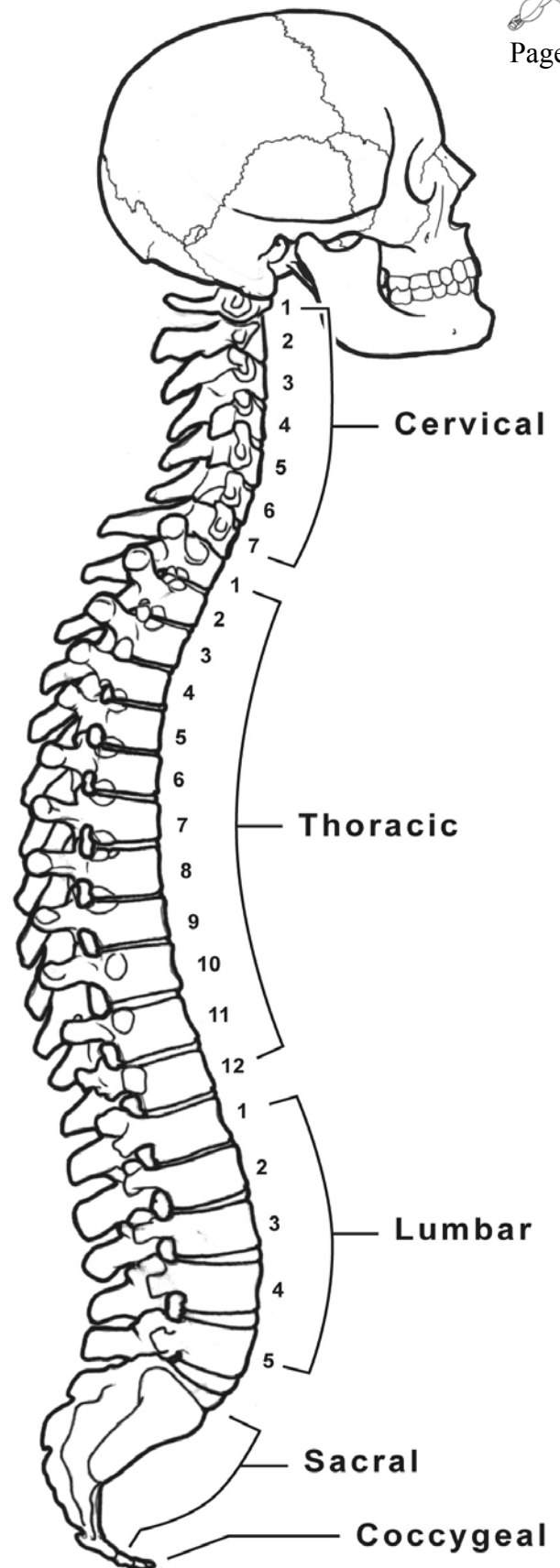
Between each vertebra is an intervertebral disc (inter means between). These discs are made of a substance called collagen. Collagen is a type of very dense and fibrous cartilage. The intervertebral discs make it possible for our vertebrae to move.

Let's define cartilage:

Flexible tissue that connects bones in humans and animals. Cartilage is the material that supports your ears and nose. A shark's skeleton is all cartilage.

The vertebral column protects our spinal cord. The spinal cord is a thick bundle of nerve cells that connects the brain with the rest of the body.

Colour in the vertebral column to the right, using different colours for each section.





Cartilage

In small groups, let's take a closer look at cartilage. Let's remember that the intervertebral cartilage is much tougher and fibrous than the cartilage we will be looking at today which is called articular cartilage or joint cartilage.

**** The cartilage in the chicken wing is different than that of the cartilage of the intervertebral discs. The intervertebral discs are thicker and the cartilage is more fibrous.****

Materials:

- 1) a chicken wing or a chicken leg
- 2) newspaper
- 3) scissors
- 4) tweezers
- 5) magnifying glass
- 6) gloves

Method:

- 1) Use chicken cooked at 350°F for 45 minutes. ****This will reduce the risk of salmonella.****
- 2) Lay the chicken wing or leg on the newspaper.
- 3) With your fingers, find the spot where two bones join to make a joint.
- 4) Use the scissors and tweezers to expose the joint and find the cartilage between the two bones.
- 6) Look closer at the cartilage with the magnifying glass.
- 7) When you're finished, be sure to wash all your instruments with soap and warm water. Be sure to also wash your desk with a cleaning solution or diluted bleach.



