PEH3
Quarter 1 – Module 4:
Physiological Indicators for
Physical Activities

Department of Education . Republic of the Philippines

PEH3- G12
Alternative Delivery Mode
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This instructional material was collaboratively developed and reviewed by educators from public and private schools, colleges, and or/universities. We encourage teachers and other education stakeholders to email their feedback, comments, and recommendations to the Department of Education at action@deped.gov.ph.

We value your feedback and recommendations.
Physiological parameters like our human heart, blood pressure, body temperature, serum levels of various stress hormones and immunological functions can be used to assess our own welfare. These
module will help you to analyze physiological indicators such as heart rate, rate of perceived exertion and pacing associated with moderate to vigorous physical activities to monitor and to adjust your participation or effort.

<table>
<thead>
<tr>
<th>CONTENT STANDARD</th>
<th>PERFORMANCE STANDARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>The learner... demonstrates understanding of dance in optimizing one’s health as requisite for physical activity assessment performance, and as a career opportunity.</td>
<td>The learner... lead dance events with proficiency and confidence resulting in independent pursuit and in influencing others positively.</td>
</tr>
</tbody>
</table>
INTRODUCTION

For the facilitator:

Welcome to Physical Education and Health Grade 12, Alternative Delivery Mode (ADM) Module on Physiological Indicators for Physical Activity.

This module was collaboratively designed, developed and reviewed by educators both from public and private institutions to assist you, the teacher or facilitator in helping the learners meet the standards set by the K to 12 Curriculum while overcoming their personal, social, and economic constraints in schooling. This learning resource hopes to engage the learners into guided and independent learning activities at their own pace and time. Furthermore, this also aims to help learners acquire the needed 21st century skills while taking into consideration their needs and circumstances.

For the learner:

Welcome to PEH3 Alternative Delivery Mode (ADM) Module on Physiological Indicator for Physical Activity.

Have you ever feeling out of breath when you exercise? What happened when you climb stairs or walk faster? Some people find harder breathing specially when they walk briskly. For those had their exercises regularly they find it like less challenging. These are indications of Physical Fitness. When you do frequent and intense exercises the greater the level of physical fitness. This module will help you understand what will happen to your body during exercise to understand its long term effect to your health as well as your overall wellness.
Part I

What I Need to Know

This module will help you understand the ways that the body adapts to physical activity and the physiological changes that comes from it.

The module is provided to help you:

1. Analyze physiological indicators when engaging in moderate to vigorous physical activities.
2. Observe the physiological Effects of physical activity;
3. Recognize physiological indicators of the physical condition
4. Learn what is physiological indicator;
5. Importance of physiological indicators of exercise
6. Determining Intensity and physiological indicators
### What I Know

Challenge: Match the items in column A with its description in column B. Write your answer on the blank.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>______ 1. Aerobic</td>
<td>a. drives the process to sustain physical activity</td>
</tr>
<tr>
<td>______ 2 Muscle-strengthening activities</td>
<td>b. activities that improve the efficiency of aerobic energy production and cardiorespiratory endurance.</td>
</tr>
<tr>
<td><em>3</em>. Bone-strengthening Activities</td>
<td>c. weight-bearing or weight loading activity producing a force on the bones that promotes bone growth and strength.</td>
</tr>
<tr>
<td><em>4</em>. Exercise</td>
<td>d. slowest way of providing the energy needed to produce movement.</td>
</tr>
<tr>
<td><em>5</em>. Physical activity</td>
<td>e. second fastest way to obtain the energy to keep muscle contracting.</td>
</tr>
<tr>
<td><em>6</em>. Phosphagen system</td>
<td>f. primary used to improved muscular strength and muscular power.</td>
</tr>
<tr>
<td><em>7</em>. Anaerobic system</td>
<td>g. planned, structured, repetitive bodily movements that someone engages in for the purpose of improving health.</td>
</tr>
<tr>
<td>______ 8. Aerobic system</td>
<td>h. fastest way of obtaining energy to muscle</td>
</tr>
<tr>
<td>______ 9. Adenosine Triphosphate</td>
<td>i. major fuel source for the cell</td>
</tr>
<tr>
<td>______ 10. Food</td>
<td>j. activities undertaken while working, playing, carrying out household chores, travelling, and engaging in recreational pursuits.</td>
</tr>
</tbody>
</table>
k. the body can degenerate energy from stored fuel, but depends on the energy derived from food sources to allow the sustained physical activity and improvements in performance.
There are several methods to distinguish the intensity of an aerobic activity. They are measured by heart rate. The higher the intensity, the higher the heart rate will be. Here are some sample methods;

