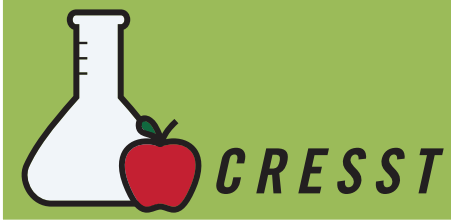
Collecting and Analyzing Data



Overview

Revised February 2016

In recent years, the increase in obesity levels in our population, especially among youth, has been the focus of a great deal of research and study. This section includes lessons that help students learn more about how research processes and experimental studies are implemented in clinical research while conducting their own investigations about health and wellness. An important aspect of clinical research studies is the selection of the outcome that will be measured in the study. Examples of study outcomes include body mass index (BMI), level of physical activity, food choices, or having a diagnosis of diabetes. In order to accurately measure these outcomes, appropriate tools must be chosen. In clinical research, measurement tools include things like surveys and questionnaires as well as devices like blood pressure meters and pedometers. Some of the important considerations when selecting a measurement tool are the validity, reliability, and feasibility of the measure for a study. Choosing an outcome measure and considering the validity, reliability, and feasibility of how it is measured is an essential part of designing a successful study. Gathering and synthesizing information about the outcome and the possible ways to measure it is one way researchers become more knowledgeable about clinical research and identify ways to strengthen their own studies.

Section Objectives

In this section, students will:

- Investigate and understand how the research process and experimental design are implemented in clinical research
- Analyze data using graphs and statistics
- Understand how reliability and validity may relate to various health measurement tools, such as pedometers and Calorie counting resources

Topics

- Implementing the research process and experimental design in clinical research
- Analyzing data using graphs and statistics
- Evaluating the effects and benefits of physical activity and healthy food choices on health
- Examining the validity and reliability of measurements

Activities

- Numbers Can Talk: Exploring Statistical Data
- Let's Work It Out
- Walkable Communities: Exploring Measurement Reliability and Validity
- What's On Your Plate?

Numbers Can Talk: Exploring Statistical Data

CRESST

Revised February 2016

Introduction

In the clinical research community, special attention has been given to the rise in obesity levels among our youth population. The Data Resource Center for Child and Adolescent Health (DRC) uses surveys and medical records to monitor trends and changes in rates of obesity. The goal of the DRC is to provide accurate, freely available data related to children's health concerns and assist in improving children's health and health-related services for youth and families throughout the United States. Analyzing this data and the survey methods used to collect it will help students learn to identify important types of data and improve their study design skills.

Purpose

In this lesson, students will investigate and learn how the research process and experimental design are implemented in clinical research. Students will then analyze existing survey data using graphs and descriptive statistics in order to make inferences and draw conclusions.

Objectives

At the end of this lesson, students will be able to:

- Apply analysis skills to existing data
- Graph data to illustrate comparisons
- Draw conclusions and inferences based on data analysis
- Discuss factors that contribute to the increase in childhood obesity
- Discuss the strengths and limitations of using existing data or survey data in research

Key Terms

- Accuracy: the closeness with which an observation or a measurement of a variable approximates its true value; an accurate test implies freedom from both random and systematic error

- Constants: all factors that are purposely kept the same throughout the experiment in both the experimental and control groups
- Control or control group: a group of research subjects or an experimental sample that remains unchanged during the experiment. The control provides an unchanged standard for comparison against the experimental groups.
- Dependent or responding variable: the variable that is measured or observed during the experiment; the measurement that "depends" on what I change
- Hypothesis: a prediction about the relationship between the variables that can be tested
- Independent or manipulated variable: the variable that is purposefully changed by the experimenter; "what I change"
- Precision: in statistics, the extent to which a measurement procedure gives the same results each time it is repeated under identical conditions
- Qualitative data: data that are descriptive, in written form, and involve characteristics that cannot usually be counted
- Quantitative data: data expressed as numbers, obtained by counting or measuring
- Statistical significance: the criterion for the decision that the results of an experiment did not happen by chance but were the result of the treatment/ experiment
- Statistics: the branch of mathematics involving the probability-based procedures to analyze data for interpretation

National and State Standards

National

Next Generation Science Standards:

Crosscutting Concepts 1, 2

Science and Engineering Practices 4, 5, 6, 8

Nature of Science Understandings 1, 2, 5, 7, 8

Essential Features of Classroom Inquiry 1, 2, 3, 4, 5

National Standards for Health: Standards 1, 2, 3, 4, 5, 6, 7, 8

Virginia

Science: BIO.1, BIO.2, BIO.3, BIO.4

Health: 7.3 j, 9.1 b, r, 9.2 c, h, 9.3 e; 10.1 a–c, f; 10.2 c

Physical Education: 9.2 a, b, 9.3 a, d, e, 9.5 a, b, c, 10.2 a, b, 10.3 a, b, 10.5 b, c

