



HEART RATE AND EXERCISE INTENSITY



LEARNING OBJECTIVES:

- Define the different intensities of physical activity and how it affects heart rate and breathing.
- Measure the heart rate at different intensities and identify physical activities of different intensities (light, moderate, vigorous).
- Share reasons for a positive or negative response at different intensities and identify enjoyable physical activities.

STANDARDS:

SHAPE America Grade-Level Outcomes:

- S3.E5.5b
- S5.E3.5

21st Century Skills:

- 21.3-5.HL.1
- 21.3-5.HL.3
- 21.3-5.HL.5
- 21.6-8.HL.1
- 21.6-8.HL.3
- 21.6-8.HL.5

SUPPLIES NEEDED FOR ACTIVITIES:

- Worksheets for Activities 3 and 4 (found at the end of this lesson)
- Two colors of writing utensils for each student
- SWITCH Elementary Classroom Module Lessons (optional). The lesson now is independent of the classroom module
 - Intro to Taking Heart Rate (pg. 17)
 - Increase Your Beats (Activity 9, pg. 34)
- Gymnasium (optional)

INTRODUCTION:

Based on the 2018 Physical Activity Guidelines, children and adolescents should accumulate a minimum of 60 minutes of physical activity daily as part of transportation, physical education, sports, free play, and planned exercise. The activities should be a combination of **moderate** and **vigorous** intensity, with most of them being of moderate intensity but, it is suggested to include at least 3 times per week activities that are vigorous.

But, what is moderate and vigorous-intensity?

Moderate intensity is defined as activity that increases heart rate, breathing, and sweating.

Vigorous-intensity substantially increases heart rate, breathing, and sweating.

Activities like hopscotch, four square, hiking, biking on a flat surface, skateboarding, brisk walking, or sports such as baseball, softball, and golf are moderate intensity. Activities like running, tag games, dancing, jump roping, martial arts, and sports such as basketball, soccer, tennis, swimming, and skiing are vigorous intensity.

How do I know when the intensity of my exercise is moderate or vigorous?

There are many ways to estimate exercise intensity, some based on how you feel, and some by measuring your heart rate and/or the oxygen you breathe in and out. The latter is much harder to measure as it requires expensive equipment, so we will focus on understanding the different intensities based on the heart rate and how we feel.

- **Heart rate:** Heart rate is a useful indicator of exercise intensity, and we can learn how to measure it by simply counting the beats of the heart and learn how to calculate a target heart rate zone.

Even though many factors influence your heart rate (e.g. stress, fitness), it is a good way to understand different exercise intensities. See Table 1 for the different intensities based on your age.

- **Perceived exertion:** Listening to your body and how hard you feel your body is working is called perceived exertion. Using the Rating of Perceived Exertion picture (Figure 1), you can find the picture and words or number that reflect how you feel when exercising. Use Figure 1 to select the level of perceived exertion during exercise.
- **Talk test:** A third way to understand the intensity of exercise is the talk test. When we exercise, breathing heavier is a sign of intensity. Suppose you breathe heavier and you can talk but you can't sing. In that case, the intensity is moderate. However, when you breathe so heavily that you can't talk or when you talk, you have to take some breaks to breathe, the intensity is vigorous.

Table 1. Intensity and Heart Rate (HR) Zones of Exercise Based on Age

	Light/Moderate Intensity 55%-64% HR max (for low health-related fitness)	Moderate Intensity 65%-75% HR max (for average health-related fitness)	Vigorous Intensity 76%-90% HR max (for good health-related fitness)
9-10 years old	110-129 beats/minute	130-150 beats/minute	151-180 beats/minute
11-12 years old	109-128 beats/minute	129-149 beats/minute	150-179 beats/minute
13-14 years old	128-148 beats/minute	128-148 beats/minute	149-178 beats/minute

Based on Bishop, J.G., & Santos, B.J. (2020). Cardiorespiratory Endurance (chapter 5). In J. Conkle (Ed.) Physical Best: Physical education for lifelong fitness and health. SHAPE America (4th edition). Champaign, IL: Human Kinetics).