1. **Target heart rate (THR) zone of 60 to 80 percent**

   The THR zone recommends attaining 60 to 80 percent of your maximum heart rate [$HR_{max}$] to bring about cardiorespiratory fitness benefits. Those who just started a fitness program may aim for 40 to 50 percent of their $HR_{max}$.

   **Procedure:**

   To find out your THR, you need to get your $HR_{max}$ and resting heart rate [$HR_{rest}$]. There are physiological tests that measure HR max very accurately but a simple method to do is by subtracting your age from 220. So, if you are 20, you can assume that your $HR_{max}$ is 200 [220-20=200].

   To get the lower and upper ends of your THR, multiply your $HR_{max}$, which is 200, by 60 percent to get lower end of your THR zone and by 80 percent to get the upper end. The THR zone for a 20-year-old is 160 beats per minute [200x0.60=120, and 200x.80=160].

   **Consideration:**

   This method does not consider one's current level of fitness.

2. **Karvonen method**

   This method is a more accurate way of finding out one's THR zone. The formula for finding your THR range using this method is;

   $$THR\ range = (HR_{max}-HR_{rest}) \times \text{percent intensity} = HR_{rest}$$

   You will use the formula in computing for the $HR_{max}$ to determine your $HR_{rest}$. To get your $HR_{rest}$ count your pulse for 30 seconds right after waking up early in the morning. Then multiply that number by two to get the number of times your heart beat in a minute.
Procedure:

The procedure is below for the same 20-year old individual with an HRrest of 60 who wants to work out at a THR zone of 60-80 percent.

1. Find the HRR, which again is HRmax - HRrest, or 200-60=140.

2. Find the low end of your THR. Multiply the HRR [14] by percent intensity [60 percent] to get 84.

3. Add 84 to the HRrest [60 beats per minute] to get 144 beats per minutes. Same computation to get upper end of the THR.

4. Multiply 140 by 80 percent [140x0.80=112].

5. Add 60 to 112 to get 172 beats per minute.

ACTIVITY: Try to answer the given procedure: Write your answer below:

Answer:___________

Consideration;

This method takes fitness into account. Taking fitness into consideration gives a huge difference since a fitter person will have a higher THR to aim for during exercise. The HRrest of a physically fit person will be lower than that of someone who is unfit or inactive because a healthy heart beats several times fewer to pump oxygen-rich blood to the muscles.

3. Borg Rating of Perceived Exertion (RPE)

Another way to determine intensity during cardiorespiratory exercise is through perceived exertion. The Borg Rating of Perceived Exertion (RPE) scale was designed to allow exercises to use a rating on how they are feeling during the activity, taking into account personal fitness, general fatigue, and environmental factors.
The scale is an easy alternative for monitoring intensity during a workout without using equipment or calculation. The range of scale is from 6 (no exertion at all) to 20 (you feel that you are engaging in a maximum amount of exertion).

Consideration:

The BORG RPE scale can be used to assess intensity for both cardiorespiratory activities and weight training. According to the American College for Sports Medicine (ACSM), most people who are exercising at an intensity to bring about cardiorespiratory benefits have an average RPE range of 12 to 16. However, measurement using this scale is subjective since there is relatively of measures that varies from person to person.