Materials

- Copies of Student Handouts
- LCD projector
- One computer per pair of students

Procedures

1. As students come into the classroom, project the 2007 Childhood Obesity State Report Card (http://www.childhealthdata.org/browse/data-snapshots/obesity-2007) on the board.
2. Conduct a class discussion using the following teacher prompts.
3. Teacher prompts to elicit participation:
   a. "I'm curious…what percent of our children, in the state of ___, are obese? What do you think?" Ask students to justify the percent they have predicted: "Why do you think that . . . .?
   b. "Let's see the results. Click on your home state and view the percentages and relative data." Read the key points aloud.
   c. "Let's look at this map of the USA showing the percent of children ages 10-17 classified as overweight or obese, by state, in 2007. What trends can you see?" When developing experimental or other types of studies, researchers usually start with an observed phenomenon or trend to inform their research questions. This phenomenon or trend should strike up more questions, and that is when the statistical analysis begins.
   d. "Can you hypothesize a reason for these trends?"
   e. "Why might these trends exist?"
   f. "As a class, let's research the Obesity Report Card for a couple different states and try to make connections as to why children might struggle with their weight."
   g. "When conducting this study, what sampling method do you believe scientists used to collect the information provided on this website?"
   h. "I'm going to send you on a web hunt to find out more!" (distribute the Numbers Can Talk student worksheets)

Observations and/or Data

- Find the state average (% overweight/obese) from the data you collected.
- What is the national average for overweight and obese children?
- How close does the calculated average compare to the website's quoted average?

Analysis and Conclusions

- What factors influence childhood obesity?
  - Why?
- How do you think that these factors influence the child's health?
  - Why?

Critical Thinking Questions

In a short paragraph (minimum of 5 sentences), compare the data from household income and state obesity percentage with physical activity and state percentage. Which factor appears to have the most influence on childhood obesity? Why do you think this is the case? Justify your answer with specific examples.

Teacher Notes

Be sure there is at least one computer with Internet access available for every two students. Check to make sure the following webpages are not blocked by school administration. If they are, ask permission to access the site.

http://www.childhealthdata.org/browse/data-snapshots/obesity-2007 and http://childhealthdata.org/learn/NSCH/topics_questions/2007-nsch
http://childhealthdata.org/docs/nsch-docs/2007_nsch_sampling_and_administration_508-pdf.pdf?sfvrsn=2

Safety Notes

Make sure all students are following proper classroom safety guidelines.

CRESST Videos

The CRESST Videos are designed to be used in conjunction with the CRESST Curriculum. Each classroom-friendly video is approximately 4 minutes in length and can be used to generate discussion related to clinical research, heathy lifestyle choices, and student research into health-related topics.

Comparing the survey data used in this lesson with the data collected through physical measurements shown in ***Clinical Research: Why Does It Matter to Me?*** illustrates the importance of choosing the appropriate data and data collection tools for a research project.

Background Information and Resources

These resources can be used to provide background information and to guide students in the research process.

Cothron, Julia H., Ronald N. Giese and Richard J. Rezba. Students and Research: Practical Strategies for Science Classrooms and Competitions, Iowa: Kendall/Hunt Publishing Company, 2000, Third Edition.

Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health, Seventh Edition. © 2003 by Saunders, an imprint of Elsevier, Inc.

Extensions

Classroom

Choose either income level or physical activity level, and develop a scenario in which either of these groups could improve its situation. Examples could be ways of acquiring healthier foods or increasing physical activities.

Cross-Curricular

Language Arts: In a short paragraph (minimum of 5 sentences), compare the data from household income and state obesity percentage with physical activity and state percentage. Which factor appears to have the most influence on childhood obesity? Why do you think this is the case? Justify your answer with specific examples.

Name:

Student Handout

Numbers Can Talk: Exploring Statistical Data

Using the 2007 Childhood Obesity State Report Card and other statistical data, let's make connections between the numbers and lifestyle choices!

Visit The National Survey for Children's Health at http://www.childhealthdata.org/browse/data-snapshots/obesity-2007 to complete the following web search.

View state report cards based on geographic location. After recording your state's data, select five other states of differing geographic location, and record the data below.
Review of your state's report card: In which state do you reside? _____

Your State: % Overweight or Obese	_____	National Rank: _____
State in Northeast: % Overweight or Obese	_____	National Rank: _____
State in Southeast: % Overweight or Obese	_____	National Rank: _____
State in Northwest: % Overweight or Obese	_____	National Rank: _____
State in Southwest: % Overweight or Obese	_____	National Rank: _____
State in Central US: % Overweight or Obese	_____	National Rank: _____

Find the state average (% overweight/obese) from the data you collected. Show your work.

What is the national average for overweight and obese children?

How close does the average of the five states that you calculated compare to the website's quoted average?

I'm sure you're left wondering, "How were these numbers obtained?" and "What are these numbers saying about childhood health?" Let's answer those questions now!

How were these numbers obtained?

Visit the 2007 NSCH Guide to Topics and Questions at http://childhealthdata.org/learn/NSCH/topics_questions/2007-nsch

Read through the survey questions and answer the following questions:

- With health being the major concern, which survey question(s) asked in the interview related directly to researching childhood obesity?

- The survey was divided into eleven sections.
  - List these sections below.
  - Circle/Highlight the sections you feel have the most influence in childhood obesity.

Visit the 2007 NSCH Sampling & Administration Process at http://childhealthdata.org/docs/nsch-docs/2007_nsch_sampling_and_administration_508-pdf.pdf?sfvrsn=2

- Draw a flow chart in the space below to explain the process researchers used in this study.

- How many people were interviewed nationally?

- How many people were interviewed from each state?

- Which statement best fits the description of proper research? Explain.
  - The number of participants or trials does not influence the validity of the research.
  - The larger the number of participants or trials, the more valid the research becomes.
  - Less is more!

Go to ***Indicator 1.4: What is the weight status of children based on Body Mass Index (BMI) for age?***, on the 2007 National Survey of Children's Health at http://childhealthdata.org/browse/survey/results?q=226&r=1

- What are these numbers saying about childhood obesity?