Figure 1. Pictorial Description of Perceived Exertion

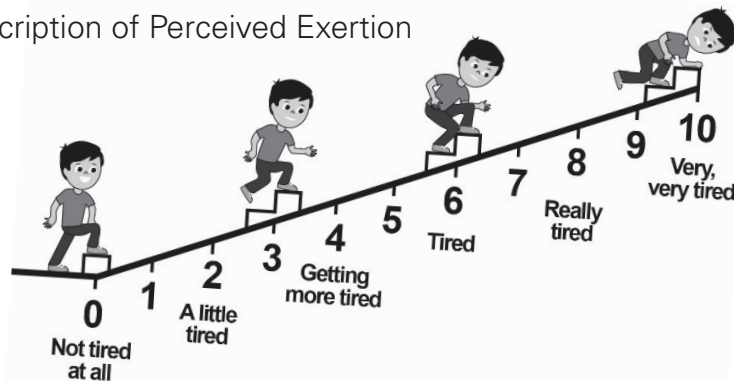


Table 2 below provides an overview of the characteristics of moderate and vigorous intensity of exercise.

Table 2. Characteristics of Moderate and Vigorous Intensity of Exercise

Moderate Intensity	Vigorous Intensity
<ul style="list-style-type: none"> • Activities like hopscotch, four square, hiking, biking on a flat surface, skateboarding, brisk walking, sports such as baseball, softball, golf. • During moderate intensity activity, you can talk without difficulty but not sing. • Your body feels as if it is getting more tired (3-5 on the perceived exertion rating scale). • Based on your heart rate, moderate intensity is when you exercise at 65%-75% of your maximum heart rate. 	<ul style="list-style-type: none"> • Activities like running, tag games, dancing, jump roping, martial arts, sports such as basketball, soccer, tennis, swimming, skiing. • In general, you will not be able to say more than a few words without pausing for a breath. • Your body feels tired to really tired (5-8 on the perceived exertion rating scale). • Based on your heart rate, vigorous intensity is when you exercise at 75%-90% of your maximum heart rate.

VOCABULARY

Moderate intensity: activity that increases heart rate, breathing, and sweating

Vigorous intensity: activity that substantially increases heart rate, breathing, and sweating

Perceived exertion: listening to your body and how hard you feel your body is working

ACTIVITY 1: MEASURE YOUR RESTING HEART RATE

(Aligned with classroom module: Intro to Taking Heart Rate, page 17).

- **DO:** Learn how to take your Heart Rate (pulse). You can use your wrist or neck to take your pulse. If using the wrist, place the tips of the index and middle fingers just one finger distance from your wrist (over the artery) and press lightly. Do not use the thumb. Start the count on a beat, which is counted as “zero.” Take a full 60-second count of the heartbeats, or take for 30 seconds and multiply by 2, or take for 6 seconds and multiply by 10. As an alternative method, students can place tips of their index and middle fingers on their neck just to the right or left of their throat and take their heart rate from this location. *Note to Instructor: This may be review for some students if they’ve done the Intro to Taking Heart Rate lesson from Classroom Module, but it is always good to review and practice it again.*
- **REFLECT:** What was your heart rate? Was it easier to find your pulse from your wrist or on your neck?
- **APPLY:** Now that you know how to take your pulse, try teaching your family members how to take their pulse tonight at home.

ACTIVITY 2: INCREASE YOUR BEATS

(Aligned with classroom module; Activity 9, page 34)

- **DO:** Do you know how fast your heart can beat? The fastest it can beat is called maximum heart rate, and it can be estimated based on your age. The younger we are, the higher the maximum heart rate we have. To estimate your maximum age-related heart rate, subtract your age from 220. For example, for a 10-year old person, the estimated maximum age-related heart rate would be calculated as $220 - 10 \text{ years} = 210$ beats per minute (bpm). The higher the heartbeat, the higher the intensity of exercise. For moderate exercise intensity, the intensity should be 65% to 75% of your maximum heart rate. Can you do the math calculations? For children, we use an adapted formula to calculate the intensity of exercise.

Look at Table 1 to see the heart rate zones for moderate and vigorous-intensity based on your age. *Next, ask the children to march in place for a minute.*

With your signal, have children pause, take their pulse, and record it in Worksheet 1, as light, moderate, or vigorous, based on the Heart Rate Zones (Table 1).