Hello Grade 12 senior high students are you ready to learn more new things? You will be provided with activities that will test your prior knowledge, stimulate your interest, and elevate your understanding and level of excitement in the different activities. This part of the module will help you get started and be ready for the next part.

Activity 1. What have you learned so far?

A. Using The TARGET HEART RATE formula get your own THR zone. Show your computation on a sheet of paper.

Answer:

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________
B. Get your own THR range using the KARVOVEN method. Show your computation on a sheet of paper.

Answer:_______________________________________________________________
_________________________________________________________________
__________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________.

<table>
<thead>
<tr>
<th>FITNESS INDEX SCORE</th>
<th>For Men</th>
<th>For Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>&gt; 90</td>
<td>&gt; 86</td>
</tr>
<tr>
<td>Good</td>
<td>80 – 89</td>
<td>76 – 85.9</td>
</tr>
<tr>
<td>High average</td>
<td>65 – 79</td>
<td>61 – 75.9</td>
</tr>
<tr>
<td>Low average</td>
<td>55 – 64</td>
<td>50 – 60.9</td>
</tr>
<tr>
<td>Poor</td>
<td>&lt; 55</td>
<td>&lt; 50</td>
</tr>
</tbody>
</table>
What is Physiological Indicators for Physical Activities?

These are physiological parameters, such as heart rate, blood pressure, body temperature, serum levels of various stress hormones example is the hormone cortisol and immunological functions like the suppression of lymphocyte activity all those parameters are used to assess welfare.
What are Physiological Measures?

Physiological measurement involves the direct or indirect observation of variables attributable to normative functioning of system and subsystems in the human body. This includes phenomena such as heart rate, blood pressure, cortical activity, and biochemical markers.

What is a physiological measurement tool? Physiological measurements may be very simple, such as the measurement of body temperature with a clinical thermometer, or they may be more complicated for example measuring how well the heart is functioning by taking an ECG (electrocardiograph).

Why is it important to take physiological measurements? Teachers will often undertake an individual's physiological measurements. While carrying out these
measurements, it is essential to maintain the individual’s comfort, respect and dignity, as well as applying standards of hygiene and infection control precautions.

What is the primary advantage of physiological measures? Physiological measures permit a more objective workload assessment and can provide “real-time evaluation, thus allowing the system designer to quickly and accurately identify usability problems as they occur.

What factors affect physiological measurements? Factors affecting changes in physiological measurements, examples are illnesses and infection, stress, anxiety, lifestyle factors, medication, age, environment, time of day. Assessment, like body functions and health status.

What are physiological observations when engaging in physical fitness? Physiological observations were respiratory rate, heart rate, and systolic blood pressure. The least frequent recorded physiological observations were temperature and conscious state.

What are the normal range of physiological measurements? Normal vital signs ranges for the average healthy adult while resting are: Blood pressure: 90/80mm Hg to 120/80mm Hg. Breathing: 12 to 18 breaths per minute. Pulse: 60 to 100 beats per minute.
Measuring exercise intensity using the exertion rating scale:

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>EXERTION</th>
<th>PHYSICAL SIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Barely there</td>
<td>Sensation of movement</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>Stronger sensation of movement</td>
</tr>
<tr>
<td>4</td>
<td>Somewhat hard</td>
<td>Warmth or light sweating</td>
</tr>
<tr>
<td>5</td>
<td>Hard</td>
<td>SWEATING</td>
</tr>
</tbody>
</table>

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Heart rate assessment is commonly used method for monitoring exercise intensity. One of the easiest ways to monitor your exercise intensity is to use the rating of perceived exertion (RPE) scale. Whether you walk, jog, bicycle, bench step, climb stairs or perform low impact aerobics, your exercise intensity and ensure a level of exertion that is comfortable.

