Exercise Protocol: Endurance Tests

Appropriate Applications

Endurance tests may be used to study cardiorespiratory and/or metabolic effects at various intensities of effort. They can also be used to collect data in thermoregulatory and altitude studies and in other studies examining the effects of endurance exercise on blood concentrations of hormones, electrolytes, etc. The exercise intensity used in a protocol is usually determined as a percent of one’s VO2max; if so, VO2max must be determined before the endurance test can be performed. These two procedures, under almost all circumstances, are not conducted on the same day. According to ACSM guidelines, three categories of intensity are suggested: 1) light/low (<50% VO2max); 2) moderate (60-75% VO2max); and 3) heavy/high (>80% VO2max). However, individual investigators may propose variations of these guidelines in their own protocols.

Test Description

After selection of the desired intensity, the subject warms up for 5-10 minutes, after which the ergometer is set to the selected intensity. For example, if the investigator selects 70% of VO2max as the intensity for a treadmill study, the speed and grade are adjusted until the subject reaches 70% of his/her VO2max. A variation that is frequently used for cycle ergometry testing is to conduct the endurance test at a given percent of each subject’s peak or maximum power output. For a test, the subject is asked to continue exercising either for a pre-determined time or until volitional exhaustion. Typically, heart rate is also monitored throughout the test using a heart rate monitor that takes its signal from a transmitter strapped around the chest with an elastic band.

Training/Supervision Required

Technicians or investigators need to be knowledgeable and trained in administering exercise tests, including the ability to conduct a pre-test health screening, and knowledge and recognition of possible signs and symptoms of cardiovascular disease. Technicians must also be familiar with the specific ergometer they propose to use in their study. If students are taking metabolic measures, i.e., collecting expired gases and analyzing for O2 consumption and CO2 production, they must first demonstrate this competency to the satisfaction of their faculty sponsor. These procedures require academic preparation in exercise science courses. Graduate students in the M.S. program in Exercise Physiology take coursework and have lab experiences to prepare them for these assessments.

Risks

The risk of a cardiac event is lower than it would be for maximal testing, however, the exact risk is not known. Any exercise bout may produce light-headedness, fatigue, possibly nausea, and delayed-onset muscle soreness. These side effects are usually minimal in fit subjects. They are also minimized by having a gradual warm-up as well as cool-down (at least 5 minutes each) and by having the subject refrain from eating for at least 2-3 hours before their test. For treadmill testing, there is also a small risk of falling. This risk is managed by having at least one spotter at the subject’s side.

Risk Management

Lactate threshold assessments are conducted in the Kasch Exercise Physiology Laboratory (ENS 255) and ENS Annex Exercise Physiology Laboratory (ENS 102) at SDSU and in the Fitness Lab at 9245 Sky Park Court. All test personnel are required to have current CPR certification and trained in emergency procedures for the particular lab. A telephone is located within 50 feet of the ergometers. Individuals with probable cardiovascular disease, as screened with the PAR-Q, are not tested at SDSU or at the Sky Park lab.

The mouthpiece and valves fall into the semi-critical device category. This device will come into contact with mucus membranes, but will not penetrate body surface. High-level disinfection using liquid glutaraldehyde disinfectants (e.g. Cidex) is acceptable according CDC recommendations. We use EPA-registered sterlants for this purpose in our laboratory.

Potential Benefits

There may be no direct benefits to subjects. However, depending on the specific protocol, subjects may receive the results of their testing, which could possibly benefit them in their training.

Consent Form Content “What will Happen in this Research?” section

Prior to undergoing the exercise protocol, we will conduct a brief health screening to determine whether testing you would put you at risk for an abnormal cardiac event such as a dangerous rhythm disturbance or a heart attack. [Add text to indicate if the information obtained from those found to be ineligible will be retained] If you are not at risk, you will be asked to report to the lab well rested; we recommend that you do no high-intensity exercise for 48 hours before your scheduled test. Also, please do not eat at least 2-3 hours before your test, but continue to drink water during this time.

For this endurance test, you will run (walk) on the treadmill (or cycle ergometer) at a workload that is equal to[number] percent of your VO2max. We want you to continue to exercise as long as you can (or for a specified time period).

Consent Form Content “What are the Risks or Discomforts Involved in the Research?” section

**(For needle sticks or venipuncture)**  This study involves a blood draw. You may feel some pain from the needle when your blood is drawn. There is a small chance the needle will cause a bruise or in rare cases an infection. You may also feel lightheaded.

**(If high intensity exercise is included)** If you are asked to perform high-intensity exercise you may experience physical discomforts that may include muscle cramps, muscle strain and/or joint injury, delayed muscle soreness, lightheadedness, and fatigue. It is likely that you will feel significant delayed muscle soreness (24-48 hours) after. There is also a risk of a cardiovascular event (less than that associated with maximal testing of 1 in 12,000 people) such as a heart attack or rhythm disturbance when participating in high intensity exercise. To manage possible risks, there will be at least one CPR-certified investigator present at the testing, as well as a cellular phone available should an emergency arise.