Describe the texture and colour of the cartilage:

Let's make a model vertebral column

Materials

- 1) thin licorice laces
- 2) fruit loops
- 3) miniature marshmallows
- 4) double pointed toothpick

Method:

- 1) Tie a knot at one end of your licorice. The knot will be the sacrum and the end will be the coccygeal section.
- 2) Stick a double pointed toothpick into the other end of your licorice.
- 3) Alternating between fruit loops and marshmallows, string them onto the licorice lace.
- 4) Remember how many vertebrae are in each section.



What does the licorice represent? *the spinal cord*



What do the fruit loops represent?

the vertebra (some students may have represented each section with a different colour of fruit loop)

What do the marshmallows represent? *the intervertebral discs*

What happens when you push two fruit loops together?

What health problems might be associated with the vertebrae being compressed (pushed together)?

Additional Information	Extensions	Modifications
<p>Be very cautious and make sure that safety precautions are taken to reduce the risk of salmonella. For example, cook the chicken and clean all instruments and desks with a strong cleaning solution or diluted bleach.</p> <p>The number of chicken wings or legs will depend on whether you want the activity to be done independently, in small groups, or as a demonstration for the whole class.</p>		<p>You may want to do the cartilage activity as a guided instruction centre, while the other students work on another activity.</p> <p>If you have chicken or turkey for dinner the night before, you could bring in the bones.</p>



May the Force be with You

As a class, let's define the term centre of gravity.

Centre of gravity is the point in a solid on which the object can be balanced. You must hold a tray of dishes under its centre of gravity or the dishes will crash to the floor.

Centre of Gravity

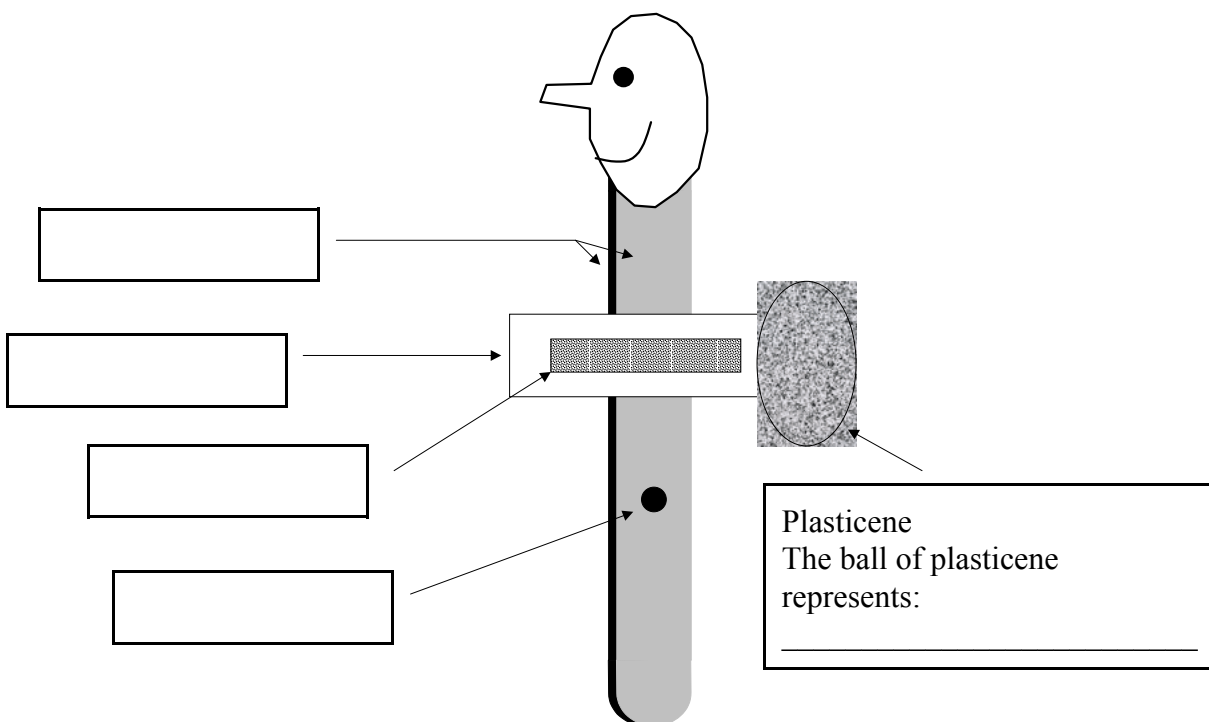
Working co-operatively in a small group, you will make a model representing what happens to your centre of gravity when you put on a backpack.