Why use RPE? Monitoring exercise intensity with RPE scale is beneficial because:

A. It provides a double-check on heart rate, especially when the target heart-rate zone is estimated from age.

B. Assessing RPE can be performed without stopping to ‘check’ it, as is necessary with heart-rate monitoring.

C. Its free, There is no equipment you can buy to accurately describe your perception of intensity, whereas the heart monitors can be expensive.

How to use Rating of Perceived Exertion (RPE)

Perceived Exertion is assessed by used of either a 0-to 10- or 6- to 20 chart to rate the feelings caused by your exertion.

For example: using the 0-to 10 scale, quietly sitting in a chair would have a rating of 0. Adding a gentle waving of your arms might increase the effort rating to 0.5. Walking at a pace that you feel is moderate would be given a rating of 3.

Remember, the rating of your exertion should be completely independent of the pace you think you are walking; it is independent solely on the feelings caused by the exertion. Increased the pace to a run and add a hill and you could work your way up to a 10 on your scale.

On the 0-to10 scale, the recommended RPE range for the most people is usually between 3 (moderate) and 5 (strong)
<table>
<thead>
<tr>
<th>Intensity Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Zero Intensity</td>
</tr>
<tr>
<td>2</td>
<td>Very Light Intensity</td>
</tr>
<tr>
<td>3</td>
<td>Light Intensity</td>
</tr>
<tr>
<td>4</td>
<td>Moderate Intensity</td>
</tr>
<tr>
<td>5</td>
<td>Intermediate Intensity</td>
</tr>
<tr>
<td>6</td>
<td>Borderline Intense</td>
</tr>
<tr>
<td>7</td>
<td>Intense</td>
</tr>
<tr>
<td>8</td>
<td>Very Intense</td>
</tr>
<tr>
<td>9</td>
<td>Extremely Intense</td>
</tr>
<tr>
<td>10</td>
<td>Maximum Intensity</td>
</tr>
</tbody>
</table>

*Note: The scale ranges from 1 (Zero Intensity) to 10 (Maximum Intensity).*
<table>
<thead>
<tr>
<th>Colour</th>
<th>BORG</th>
<th>Expl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GREEN</td>
<td>6</td>
<td>Zero exertion</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Very easy</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Minimal recognition of exertion</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Very light (Comfortable work)</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Can just start to hear your breathing</td>
</tr>
<tr>
<td>YELLOW</td>
<td>11</td>
<td>Conversation is easy and pleasant</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Light exertion - This is what you feel during normal walking</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>Somewhat Hard</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>You can hear your breath but conversation is still possible</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>You can talk but not in full sentences</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>Hard work - This is probably a good intensity for exercising</td>
</tr>
<tr>
<td>ORANGE</td>
<td>17</td>
<td>Very hard - Starting to get tired</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>You can no longer talk with your breath</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>Extremely hard. Your body is moving only by automatic response</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Max exertion</td>
</tr>
</tbody>
</table>

Source: ACSM’s Guidelines for Exercise Testing and Prescription 7th ed Philadelpia Lippincott Williams & Wilkin

Activity 1.1 TRY THIS:

1. How do you calculate your activity level

Extra active = BMR x 1.9 (hard exercise 2 or more times per day, or training for marathon, or triathlon.

Example:
My BMR is 1339 calories per day
My activity level is moderately active (work out 3 to 4x per week)
My activity factor is 1.55
My TDEE is 1.55 X 1339= 2075 Calories per day

Calculate your activity level (Show your answer below)

Answer:________________________________________________

2. The original Borg Scale runs from 6-20. Which of the following would best represent a rating of perceived exertion range (RPE) that corresponds to the 55-90% maximum heart rate?

A. 2-5
B. 10-20
C. 15-20
D. 20-25

Answer:________________________________________________
What I Have Learned

1. In sports and particularly exercise testing the rating of perceived exertion, as measured by the Borg rating of perceived exertion scale, is frequent used quantitative measure of perceived exertion during physical activity.