Go to ***Indicator 1.5: Physical activity, age 6-17***, on the 2007 National Survey of Children's Health at: http://childhealthdata.org/browse/survey/results?q=228&r=1

- Describe what you think the graph is telling you.

- Record the Nationwide data:

  Percentage (%) engaged in physical activity

  Nationwide: _____ 0 days_____ 1-3 days_____ 4-6 days_____ Everyday

- In the ***Edit Search Criteria*** box, select your state in the state dropdown menu. Compare your state's percentage (%) of children engaged in physical activity to the nationwide results for each category.

  Percentage (%) engaged in physical activity

  Your State: _____ 0 days_____ 1-3 days_____ 4-6 days_____ Everyday

- After recording your state's data, select five other states of differing geographic locations and record the data below.

	Percentage (%) engaged in physical activity			
	0 days	1-3 days	4-6 days	Everyday
State in Northeast:	_____	_____	_____	_____
State in Southeast:	_____	_____	_____	_____
State in Northwest:	_____	_____	_____	_____
State in Southwest:	_____	_____	_____	_____
State in Central US:	_____	_____	_____	_____

- Which state percentages are similar?

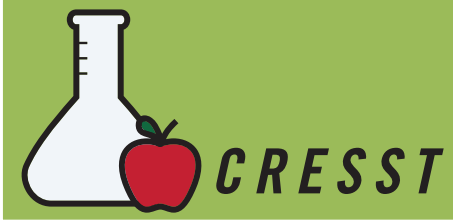
- Which states are different?

- Why do you think they compare or contrast? What inferences can be made? (What do you know about each state's demographics, food, lifestyles, etc.?)

In the ***Edit Search Criteria*** box, select *household income level* in the subgroup dropdown menu.

- What conclusions can be drawn? (Note: 0-99% is the lowest income level)

- Select any combination of income levels to compare and draw a graph comparing your data (use color in your graphing).



Let's Work it Out

Revised February 2016

Introduction

The relationship between Calories consumed and the Calories used by an individual to meet his or her daily energy requirement is referred to as energy balance. When energy is out of balance, the individual will either lose or gain weight. This relationship is key to healthy weight maintenance. To successfully lose weight, individuals must increase physical activity and reduce Calorie consumption. To sustain that weight loss, one's diet and physical activity plan needs to be maintained as a natural part of his or her daily schedule. Individuals who personalize their diet and physical activity plan, and incorporate it into their everyday life, generally have a better chance of maintaining a healthy weight than those who adopt overly intense plans or ones that include specialized foods or equipment.

Purpose

In this lesson, students will study the benefits of being physically active while comparing information from a variety of websites to examine the accuracy and validity of health information. They will explore what "physically active" means to them and find at least three ways they can be active.

Objectives

At the end of this lesson, students will be able to:

- Demonstrate the ability to access valid information and use goal-setting skills to enhance health
- Demonstrate the knowledge and skills to achieve and maintain a health-enhancing level of physical activity and fitness
- Develop a personal plan to stay active on a regular basis
- Use Microsoft® Excel or other spreadsheet to graph their findings using bar graphs

- Develop hypotheses or questions and gather information from relevant sources
- Use the information gathered to determine three of the best ways to burn Calories throughout the school day

Key Terms

- Accuracy: the closeness with which an observation or a measurement of a variable approximates its true value; an accurate test implies freedom from both random and systematic error
- Aerobic exercise: exercise that increases your heart rate, works your muscles, and raises your breathing rate
- Energy balance: the relationship between "energy in" (Calories consumed) and "energy out" (Calories used by the body to meet the organism's daily energy requirements). An energy imbalance will result in either weight gain or loss.
- Flexibility exercise (stretching): exercise that helps keep your joints flexible and reduces your chance of injury during other activities
- Nutritional Calorie: a unit equal to one kilocalorie, used to express the heat output of an organism and the energy value of food. It is abbreviated as Kcal or Cal. It is also called a large Calorie.
- Reliability: the extent to which a test, device, or tool gives the same results in repeated measures under similar circumstances
- Strength training (resistance training): exercise that helps build strong bones and muscles
- Validity: the extent to which inferences based on scores are appropriate and meaningful

National and State Standards

National

Next Generation Science Standards:

Disciplinary Core Ideas LS1.C

Crosscutting Concepts 2, 3, 5

Science and Engineering Practices 5, 8

Nature of Science Understandings 1, 3, 5, 7, 8

Essential Features of Classroom Inquiry 1, 2, 3, 5

National Standards for Health: Standards 1, 2, 3, 4, 5, 6, 7

National Standards for Physical Education: Standards 3, 4 ,5

Virginia

Science 6.1 b, e, f, LS.1 h, PS.1 g–k BIO.1 a, e
Health: 6.2 a, 6.3 b, c, d, f, 7.1 b, 7.2 a, b, c, e, n, o, 7.3 b, k, t, 8.1 b, 8.2 c–g, 8.3 a, c, 9.1 b, g, p, 9.2 b, d, f, h, , 9.3 a, 10.1 a, b, c, f, 10.2 a, b, 10.3 a, g, l
Physical Education: 6.2 a–d, 6.3 a, b, 6.5, 7.2 b, 7.3 a–e , 7.5 a, b , 8.3 a, b, 8.4 a–e, 8.5 b, 9.2 a, b, 9.3 a–e, 9.5 a–c, 10.2 a, b, 10.3 a, b, 10.5 a–c, 11/12.2 a, b, 11/12.3 a–d, 11/12.5

Materials

- Internet access to Calorie counting websites
- At least one computer per 2 students

Procedures

1. As a class, discuss energy balance and the relationship between Calorie intake and physical activity.
2. Brainstorm ways to be physically active. Encourage the students to consider any activity where they are moving (walking, going up/down stairs, and housecleaning).
3. Write the ideas on the board/Smart Board and have each student choose at least ten activities he or she would enjoy.
4. Using the Internet, the students will look up each of their activities and determine how many Calories are burned in 30 minutes.
5. Students will then use another spreadsheet program to graph their findings using a bar graph.
6. The students will use the information gathered to determine three of the best ways to burn Calories throughout the school day.

