

Activity:

Energy In-Energy Out

Overview

In this activity, participants will learn about the importance of balancing “energy in” (food eaten) with “energy out” (energy used by the body to function normally and during physical activity) to maintain a healthy weight. *Note that this activity is meant to demonstrate the relationship between energy coming in and energy going out; it does not represent exact values of calories used for each exercise in this activity.*

Learning Objectives

By the end of the activity, participants will be able to:

- Understand the relationship between energy in and energy out.
- Understand how to achieve balance between energy in and energy out to maintain a healthy weight.
- Understand the consequences of an imbalance in calorie intake/use.

Audience

3rd grade to adult

Materials

- Timer/watch
- Balance scale
- Beanbags of equal weight (10)
- Snack cards (included with this lesson)
- Energy In-Energy Out chart (included with this lesson)
- Container to hold snack cards

Duration

20 minutes

Activity Preparation

Gather 10 beanbags and a balance scale prior to doing this activity. Label the left side of the scale “Energy In” and the right side “Energy Out” and place the scale on a level surface at the front of the room. Print out enough snack cards for each participant (one set includes 15 cards), cut them out, fold them in half, and place them in a container off to the left of the scale. Place 5 beanbags in front of each side of the balance scale.

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Background Information:

Calories in food give our bodies the fuel to perform the basic functions that enable us to survive (think, breathe, move, etc.). The amount of energy (calories) each person needs to take in each day to perform basic metabolic functions depends on a number of factors like age, height, weight, and gender. Any energy that is used beyond these basic bodily processes (such as physical activity) will also require energy from food. Maintaining a healthy weight means achieving energy balance, which involves balancing energy taken in from food with the amount of energy used by our bodies to perform both basic functions and physical activity.

Instructions

1. Begin this activity with a discussion about how the body uses energy that is taken in from food we eat, asking some or all of the following questions:
 - What happens when you take in more energy than you use? [Gain weight]
 - What happens when you use more energy than you take in? [Lose weight]
 - Are all calories the same? Are the calories you get from an apple the same as the calories you get from a cookie? [A calorie is a calorie but the source of the calorie matters. Food is made up of different mixtures of macronutrients (carbohydrates, fats and proteins), which are nutrients containing calories that provide energy for the body to function normally. However, the body uses these sources of energy differently (see bullets below and the *Nutrients* flash cards included in the Educational Materials section). Getting adequate amounts of all three macronutrients in a proper balance to meet your specific needs is essential for good health.]
 - **Fat** provides 9 calories per gram and is easily stored by the body for future energy needs (so that cookie, with approximately half its calories coming from fat, may provide you with a short burst of energy from the carbohydrates (sugar) but will probably be stored as fat in the body to use later).
 - **Carbohydrates** provide 4 calories per gram but can only be stored in limited amounts so they act as a fast-burning energy source (so that apple that's made up of mostly carbs would provide you with a quick burst of energy).
 - **Proteins** also provide 4 calories per gram and are mostly responsible for building new proteins with specific functions in the body but can provide energy when carbohydrates and fats are in short supply.
 - Can you give examples of foods you would eat when you need a lot of energy (like before exercising)? [Foods that contain carbohydrates for a quick and easy source of energy. Complex carbs, specifically, because the body burns them at a slower rate so they maintain energy for longer periods of time.]
2. Ask for volunteers to come to the front of the class one at a time, draw a snack card from the container, and follow the directions on the snack card by placing the appropriate number of beanbags on the left side of the balance scale (Energy In).
3. Ask the participant to imagine that they have just consumed the food on their snack card. Instruct them to refer to the Energy In-Energy Out chart and do the exercise that corresponds to the number of beanbags they placed on the balance scale. While the participant is doing the exercise as you keep time, place the same number of beanbags on the right side of the balance scale (Energy Out) to represent that the participant is reaching an energy balance by balancing energy in with energy out.

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4. After the participant has worked his/her way through the energy balance, invite the next volunteer up to draw a snack card. One at a time, have each participant complete steps 2 and 3 until all volunteers have had a turn.
5. After each participant has had a chance to balance the scales with energy in and energy out, help them make the connection that the foods containing more calories required them to do more vigorous exercise for longer periods of time. Inform participants that they would have to multiply the time they spent doing their exercise by approximately 30 to actually expend the energy they would have taken in from the snack they selected (so, they would have had to march in place for ~5 minutes, dance for ~10 minutes, do squats for ~15 minutes, do sit-ups for ~ 20 minutes, or do jumping jacks for ~30 minutes based on estimated values of calories burned per hour of each activity).
6. Demonstrate for the group what happens when there is an imbalance. For example, if you ate a snack bag of potato chips (add 3 beanbags to the left side of the scale) and then marched in place for 5 minutes (add 1 beanbag to the right side of the scale), you are taking in more energy than you are using and that will lead to weight gain. Conversely, if you ate a medium apple (add 2 beanbags to the left side of the scale) and then did squats for 15 minutes (add 3 beanbags to the right side of the scale), you would be using more energy than you are taking in and will lose weight.

Adapted from: “Balancing Act,” Colorado Department of Education
(<http://www.cde.state.co.us/cdenutritran/nutriTNandCOConnectionslessons.htm>).

*Estimations of energy taken in from each snack used in this activity are based on values used in the activity from which this lesson plan was adapted. Estimations of energy used for each exercise used in this activity are based on data from Wisconsin Division of Public Health’s Department of Health and Family Services (<http://www.dhs.wisconsin.gov/physical-activity/active-communities/pdfs/Caloriesperhour.pdf>).

Energy In-Energy Out Snack Cards

You ate 1/2 cup of raw broccoli.



Add 1 beanbag to the scale.



You ate 1 medium raw carrot.



Add 1 beanbag to the scale.



You ate 1 cup of buttered popcorn.



Add 1 beanbag to the scale.



You ate 1 small chocolate chip cookie.



Add 2 beanbags to the scale.



You ate 1 medium apple.



Add 2 beanbags to the scale.



You ate 1 small banana.



Add 2 beanbags to the scale.



You drank 1 cup (8 oz.) of orange juice.



Add 3 beanbags to the scale.



You ate 1 granola bar.



Add 3 beanbags to the scale.



You ate 1 snack bag of potato chips.



Add 3 beanbags to the scale.



You drank 1 can (12 oz.) of soda.



Add 4 beanbags to the scale.



You ate 1 handful (1 oz.) of mixed nuts.



Add 4 beanbags to the scale.



You ate 6 oz. of whole-milk yogurt.



Add 4 beanbags to the scale.



You ate 1 toaster pastry.



Add 5 beanbags to the scale.



You ate 1 large bagel.



Add 5 beanbags to the scale.



You ate 1 milk chocolate candy bar.



Add 5 beanbags to the scale.



Energy In-Energy Out Chart

Snack	Calories	# of Beanbags	Exercise
Broccoli (1/2 cup, raw)	12	1	March in place 10 seconds
Carrot (1 medium, raw)	31		
Popcorn (1 cup, buttered)	41		
Chocolate chip cookie (1 small)	65	2	Freestyle dance 20 seconds
Apple (1 medium)	81		
Banana (1 small)	90		
Orange Juice (8 oz.)	110	3	Squats 30 seconds
Granola Bar (1)	130		
Potato Chips (1 oz.)	148		
Soda (12 oz.)	150	4	Sit-ups 40 seconds
Mixed nuts (1 oz.)	169		
Yogurt (6 oz., whole-milk)	190		
Toaster Pastry (1)	200	5	Jumping jacks 1 minute
Bagel (1 large)	210		
Milk Chocolate bar (1.55 oz.)	210		