Materials:

- 1) three tongue depressors
- 2) a heavy duty hole punch
- 3) a paper fastener
- 4) magnet
- 5) glue
- 6) a small level
- 7) scissors
- 8) a small graphic showing the profile of a head
- 9) a ball of plasticene
- 10) magnetic blackboard

Method:

- 1) Using the heavy duty hole punch, punch holes in the middle of two tongue depressors.
- 2) Fasten these two tongue depressors with the paper fastener.
- 3) Stick the magnet on the back of the fastened tongue depressors.
- 4) Glue the small level to the third tongue depressor (no hole). Make sure the level is in the middle. Cut off the ends.
- 4) Wait for it to dry.
- 5) Glue the tongue depressor (with level on it) to the other two tongue depressors (fastened by a paper fastener) to make a cross.
- 6) Wait for it to dry.
- 7) Glue the head graphic just above the level.
- 8) Stick your model on the magnetic blackboard so that it is balanced.
- 9) Label the diagram on the next page depicting the model you just made.



NOW, add the ball of plasticine as shown in the diagram above.

<p>Draw what happens:</p>	<p>Where is your centre of gravity?</p> <hr/> <hr/> <hr/> <p>How might your body adjust to this load and the change in your centre of gravity?</p> <hr/> <hr/> <hr/> <hr/> <hr/>
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Our bodies adapt to forces when they are applied to our bodies. As a class, let's look at the unloaded posture of one of our classmates and draw a picture in the chart below:

Draw a picture of your classmate's unloaded posture:
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**** Choose a volunteer. Have the volunteer stand sideways, so that the class can look at their unloaded posture and draw a picture. Then, have the volunteer overload their backpack (you may want to have this already done) and put it on. Encourage them to lean forward to adjust to the weight. The class will draw another picture. Discuss, as a class, how the posture has changed. The leaning forward of the torso is called "Trunk Forward Lean" or TFL and is the angle between the trunk of the body and a vertical axis. The head poking forward is called the "Cranial Vertebral Angle" or CVA and is the angle between a horizontal axis and the head.****

Now, let's place an overloaded backpack on our classmate and see how their posture has changed. Draw their posture in the chart below:

Draw a picture of your classmate's posture with a load . . .	Describe how it has changed: _____ _____ _____ _____ _____ _____ _____ _____ _____
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As a class, let's define the following three terms:

Mass

The amount of matter in an object. Mass is also defined as the resistance of an object to make a change in its motion. An object's mass always stays the same, while weight, which is the pull of gravity, can change.

Force

Energy that changes the motion or shape of an object. You use force when you hit a baseball or squeeze some clay.