Observations and/or Data

- Ask students the following questions when reviewing the activities and the amount of Calories burned in 30 minutes:
  - What are some activities that you think burn a lot of Calories?
  - What are some activities that you would enjoy doing at least twice a week for one month?
  - Did you accurately identify Calorie-burning activities?
  - Which activities will you perform in order to complete your plan?

Analysis and Conclusions

- Were there differences between websites in the number of Calories burned for the various activities? What explanations can you suggest for any differences?
- After completing your research and class discussion of the findings, write a short report about which three activities you would do most often. Develop a plan for doing these activities two to three times a week.

Critical Thinking Questions

- Burning Calories is considered synonymous with weight loss. Based on the activities you have examined, which activities would burn more Calories?
  - Why?
- Would strength training burn more Calories than aerobic activities?
  - Why?
- What would be the benefit of combining strength training and aerobic activities?

Teacher Notes

Check the classroom Internet access to be certain that students can access a variety of Calorie counting and physical activity websites. These websites should include the range of Calories consumed for different body types.

Students should have a basic understanding of the definition of physical activity and Calories, potential versus kinetic energy, mechanical energy, and energy conversions within the body that cause the utilization of Calories.

Safety Notes

Make sure all students are following proper classroom safety guidelines.

CRESST Videos

The CRESST Videos are designed to be used in conjunction with the CRESST Curriculum. Each classroom-friendly video is approximately 4 minutes in length and can be used to generate discussion related to clinical research, heathy lifestyle choices, and student research into health-related topics.

The Health class in ***CRESST Kids and Health: From Classroom to Community - How Research Can Improve Our Health*** is completing this lesson. The video can help students make connections between physical activities, energy balance, and healthy choices. This lesson is one of the lessons highlighted in this video.

Background Information and Resources

Students should use different search engines in order to find different websites that will assist them in determining common daily activities and the approximate amount of Calories burned. Below are some websites that may provide students with this information.

Calorie Count
www.caloriecount.com

This site provides Calorie values from a large variety of food. It can be used without signing up; however, there are more resources available to those who sign up.

Health Status Calories Burned Calculator
www.healthstatus.com/calculate/cbc

This site includes a calculator that determines the number of calories burned for a variety of physical activities.

Livestrong.com: MyPlate
www.livestrong.com/myplate

This site provides Calorie values for a large variety of food, as well as a large variety of health and wellness resources. It can be used without signing up; however, there are more resources available to those who sign up.

Livestrong.com: Fitness and Exercise Directory
www.livestrong.com/thedailyplate/fitness/directory/

This site includes a directory of common physical activities and includes the number of calories burned for each activity.

Extensions

Classroom

Physical science energy topics can be discussed when introducing Calories and food energy. A chemistry experiment could be designed and conducted to determine the Calories in various foods. This experiment will also illustrate the difference between a calorie and a nutritional Calorie.

Cross-Curricular

Language Arts: In language arts class, students can complete the physical activity report as an exercise in technical writing.

Physical Education: Coordinate with the Health and Physical Education teachers to allow students to collect relevant data during their Health and Physical Education classes.

Name:

Student Handout

Let's Work It Out Sample Rubric

Your plan must include the following:	Possible points	Points received
1. The identification of at least four activities that will be performed at least twice a week (5 points per activity)	20	
2. A paragraph (5 to 7 sentences) about the four activities chosen	20	
3. A spreadsheet graph of the Calories burned while doing at least ten different activities	20	
4. Time schedule and calendar for performing the activities (should span over at least a month)	20	
5. Two witness letters, photographs, or other approved documentation of activity participation	20	
	Possible Grade = 100	Grade =

#2 and #3 will be completed in class prior to the development of your activity plan, but must be turned in at the end of the unit along with your plan.

Walkable Communities: Exploring Measurement, Reliability and Validity

CRESST

Revised February 2016

Introduction

The ease with which regular exercise can be incorporated into daily life is being studied as one factor that may be related to rates of obesity within a community. Walking is recommended by many public health organizations to promote fitness and wellness. In some neighborhoods, it is easier than in others to walk as part of accomplishing the usual tasks of the day. Researchers have developed a variety of methods to measure the walkability of a neighborhood, such as using pedometers to measure how far people walk per day or completing rating scales that incorporate factors such as availability of sidewalks and safety in the neighborhood. This lesson uses the outcome of walkability of a community to investigate the important concepts of reliability, validity, and feasibility of outcome measures in clinical studies.

Purpose

The purpose of this lesson is to explore reliability, validity, and feasibility of an outcome measure for a clinical study by considering how to measure the concept of a "walkable community."