Next, have children run in place for a minute. With your signal, have children pause, take their pulse and record it on Worksheet 1, in the column that reflects the intensity of the activity they just did. If children didn't reach the vigorous intensity of exercise, ask them to do 10-15 frog jumps and then take their pulse.

- **REFLECT:** What was your resting heart rate? Was it between 60-100 beats per minute? How about your exercising heart rate? Did it fall in the Target Heart Rate Zone? If your heart rate was below or above the recommended zone, what could you do differently?
- **APPLY:** Think of ways you can be active for 60 minutes each day to get your heart rate in the Target Heart Rate Zone. What are some activities you could try daily to accomplish this?

ACTIVITY 3: HOW DOES IT FEEL? CHANGE THE CONDITIONS

- **DO:** Do the same activity with and without music, alone or with a friend, using a dancing video or running in place next to a desk.

To start, have students stand next to their desks (if in the classroom) or next to each other in the gym. With your signal, ask them to run in place (or run across the gym and back) for a preselected time (e.g., 2 minutes). At the stop signal, ask them to measure their heart rate and complete Worksheet 1 immediately. Repeat the activity of the same duration, but add music or play a dancing video the second time. You can use one of the following YouTube videos:

- Like to Move It (Madagascar)
- I'm Still Standing (Sing)
- Can't Stop the Feeling (Trolls)
- Try Everything (Zootopia)

Ask the student to measure their heart rate again and complete Worksheet 1 based on how they felt during the exercise. Ask them to write down the new numbers in the same column as before but with a different color of a pen to compare the two different conditions (e.g., use a red pen when recording how you felt with music and with a black pen when recording without music). Multiple copies of Worksheet 1 may be needed if you repeat the activity multiple times under different conditions (e.g. music, friend, video). One Worksheet 1 is enough for two comparisons (e.g., with/without music).

- **REFLECT:** How did it feel in each scenario? Compare your numbers in each scenario. Did you notice any differences in how you felt during exercise? Can you explain why there are differences if any? What happened when you added the music and/or video? How did the exercise feel?
- **APPLY:** As research shows, when we get distracted from the intensity of the exercise and make it more interesting by adding music/video, making it a game, involving our friends, or having variety, then we feel the intensity of the exercise to be lighter, even if our heartbeat is the same or even higher. That approach helps us stay longer on moderate to vigorous intensity levels and improve our fitness and health. Try one of these approaches next time you exercise so your heart can beat the same or even higher, but the intensity feels lighter!

ACTIVITY 4: DESIGNING A PERSONAL FITNESS PLAN

- **DO:** Have students record on Worksheet 2 opportunities for physical activity at school (beyond PE), in the neighborhood, and at locations for sports activities (e.g. gymnastics, soccer, dance, tennis, swimming, etc.). Next, ask them to record their heart rate at each activity and identify the intensity of the activity. Then, have them draw a face that reflects how they felt during the activity.
- **REFLECT:** Which one is their favorite activity? Why? Do you do activities of moderate intensity during your day?
- **APPLY:** What could you do to add more moderate intensity activities or increase your heart rate on the activities you already do? If there is an activity that doesn't feel good, what can you do to make it more pleasant? Does the activity involve friends, games, music? What else can you modify to make it feel better? Responses to these questions can be recorded in the last column of Worksheet 2.

Resources:

1. U.S. Department of Health and Human Services, 2018
2. American College of Sports Medicine, <https://www.acsm.org/>
3. Physical Best: physical education for lifelong fitness and health. SHAPE America. (2020). J., Conkle (Ed.). Champaign, IL: Human Kinetics.

Written in 2021 by Spyridoula Vazou, Ph. D., Iowa State University Department of Kinesiology, and Laura Jackman, Education Coordinator, Iowa Heart Center Foundation, in partnership with Iowa State University Extension and Outreach 4-H Youth Development.

This institution is an equal opportunity provider. For the full non-discrimination statement or accommodation inquiries, go to www.extension.iastate.edu/diversity/ext.