Weight

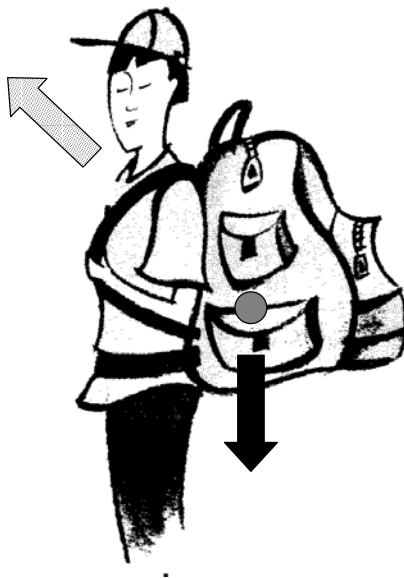
The pull of gravity on an object. Weight is different from the mass, or amount of matter, in the object. Mass stays the same, but weight changes, depending on where the object is being weighed. It is commonly associated with the unit of pounds.

Even though your backpack is carrying a certain weight (similar to when you weighed your backpack on a scale) your body feels like it is carrying more.

The grey dot in the middle of the backpack is the backpack's centre of gravity. The black vertical arrow, directly under the backpack's centre of gravity, represents the *external* force.

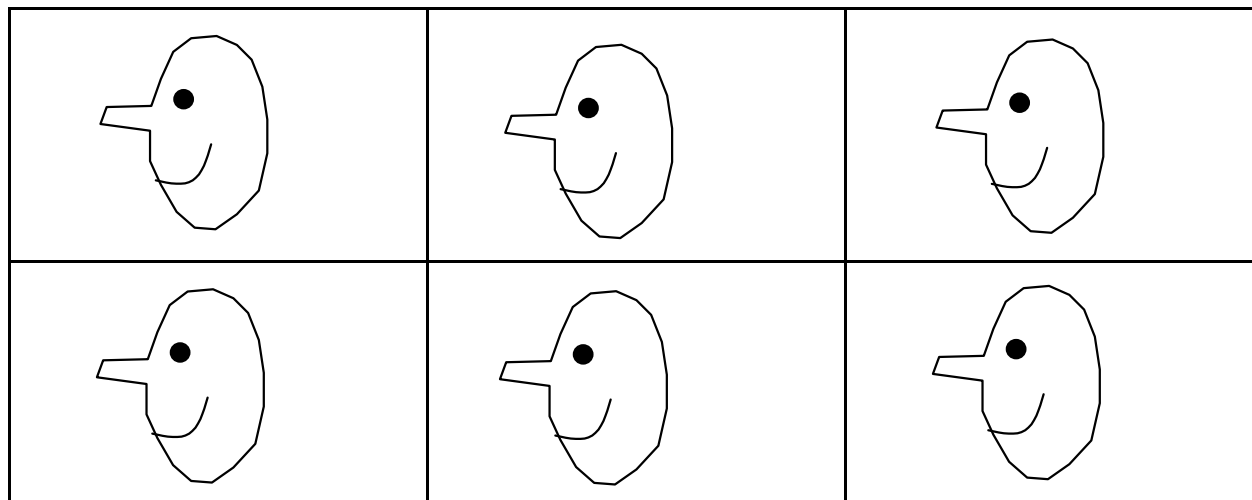
The grey arrow is called a *reaction* force. Reaction forces are the forces produced by your body, in reaction to the external force of the backpack.

Label both the external force and the reaction force in the diagram below:





Additional Information	Extensions	Modifications
Photocopy the graphics below for the students.		- you may want to punch the holes in the tongue depressors beforehand.





Packing it Light and Wearing it Right

As a class, let's watch the video "Pack it Light. Wear it Right." (© Ontario Chiropractic Association, 2002). After watching the video, answer the following questions:

1) How should you pack your backpack?

Flat, heavy and regular shaped items should be placed next to the back. Odd shaped items should be in the middle.

2) What are some strategies you could do to decrease your backpack load?

Leave items that are not necessary at home or school. Fill up your water bottle at school. Plan ahead or get work done at school.

3) What is the proper way to pick up and put on your backpack?

Use your legs to pick up your backpack. Have a parent or an older sibling help you put on your backpack or put the backpack on a table and then put it on.

4) What is the proper way to wear a backpack?

Wearing both shoulder straps and wearing your waist or chest strap if you have them.