Objectives

At the end of this section, students will be able to:

- Define reliability and validity
- Explain why reliability, validity, and feasibility of the outcome measure is important in a clinical study
- Analyze data collected from a pedometer to assess reliability of the pedometer measurement
- Correlate the walkability checklist score of the community with physical activity level as measured by pedometers
- Debate the pros and cons of using the walkability checklist and pedometers as a measure of a "walkable community"

Key Terms

- Construct: an idea or theory, especially one that is complex and formed from a number of other elements (e.g., intelligence)
- Pedometer: a device that measures the distance walked by recording the number of steps taken
- Reliability: the extent to which a test, device, or tool gives the same results in repeated measures under similar circumstances
- Validity: the extent to which inferences based on scores are appropriate and meaningful
- Walkability: a measure of how easy it is to walk around in an area, neighborhood, or community

National and State Standards

National

Next Generation Science Standards:

Crosscutting Concepts 3, 5

Science and Engineering Practices 3, 4, 5, 6, 8

Nature of Science Understandings 1, 2, 3, 5, 7, 8

Essential Features of Classroom Inquiry 1, 2, 3, 4, 5

National Standards for Health: Standards 1, 2, 3, 4, 5, 6, 7, 8

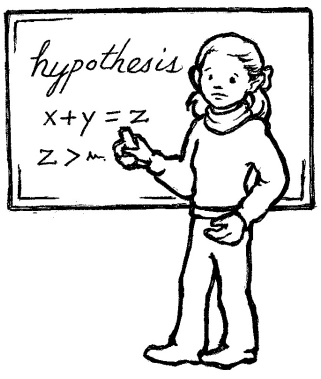
National Standards for Physical Education: Standards 2, 3, 4

Virginia

Science 6.1 f, LS.1 e, I, j, PS.1 f–k, BIO.1 a–g, I, m

Health: 6.1 g, 6.2 a, 6.3 b, c, j, 7.1 b, c, k, n, 7.2 a-c, t, u, v, 7.3 b, c, e, k-m, t, 8.1 b, 8.2 c, r, 8.3 b, c, p, q, 9.1 b, g, p, r, 9.2 b, d-f, h, v, y, 9.3 a, e, 10.1 a, f, i, 10.2 b, c, f, o, u, x, 10.3 a, g, m,

Physical Education: 6.4 a, b, 6.5 b, 7.2 d, 7.3 b, 7.4 a–c, e, 7.5 a, b, 8.2 d, 8.5 c; 9.1 d, 9.2 a, c, 9.5 a, 10.1 a, b, 10.2 d, 10.4 b, 10.5 d, e,



CRESST

Materials

- Pedometers
- Copies of the Walkability Checklist (http://www.walkableamerica.org/checklist-walkability.pdf) for the class
- Copies of the Neighborhood Environment Walkability Scale – Youth (NEWS-Y) (http://sallis.ucsd.edu/Documents/Measures_documents/NEWS_Y_adolescent.pdf) for the class
- A spreadsheet program for data recording, graphing, and calculations
- As an alternative, data can be recorded and graphed on paper
- Computer and LCD projector

Procedures

1. Engage students in a discussion of walking as a form of exercise and its relationship to health and wellness. What opportunities do students have to walk during the day? What are some of the things that make walking difficult or easy within the community? If we were to conduct a study to compare communities or neighborhoods on how easy it is to walk while carrying out daily activities, how could we measure "walkability"?
2. Introduce three methods that have been used to measure walkability: the pedometer, the walkability scale, and the NEWS-Y.
3. Define reliability, validity, and feasibility, and review the importance of these concepts when measuring a study outcome such as walkability.
4. To illustrate the concept of reliability:
   a. Students walk a defined distance (such as 1 lap around the school track) at a comfortable pace wearing a pedometer on their right arm. Record the total steps walked.
   b. Repeat the walk for the same distance wearing the pedometer on the left arm. Record the total steps walked. Alternatively, the pedometer can be used to measure the total steps when walking the same distance on two different days.
   c. Create a graph, plotting measurement 1 versus measurement 2. Using a spreadsheet program, calculate the correlation coefficient. The more highly

correlated the two measures are, the more reliable the measure.

5. To illustrate the concept of validity:
   a. Have students work in groups to complete the NEWS-Y for the neighborhood around the school. This is a validated measurement tool. Discuss the neighborhood characteristics that are being evaluated in the NEWS-Y.
   b. One way to show that a measurement tool is valid is to show that it measures the same thing that a "gold standard" validated tool measures. Have students work in groups to complete the walkability checklist, another measure of walkability, for the neighborhood around the school. What are the similarities and differences?

Observations and/or Data

- Reliability exercise:
  Enter the two pedometer recordings for each student in an Excel spreadsheet. The spreadsheet should have three columns (student ID, total steps for 1st measurement, and total steps for 2nd measurement) and a row for each student.
- Validity exercise:
  Does the walkability checklist appear to assess the same factors as the NEWS-Y? What are the similarities and differences?

Analysis and Conclusions

- Reliability exercise:
  Create a graph, plotting measurement 1 versus measurement 2. Using Excel, calculate the correlation coefficient. The more highly correlated the two measures are, the more reliable the measure. What are some reasons that the two measures might not be exactly the same?
- Validity exercise:
  What are the advantages and disadvantages of using the NEWS-Y versus the walkability checklist?

Critical Thinking Questions

- What are some ways that the reliability of a measurement tool can be improved? Is training of the individuals who will be making the measurements important?
- Discuss how the walkability checklist could be validated by comparing walkability checklist scores to the NEWS-Y scores in various communities. What kinds of

communities would you want to study (similar or different communities)?

- Based on what you considered about your community when completing the NEWS-Y and the walkability checklist, what things could be changed in your community to improve its walkability? Do you think people would walk more if these changes were made?