IOWA STATE UNIVERSITY
Extension and Outreach



	Light	Moderate	Vigorous
% of your Heart Rate (Check Table 1 for exact numbers and copy them in the cells)			
Name of activity (Which activity fit in each intensity based on your heart rate?)			
Perceived exertion (How tiring was it? See Figure 1 for scale)			
Talk test (Could you talk? Yes or No)			
How did you feel? (Draw the face that best represents how you felt during the activity)			

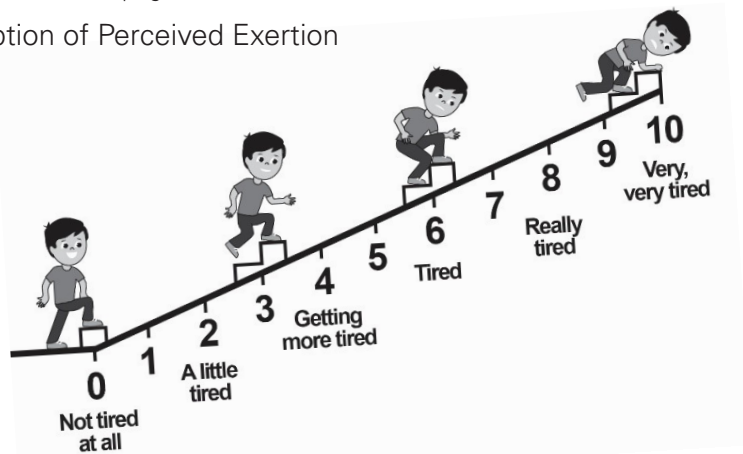


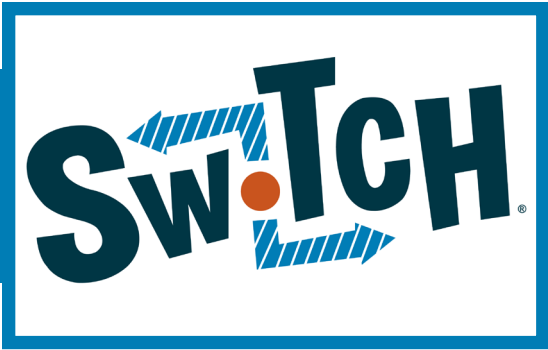
Table 1. Intensity and Heart Rate (HR) Zones of Exercise Based on Age

	Light/Moderate Intensity 55%-64% HR max (for low health-related fitness)	Moderate Intensity 65%-75% HR max (for average health-related fitness)	Vigorous Intensity 76%-90% HR max (for good health-related fitness)
9-10 years old	110-129 beats/minute	130-150 beats/minute	151-180 beats/minute
11-12 years old	109-128 beats/minute	129-149 beats/minute	150-179 beats/minute
13-14 years old	128-148 beats/minute	128-148 beats/minute	149-178 beats/minute

Based on Bishop, J.G., & Santos, B.J. (2020). Cardiorespiratory Endurance (chapter 5). In J. Conkle (Ed.) Physical Best: Physical education for lifelong fitness and health. SHAPE America (4th edition). Champaign, IL: Human Kinetics).

Figure 1. Pictorial Description of Perceived Exertion





WORKSHEET 2: MY PERSONAL FITNESS PLAN

Name: _____ Homeroom: _____




Opportunities for Physical Activity (outside of PE)	Heart Rate (pulse) and Intensity (use Table 1)	How did it feel?   	Reflect: Strategies for Improvement (write or discuss)

Table 1. Intensity and Heart Rate (HR) Zones of Exercise Based on Age

	Light/Moderate Intensity 55%-64% HR max (for low health-related fitness)	Moderate Intensity 65%-75% HR max (for average health-related fitness)	Vigorous Intensity 76%-90% HR max (for good health-related fitness)
9-10 years old	110-129 beats/minute	130-150 beats/minute	151-180 beats/minute
11-12 years old	109-128 beats/minute	129-149 beats/minute	150-179 beats/minute
13-14 years old	128-148 beats/minute	128-148 beats/minute	149-178 beats/minute

Based on Bishop, J.G., & Santos, B.J. (2020). Cardiorespiratory Endurance (chapter 5). In J. Conkle (Ed.) Physical Best: Physical education for lifelong fitness and health. SHAPE America (4th edition). Champaign, IL: Human Kinetics).