

Respiratory Control

Objective:

To explain in words or diagrams how breath holding, exercise, hyperventilation, and re-breathing affect ventilation, at the level of 85% proficiency for each student.

In order to achieve this objective, you will need to be able to:

1. Measure the influence of inhalation, exhalation, and exercise on duration of breath holding.
2. Measure the influence of hyperventilation and re-breathing on the depth and rate of respiration.

Materials:

Group Supplies:

Tape measure
Nose clips
Alcohol swabs
70% ethanol solution
Disposable autoclave bag
Scotch tape
Paper bag
Stethoscope
Nonin Pulse Oximeter

Methods and Results:

In this lab the rate and depth of breathing is measured qualitatively by *visual observation*.

1. *Observe* quiet breathing for 1 minute with the subject in a sitting position.

Describe the depth and pattern of breathing during and after bag-breathing.

Respiratory rate during normal quiet breathing: _____ breaths / minute.

2. Have the subject breathe normally for 2 minutes, then inhale deeply and hold their breath for as long as they can.

Duration of breath-holding: _____ sec

As the subject begins breathing, *observe and time* the recovery period (time to return to normal breathing — usually slightly over 1 minute).

Duration of recovery period: _____ sec

Did the subject report having the urge to inhale *or* exhale while holding their breath?

3. Have the subject exhale forcefully and completely and then hold their breath for as long as they can.

Duration of breath-holding: _____ sec

As the subject begins breathing, *observe and time* the recovery period (time to return to normal breathing — usually slightly over 1 minute).

Duration of recovery period: _____ sec

Did the subject report having the urge to inhale *or* exhale while holding their breath?

4. Have the subject hyperventilate (**breathe deeply and forcefully** at the rate of 1 breath every 4 sec) for about 30 seconds.

Caution: A sensation of dizziness may develop. (As the carbon dioxide is washed out of the blood by hyperventilation, the blood pH increases, leading to a decrease in blood pressure and reduced cerebral circulation.) The subject may experience a lack of desire to breathe after forced breathing is stopped.

Observe the subject both *during and after* hyperventilation and measure the respiratory rate during the first minute after hyperventilation.

Describe the depth and pattern of breathing during and after hyperventilation.

How is the respiratory depth and pattern after hyperventilation different than during normal quiet breathing?

5. Have the subject breathe into and out of a paper bag for 3 minutes. Observe the subject both during and after bag breathing and measure the respiratory rate after breathing into and out of the bag.

Caution: During the bag-breathing exercise the subject's partner should watch the subject carefully for any problematic reactions.

Describe the depth and pattern of breathing during and after bag-breathing.

Is the respiratory depth and pattern after breathing into and out of the paper bag different than that seen during normal quiet breathing?

Is the respiratory depth and pattern after breathing into and out of the paper bag different than that seen after hyperventilating?

Explain why

6. Have the subject run in place for 2 minutes, and then hold their breath for as long as they can.

Duration of breath-holding: _____ sec

Duration of breath-holding after maximum inhalation (see # 2): _____ sec

Duration of breath-holding after maximum exhalation (see # 3): _____ sec

How does the duration of breath holding after running compare to the duration of breath hold after maximum inhalation (see #2)? After maximum exhalation (see #3)

Explain why

Discussion:

1. Why does the duration of breath holding vary when preceded by inhalation? By exhalation? By exercise?
2. Why does the depth and pattern of breathing vary when preceded by hyperventilation? By rebreathing into and out of a bag?