Teacher Notes

You can calculate the score on the NEWS-Y using instructions available at http://sallis.ucsd.edu/Documents/Measures_documents/NEWS_Y_scoring.pdf. This calculation is rather complicated but would definitely illustrate the point of how complex validated clinical trial measures can be.

Safety Notes

Make sure all students are following proper classroom safety guidelines. When walking outside of the classroom, follow guidelines appropriate for physical education safety.

CRESST Videos

The CRESST Videos are designed to be used in conjunction with the CRESST Curriculum. Each classroom-friendly video is approximately 4 minutes in length and can be used to generate discussion related to clinical research, heathy lifestyle choices, and student research into health-related topics.

The physical activities presented in ***CRESST Kids and Health: From Classroom to Community - How Research Can Improve Our Health*** can be used to create a community plan to improve walkability and provide options for increased physical activity.

Background Information and Resources

An important aspect of clinical research studies is the selection of the outcome (also called the study endpoint) that will be measured in the study. The outcome is the construct that the study is attempting to understand or affect. Examples of study outcomes include body mass index (BMI), level of physical activity, food choices, or having a diagnosis of diabetes. In the process of designing a clinical study, the method that will be used to measure the outcome must be selected from measures already reported in the scientific literature, or a new method must be developed.

Some of the important considerations in the selection of a measurement tool are the validity, reliability, and feasibility of the measure for a study. Reliability, or consistency of the measure, refers to whether using the measurement tool generates the same results when used under similar circumstances. Validity refers to whether the measurement tool actually measures what it intends to measure. A measurement tool can be valid (measures what we think it measures), but not reliable. It can also be reliable (measures consistently), but not valid. The reliability and validity of existing measures are often published in the scientific literature. If a new method of measurement of an outcome is proposed, then it is important to establish this measure's reliability and validity. Feasibility of a measure indicates whether it is practical (easy to use, affordable, etc.) to use in a particular study population or setting. Choosing an outcome measure and considering its validity, reliability, and feasibility is part of the information gathering and synthesis needed to design a clinical study.

"Walkable community" is a concept indicating how friendly a community or neighborhood is to walking. Communities around the world are considering ways to increase walkability as a way to improve the health and well-being of the community (www.walkscore.com). Some of the factors that influence the walkability of a neighborhood include availability of sidewalks, level of traffic, and safety. Several tools or processes have been used to measure walkability. Some of these include counting the number of people walking in a given area during a period of time, using a standard scoring process such as the Walkability Checklist (http://www.walkableamerica.org/checklist-walkability.pdf), or using a validated rating scale such as the Neighborhood Environment Walkability Scale – Youth (NEWS-Y) (http://sallis.ucsd.edu/Documents/Measures_documents/NEWS_Y_adolescent.pdf).
Walkability has been shown to correlate with BMI and measures of physical activity as well (Frank et al. 2005). The Center for Disease Control (http://www.cdc.gov/physicalactivity/basics/adults/) advises at least 2.5 hours of walking per week for adults to reduce the risk of obesity and the resulting health conditions such as cardiovascular disease, diabetes, hypertension, high cholesterol, stroke, cancer, and depression. Children and adolescents should have one hour or more of physical activity per day. In a walkable community, it is easier to accumulate the recommended minutes of walking per week while carrying out daily tasks such as going to and from school or running errands.

University of California, San Diego: James F. Sallis, Ph.D.
http://sallis.ucsd.edu/index.html

Dr. Sallis maintains a number of resources related to walkability and physical activity on his website. His current projects can be accessed via the links at the bottom of the page.

"How Neighborhood Design and Recreation Environments Affect Physical Activity in Youth"
http://videos.med.wisc.edu/videos/1689

This presentation by Dr. James F. Sallis can be used to introduce "walkability."

Neighborhood Environment Walkability Scale – Youth (NEWS-Y)
http://sallis.ucsd.edu/Documents/Measures_documents/NEWS_Y_adolescent.pdf

This validated rating scale was developed by Dr. Sallis to measure community walkability from an adolescent perspective.

Center for Disease Control and Prevention: How much physical activity do you need?
http://www.cdc.gov/physicalactivity/everyone/guidelines/

This site provides recommendations for physical activity that are based on the 2008 Physical Activity Guidelines for Americans. Recommendations are provided for different age categories.

Walk Score
www.walkscore.com

This site provides information about neighborhood walkability and a directory of scores for various cities and communities throughout the United States.

Frommers: World's Most Walkable Cities
http://www.frommers.com/slideshows/819366-the-world-s-most-walkable-cities#sthash.uOnzTCEJ.dpbs

This site provides information about the most walkable communities around the world.

Virginia Safe Routes to School Program
http://www.virginiadot.org/programs/ted_Rt2_school_pro.asp

This website, from the Virginia Department of Transportation (VDOT), provides resources to help schools and communities create and maintain Safe Routes to School (SRTS) programs. These programs are designed to encourage children and youth to increase physical activity by providing safe routes for walking and biking.

Extensions

Classroom

For additional data collection and analysis experience, have each student complete the walkability checklist for the neighborhood around his or her home. Next, have students wear a pedometer for a whole day to count the steps that they walk. Each student enters his or her data into a class spreadsheet in Excel (Column 1 = student ID, Column 2 = walkability checklist score, Column 3 = pedometer number of steps in a day, with one row for each student). Use Excel to plot the checklist score versus number of steps. Are they correlated? How might the measures of walkability be similar and different from one another?