2. The Borg Rating of Perceived Exertion (RPE) scale will help to estimate how hard you are working (your activity intensity. Perceived exertion is how hard you think your body is exercising.

3. Regulating oxygen uptake during high intensity exercise using heart rate and perceived exertion.

4. Physiological differences and rating of perceived exertion (RPE) in young and adult.
5. Rating of RPE and blood lactate concentration during sub-maximal physical activity.
6. The rate of heart storage mediates an anticipatory reduction in exercise intensity during physical activity at a fixed rating of perceived exertion.

7. Physiological parameters, such as heart rate, blood pressure, body temperature, can be used to assess our health and welfare.

8. Rating of perceived exertion and heart rate as indicators of exercise intensity in different environmental temperatures.

9. How RPE is calculated? To determine your approximate heart rate, simply multiply your BORG’s rating (RPE) by 10. For example:

   An RPE score of 16 x 10 = 160 beats per minute

10. Rated Perceived Exertion Scale is used to measure the intensity of your exercise. The RPE rule scales from 0-10

What I Can Do

Source: https://www.cdc.gov. Livelan clinic.org, DIWA Senior High School Series PEH

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1. If you already had an objective data regarding your physical activity, would it be better to scrap all of it and start over with just perceived exertion? Why or Why not? (Show your answer below)

Answer: ___________________________
Assessment

Multiple Choice. Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. What is perceived exertion?
   a. How difficult an athlete thinks a workout is going to be
   b. A way to get athletes to work harder by pretending that the workouts are easy
   c. How difficult an athlete thinks a completed workout was
   d. A way of rating injuries caused by workouts

2. How is perceived exertion rated?
   a. On a scale of 1-100
   b. System of 1-10
   c. Like steak: rare, medium, well done
   d. It's measured with a tracking device

3. In Borg RPE what does the number 9 represents?
   a. Very light exercise which equals walking
   b. Somewhat hard but the individual is still able to continue the activity
   c. Extremely strenuous exercise
   d. The hardest exercise

4. Why do we use Rating Perceived Exertion scale?
   a. To measure the intensity of your exercise
   b. To validate your individual data
   c. Take sum up your score regularly
   d. Use for running

5. How is perceived exertion related to exercise intensity?
a. To determine if your heart rate is within the target zone  

b. To check out target heart rate and estimated maximum heart rate  
c. As a substitute for other coping skills  
d. Choices A & B is the correct answer  

6. What exercise intensity corresponds with an RPE of 15?  

a. Is a way of measuring physical activity  
b. Establishing an exercise prescription  
c. Suggest a moderate intensity and corresponds to 60% HR range  
d. Corresponds to 85% of heart rate range  

7. What methods of determining Intensity is considered the more accurate way of finding out one’s Target Heart Zone?  

a. Target Heart Rate (THR)  
b. Borg Rating of Perceived Exertion (RPE)  
c. Cardiorespiratory Fitness FITT  
d. Karvonen Method  

8. What is physiological indicators of fitness?  

a. Slow wave of mental workload  
b. Responses to changing environment  
c. Use to assess human health and welfare  
d. Help to improve cardiorespiratory  

9. What are the physiological parameters?  

a. serum levels of various stress hormones  
b. Heart Rate  
c. Blood pressure  
d. All of the above  

10. How much vigorous intensity exercise is recommended?  

a. get at least 150 minutes of moderate activity  
b. 75 minutes of vigorous aerobic activity a week  
c. A & B is the correct answer  
d. none of the above
Answer Key

1. B
2. B
3. A
4. A
5. D
6. C
7. D
8. C
9. D
10. C

References
1. Rating of perceived exertion; https://wikipedia rating
2. Williams N. The Borg Rating Of Perceived Exertion, Occupational Medicine 2017; 67, 404-405
3. American College of Sports Medicine, guidelines for exercise. Lippincott: Williams and Wilkins; 2013 March 4
4. Diwa Senior High School Series, Physical Education and Health.