5) What should you look for when you purchase a backpack?

You should look for backpacks made of lightweight material, with two 5 cm wide padded shoulder straps and a waist strap. The backpack should be no longer than your torso and a padded back will increase your comfort. You might like multiple compartments to help you organize your various belongings.

6) What should you do in the store to make sure the backpack is right for you?

Try the backpack on. You may even want to fill it up with stuff to get an idea of what it will feel like when full.

Additional Information	Extensions	Modifications
	You could have the students create posters, summarizing some of the concepts presented in the video, to put up around the school.	



Sharing our Knowledge

**** Use your favourite method to select groups of about 3 or 4. You may assign the topics or let each group choose one in a lottery. Some optional topics could include:**

- What you should look for when selecting a backpack
- How to pack your backpack
- How you should pick up and put on your backpack
- What an overloaded backpack can do to your back health
- Strategies to reduce the load in your backpack
- The anatomy of the back
- What you should do when you get hurt.**

In a small group, you will write a short commercial about some of the back health principles we have learned in this unit. You will be presenting this commercial to the primary division (grades 1, 2 and 3).

Before you begin your presentation planning process, as a class, let's talk about our audience and what we know about them.

**** Conduct a class discussion about the primary division. If you are involved in reading buddies, you may want to ask students about what their reading buddies like to read, what they think they might be interested in and what TV shows they like to watch. You may want to create a list of things that they need to find out. They can ask students in the primary division during reading buddies, or over a lunch hour. They could even ask a brother or sister.****

<p>Some things I KNOW about my audience:</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>What I NEED to KNOW about my audience:</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
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Presentation Plan:

TOPIC:		
Audience background information: _____ _____ _____ _____ _____		
Describe the beginning . . .	Describe the middle . . .	Describe the end . . .
_____ _____ _____ _____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____ _____ _____ _____
Group Members: 1) _____ 2) _____ 3) _____ 4) _____ 5) _____	What materials will you need for your presentation? _____ _____ _____ _____	

Once you have finished your presentation plan, you can use the following pages to prepare your presentation in more detail.



Date:	Level ONE	Level TWO	Level THREE	Level FOUR
Understanding of concepts	<ul style="list-style-type: none"> - students failed to communicate key concepts - the concepts communicated were incorrect or lacking in detail 	<ul style="list-style-type: none"> - students communicated the knowledge in a factual manner - some of the concepts communicated were lacking in detail 	<ul style="list-style-type: none"> - students connected content to daily life - the concepts communicated were accurate and detailed 	<ul style="list-style-type: none"> - students communicated the knowledge using a creative story that reflected daily life - the concepts communicated were accurate and students provided additional information from independent research or extensions
Communication of concepts	<ul style="list-style-type: none"> - the students did not consider the audience of the presentation - voices were unclear and inaudible 	<ul style="list-style-type: none"> - students utilized some presentation strategies that were not well suited for the audience - voices were at times unclear or inaudible 	<ul style="list-style-type: none"> - students directed the presentation content to the audience using appropriate vocabulary and situations - voices were clear and audible 	<ul style="list-style-type: none"> - students engaged the audience by using audience appropriate props, situations and vocabulary - voices were clear and audible
Group Members:				

Date:	Level ONE	Level TWO	Level THREE	Level FOUR
Understanding of concepts	<ul style="list-style-type: none"> - students failed to communicate key concepts - the concepts communicated were incorrect or lacking in detail 	<ul style="list-style-type: none"> - students communicated the knowledge in a factual manner - some of the concepts communicated were lacking in detail 	<ul style="list-style-type: none"> - students connected content to daily life - the concepts communicated were accurate and detailed 	<ul style="list-style-type: none"> - students communicated the knowledge using a creative story that reflected daily life - the concepts communicated were accurate and students provided additional information from independent research or extensions
Communication of concepts	<ul style="list-style-type: none"> - the students did not consider the audience of the presentation - voices were unclear and inaudible 	<ul style="list-style-type: none"> - students utilized some presentation strategies that were not well suited for the audience - voices were at times unclear or inaudible 	<ul style="list-style-type: none"> - students directed the presentation content to the audience using appropriate vocabulary and situations - voices were clear and audible 	<ul style="list-style-type: none"> - students engaged the audience by using audience appropriate props, situations and vocabulary - voices were clear and audible
Group Members:				

Additional Information	Extensions	Modifications
Use page 18a to photocopy extra rubrics.	The class could hand out the activity sheets available from the Ontario Chiropractic Association to the primary students to take home after the presentation.	