Cross-Curricular

Mathematics: Coordinate with mathematics teachers so that the students can complete the graphs and graph analyses in mathematics class.
Language Arts: In language arts class, the students can complete a report or presentation of suggestions to improve walkability in the school community.
Physical Education: Coordinate with the Health and Physical Education teachers to allow the students to collect relevant data during their Health and Physical Education classes.

What's On Your Plate?

CRESST

Revised February 2016

Introduction

Energy balance, the relationship between Calories consumed and the Calories used by an individual to meet his or her daily energy requirement, is critical to healthy weight maintenance. To successfully lose weight, individuals must increase physical activity and reduce Calorie consumption. Many online Calorie counting sites use data provided by users. In some cases, this data is inaccurate or misleading. It is important that Calorie estimates from credible resources are used to create and maintain a sustainable dietary plan.

Purpose

In this lesson, students will study the benefits of using credible resources to assist with monitoring food intake, setting realistic goals, and improving healthy eating habits. They will explore interactive websites and resources in order to create a healthier meal plan and monitor food intake. Students will discuss concepts associated with the reliability and validity of their measurements.

Objectives

In this lesson, students will:

- Monitor food intake over a specified period of time
- Analyze nutritional values of their food intake
- Distinguish between scales of measurement
- Understand concepts relating to the credibility of measurement, specifically reliability and validity
- Develop a plan to enhance healthy eating habits

Key Terms

- Energy balance: the relationship between "energy in" (Calories consumed) and "energy out" (Calories used by the body to meet the organism's daily energy requirements). An energy imbalance will result in either weight gain or loss.
- Interval scale: level of measurement in which there are equal intervals between numbers, the "zero point" is arbitrary and negative numbers can be used (e.g., temperature)
- Nominal scale: level of measurement, with no implied order, in which names or labels are used for certain characteristics (e.g., male and female)
- Ordinal scale: level of measurement in which categories are ordered, but there is no measure of the degree of difference between categories (e.g., the results of a horse race: first place, second place, third place, etc.)
- Ratio scale: level of measurement in which ratios can be used in comparing scores, and it is possible to measure a true zero point (e.g., weight)
- Reliability: The extent to which a test, device, or tool gives the same results in repeated measures under similar circumstances
- Validity: the extent to which inferences based on scores are appropriate and meaningful

National and State Standards

National

Next Generation Science Standards:

Disciplinary Core Ideas LS1.C

Crosscutting Concepts 2, 3, 4, 5

Science and Engineering Practices 4, 5, 6, 8

Nature of Science Understandings 1, 2, 3, 5, 6, 7, 8

Essential Features of Classroom Inquiry 2

National Standards for Health: Standards 1, 2, 3, 4, 6

Virginia

Science 6.1 b, e, f, LS.1 e PS.1g–k BIO.1 a, e, f

Health: 6.1 b, 6.2 a, 6.3 a, 7.1 e, 7.2 e, 8.3 e, 9.1 b, c, 9.2 c, f, 9.3 a, b, 10.1 b, 10.2 b, 10.3 a, b

Physical Education: 7.3 d, 7.5 a, 8.4 a, b, c, 8.5 b, 9.3 a, 10.5 a

Materials

- Internet access
- Laptop LCD projector

Procedures

Day 1:

1. Visit www.choosemyplate.gov and review the new USDA "Choose My Plate" guidelines with the students.
2. Explain procedures for itemizing today's food consumption using the attached Food Intake Record.
    a. Direct students to write down what they have eaten so far during Day 1 and continue through the end of the day.
    b. Remind students to bring their completed Food Intake Record to the next class.

Day 2:

1. Explain how to access Food-A-Pedia (https://www.supertracker.usda.gov/foodapedia.aspx) or a similar website.
2. Ask students to look up and record the caloric values for the food items in their logs.
3. Create a sample meal description (for example: a peanut butter and jelly sandwich with a glass of milk) that you will describe to the class. This description should not include specific details about serving size, food brands, etc. Have all students calculate the total caloric value of this meal.
4. Ask students to share the total caloric value they calculated for the sample meal described in step 3.
5. Prompt a classroom discussion about reasons for differences in the students' total values by asking them why they think they might have calculated different caloric values for the same meal. Consider different interpretations of portion size, type of bread, etc.

Day 3:

1. Explain how to access the USDA SuperTracker Food Tracker (https://www.supertracker.usda.gov/foodtracker.aspx).
2. Have the students enter food items from Day 1's Food Intake Record in the Food Tracker and click on the "Nutrient Intake Report" link to compare their nutrient and caloric intake to the target values in the report.

3. Ask students to write a summary of their personal findings related to their eating habits including three healthy suggestions to improve their own food choices.
4. Assign homework: The students will write a personal meal plan based on the USDA SuperTracker Food Tracker recommendations using a blank Food Intake Record.
5. Collect the revised meal plan and summary.
6. Assess summary and provide feedback as needed.

Observations and/or Data

- Observed eating habits will be recorded using the Food Intake Record sheets.

Analysis and Conclusions

- Did everyone calculate the same values for the sample meal?
- What factors may have contributed to any differences?
  - How might these differences influence an individual's health?
- How could we redesign this activity to improve the reliability of our results?
- What are the basic food groups?
- What are some of the features or characteristics of a healthy meal plan?
- Which food group(s) should be eaten in moderation?

Critical Thinking Question

- Which is more important, validity or reliability? (Hint: This is a challenging question. Scores must be reliable in order to be valid.)

Teacher Notes

When discussing healthy eating, it is important to gather information from students about their preconceived ideas of healthy habits. The students should have a general understanding of the basic food groups. Background information about basic food groups and the USDA's "Choose My Plate" guidelines are available at www.choosemyplate.gov.

