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VO_{2max} Test Overview

Exercise testing is designed to measure your level of physical fitness. The VO_{2max} test is considered the "gold standard" measure of aerobic/cardiovascular fitness, meaning that it is the most accurate measure of an individual's aerobic/cardiovascular fitness [1]. The test utilizes a technique called indirect calorimetry. Throughout the duration of the VO_{2max} test, you will breathe through a mouthpiece securely fastened to your face. The mouthpiece is attached by a tube to a metabolic cart. The equipment measures the airflow of both oxygen and carbon dioxide when you breathe into the mouthpiece. By measuring both how much oxygen is used and how much carbon dioxide is produced by the muscles during exercise, we can indirectly measure energy consumption. This measure of energy consumption provides us with an indication of your aerobic/cardiovascular fitness [2]. The results of the test provide you with insight into your endurance capabilities, helping you to understand how much work you are capable of performing and your overall endurance performance potential.

Testing Procedures

For the test, you will wear your own exercise clothing and athletic shoes. The practitioner will help you put on a heart rate monitor, which will be attached to a strap wrapped around your chest. Heart rate data will be collected during the duration of the test. The practitioner will also measure your blood pressure before the test begins. After fitting you with a properly-sized mouthpiece, the test can begin.

The VO_{2max} test is performed on either a treadmill or a Monark cycle ergometer (a research-grade stationary bike). The test involves performing the physical activity (either running or cycling) until exhaustion. You will start at an easy exercise intensity, and we will gradually increase the intensity of the exercise until you can no longer continue. The longer you last on the treadmill/cycle ergometer protocol, the more work you are doing, and a significant increase in work will result in a greater VO_{2max}.

You will breathe into the mouthpiece for the duration of the test. During the test, heart rate and blood pressure will be monitored, and you will be asked to rate your perceived level of exhaustion by pointing to a standard RPE scale (Figure 1). If you feel faint or uncomfortable, you can request that the exercise test stop at any time. The test typically lasts between 10-15 minutes, but it will vary for each person.

Rating	Descriptor
6	No exertion at all
7	Extremely light
8	
9	Very light
10	
11	Light
12	
13	Somewhat hard
14	
15	Hard (heavy)
16	
17	Very Hard
18	
19	Extremely hard

Figure 1: During the VO_{2max} test, you will be asked to rate your perceived level of exhaustion using this RPE scale.

Risks

The risks associated with the VO_{2max} test are generally the same as those that may happen during strenuous athletic events. The risks include (but are not limited to):

- Physical discomfort during and immediately after the test
- Chest pain
- Dizziness or nausea
- Fatigue
- Musculoskeletal injury
- Muscle soreness and joint pain after the conclusion of the test
- Sudden heart attack

To minimize these risks, emergency equipment and CPR/AED-trained personnel are available. In addition, you will have your heart rate monitored continuously throughout the test, and you will have your blood pressure and RPE monitored periodically throughout the test. The test will be discontinued if any abnormal heart rate or rhythm or blood pressure is detected. If you feel faint or uncomfortable, you can request that the exercise test stop at any time.

For further information about the procedure, please contact the Augustana College Kinesiology Department at kinesiologylab@augustana.edu.

[1] Ross, R., Blair, S.N, Arena, R., et al. (2016). Importance of assessing cardiorespiratory fitness in clinical practice: a case for fitness as a clinical vital sign: a scientific statement from the American Heart Association. *Circulation, 134*(24), e653-e699.

[2] Balady, G.J., Arena, R., Sietsema, K., et al. (2010). Clinician's guide to cardiopulmonary exercise testing in adults: a scientific statement from the American Heart Association. *Circulation, 122*(2), 191.225.