Have We Changed

**** As the students enter the class and before they unload their backpacks, have them weigh their back packs on a scale. Write the weight of their backpack on a post-it note (a different coloured one from their body weight).****

Today:

- 1) Place the post-it note with the weight of your backpack in box A.
- 2) Place the post-it note with your weight in box B from the activity "It Can All Add Up."

A

(weight of back pack)

3) Complete the operation of $A \div B$

_____ \div _____ = _____

4) Now, to find the percentage, multiply the above answer by 100

_____ \times 100 = _____ %

B

(your weight)

Let's write down our backpack percentages. As a class, let's calculate the mean, median and mode of the class.

Mean	Median	Mode

How did the Mean change? _____

What does this tell us?



How did the Median change? _____

What does this tell us?

How did the Mode change? _____

What does this tell us?

Summarize what you have learned during this unit:

**** Create a discussion, with the class, about how the data have changed (or not changed) and what might have contributed to these changes. Finally, discuss how proper backpack selection and use fit into a healthy lifestyle and list the other attributes of a healthy lifestyle (eating well and being active).****

Additional Information	Extensions	Modifications
CAUTION: It is very important that the students understand that their weight is a personal and private number and it does NOT need to be shared with anyone.	Create a class spreadsheet using Quatro Pro or MS Excel with each student's percentage. You can then randomly weigh backpacks at the beginning or end of the day, throughout the unit. The students can then record their percentages in the spreadsheet under the same row. You could also use the spreadsheet to help calculate the mean, median and mode. You could do this same activity in a few weeks to compare their results and see if reducing backpack loads has truly become a habit.	You may want to allow students to use calculators. If students don't have a scale at home, provide a PRIVATE place in the classroom to weigh themselves.

Homework



Share your “Pack it Light. Wear it Right.” booklet with at least one family member at home. Tell them all you have learned about backpack use and safety. Have the person, that you shared your booklet with, fill out the form below, detach it and bring it back to school.

7

_____ shared their “Pack it Light. Wear it Right.” booklet with the following family members:

Parent’s Signature



This certificate hereby certifies

is a “Pack it Light. Wear it Right.” expert.

Principal

Teacher

Glossary

Cartilage

Flexible tissue that connects bones in humans and animals. Cartilage is the material that supports your ears and nose. A shark's skeleton is all cartilage.

Centre of Gravity

Is the point in a solid on which the object can be balanced. You must hold a tray of dishes under its centre of gravity or the dishes will crash to the floor.

Chest Strap

Holds the shoulder straps together across the chest.

Force

Energy that changes the motion or shape of an object. You use force when you hit a baseball or squeeze some clay.

Mass

The amount of matter in an object. Mass is also defined as the resistance of an object to make a change in its motion. An object's mass always stays the same, while weight, which is the pull of gravity, can change.

Mean

A number that represents the average of a group of different amounts.

Median

The middle number in a group of sequentially ordered numbers.

Mode

In a group of numbers it is the number that occurs the most.

Shoulder Strap

Are the main straps used to carry the backpack.

Spinal Cord

The thick bundle of nerve cells in the spine that connects the brain to nerve cells in the arms, leg, and trunk of the body.

Vertebra

One of the bones of the spine, or backbone. Its plural is vertebrae.

Waist Strap

Pulls the backpack closer to the body.

Weight

The pull of gravity on an object. Weight is different from the mass, or amount of matter, in the object. Mass stays the same, but weight changes, depending on where the object is being weighted. It is commonly associated with the unit of pounds.



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