The students should also be familiar with serving size. Serving size is a standardized amount of a food used to compare similar foods. It is usually listed in common measurements, such as 1 cup or 1 ounce. Often, the serving size differs from the contents of the food package. For example, one serving of soda equals one cup (eight fluid ounces); however, the typical can of soda contains 12 fluid ounces. Thus, a can of soda is usually 1.5 serving sizes.

Preview the YouTube video (http://www.youtube.com/watch?v=dZ49FuUpxnE) and written guide https://www.supertracker.usda.gov/userguide.aspx), and familiarize students with Food-A-Pedia at https://www.supertracker.usda.gov/foodapedia.aspx.

Safety Notes

Make sure all students are following proper classroom safety guidelines.

Background Information and Resources

Every five years, U.S. Departments of Health and Human Services (HHS) and Agriculture (USDA) publish the Dietary Guidelines for Americans. The 2015-2020 Dietary Guidelines for Americans is the 8th edition. Building on the previous editions, these guidelines focus on eating patterns in addition to Calorie and nutrition recommendations and emphasize the importance of physical activity. The new guidelines are found at www.choosemyplate.gov.

USDA SuperTracker Help
https://www.supertracker.usda.gov/help.aspx

This webpage provides a user guide and site video tours to help you and your students navigate and use the SuperTracker tools.

USDA: Choose My Plate
http://www.choosemyplate.gov

This site provides a wealth of information, tools, and background information related to the current USDA Dietary Guidelines for Americans.

USDA Choose My Plate: Printable Materials
http://www.choosemyplate.gov/printable-materials

This website includes a number of printable resources and activities to support nutrition instructions. Some recommended items from this list are:

- Getting Started with My Plate
- Calorie Balance Handout
- Recipes from Create Healthy, Active Celebrations
- SuperTracker and other tools, this includes a SuperTracker Scavenger Hunt to help introduce the students SuperTracker tool

PBSKIDS: Food Smarts: Understanding Food Labels http://pbskids.org/itsmylife/body/foodsmarts/article4.html

This PBS Kids website gives the students an easy to read explanation of food labels. Links to additional activities and resources, such as “Serving Size Surprises” and “Real World Tips and Tricks” are also useful. The Food Smarts Video (http://pbskids.org/itsmylife/video/index.html?guid=e7f8bd80-3ad9-4304-801b-61c5ad9e2d84) is an excellent complement to all of these topics.

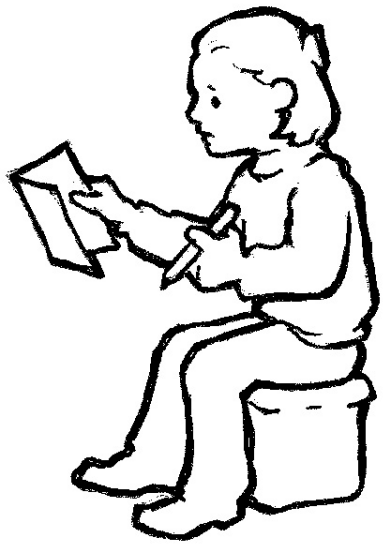
Extensions

Classroom

Students can utilize the two worksheets in this lesson, as well as visit PBSKIDS: Food Smarts: Understanding Food Labels (http://pbskids.org/itsmylife/body/foodsmarts/article4.html) to learn about food labels and use a Calorie counting site to determine the caloric/nutritional values of the foods they have at home. Then, they can then make a daily/weekly food plan, possibly discussing the exercise with their parents and choosing healthy substitutes for future grocery shopping.

Cross-Curricular

Language Arts: In language arts class, students can complete a report or presentation highlighting the benefits of including certain types of food in a daily meal plan.
Physical Education: Coordinate with the Health and Physical Education teachers to allow students to collect relevant data during their Health and Physical Education classes.



Name: _____

Student Handout

Food Intake Record

For (date): _____

Record the food that you have eaten today, starting with breakfast, then continue to record what you eat for the rest of the day. Try to be as accurate as possible with the type of food eaten and the amounts. List each food separately.

For example: a peanut butter and jelly sandwich would be listed as follows:

Meal	Food	Amount	Food Group	Servings
Lunch	*Peanut Butter*	*2 tablespoons*	*Meat*	*2*
	Jelly	*2 tablespoons*	*FOS*	*2*
	Bread-white	*2 slices*	*Breads, Cereals, Pasta*	*2*
	Milk	*1 cup*	*Dairy*	*1*
	Apple	*1 medium*	*Fruit*	*1*

Meal	Food	Amount	Food Group	Servings
Breakfast				
Lunch				
Dinner				
Snack				

Name:

Student Handout

Peer Review Checklist

Record your nutrient intake in the column title “Yours” using the SuperTracker Food Tracker Nutrient Intake Report page.

Have your partner place a checkmark in the column title “Minimum Requirements” if you met the minimum requirements.

Nutrient	Recommended	Yours	Minimum Requirements
Calories (kcal)	2200		
Protein (g)	50 g		
Carbohydrates (g)	300 g		
Dietary Fiber(g)	25 g		
Total Fat(g)	No more than 30% of total calories		
Saturated Fat (g)	No more than 10% of total calories		
Cholesterol (mg)	300 mg		
Vitamin A (RE)	700 RE		
Vitamin C (mg)	75 mg		
Calcium (mg)	1200 mg		
Iron (mg)	8 mg		
Sodium (mg)	<=2400 mg		