**PEMES 3153 Physiology of Exercise Lab**

**Muscular Strength, Power and Endurance**

**Lab 10**

The purpose of this lab is to determine the relationships among measures of muscular strength, muscular power and endurance and to determine if the relationships are the same for males and females. Some data will be collected prior the lab time on Thursday April 12 and Friday April 13. **Bring with you to lab the data from # 1 and #2 below ie. You have to collect it before lab.** The data for #3 and #4 will be collected in the lab.

**Data Collection:**

1**. You must allow a minimum of 1 hour between doing the maximal tests in this section and the submaximal tests in #2 below**. Use the weight machines upstairs in the WRC. Determine your one repetition maximum(1RM) for the leg press station (this station is in the West Fitness Area at the curve of the track), for the arm curl (elbow flexion, bicep curl located in East Fitness Area) station and for the arm extension (elbow extension, triceps extension located in East Fitness Area) station. To determine your 1 RM begin with a weight that you can do with moderate effort and then progress to heavier weights from there. Record the heaviest weight in pounds (from the weight stack) that you can do for 1 **complete** repetition. At each station align your joint with the axis of the weight arm as best you can. **At the leg press station use only do your dominant leg**. Adjust the platform so there is a 90 degree angle at the knee in the starting position. Place your forefoot at the level of the top rivets on the foot platform. Record all your data on the data sheet at the end of this lab.

2. Once you have determined your 1 RM for the 3 stations determine 50% of the 1 RM and do as many repetitions as you can at the 50% loading at each station. If the 50% of 1 RM is not a whole weight plate, go up the next higher weight plate (If you wind up using more than 50% of 1 RM, record the percentage of 1 RM you did use).

3. In lab, determine the circumference of the thigh (cm) of your dominant leg and the thigh skinfold (mm) on your dominant leg. The thigh circumference is taken at a level midway between the inguinal crease (where the thigh attaches to the pelvis when you flex your thigh) and the superior border of the patella. The thigh skinfold is taken at the same midpoint of the thigh on the anterior aspect of the thigh.

4. In lab, determine the circumference (cm) of the upper arm in your dominant arm. Measure at a point midway between the olecranon and acromial processes. Determine the triceps skinfold (mm) at this same midpoint on the posterior aspect of the upper arm. The arm should be hanging relaxed at the side for both measurements.

5. You will also be using your Peak Power in watts from the Wingate test (Peak Watts).

**Do the following in lab**:

1. Using Excel and the data previously collected compute the cross sectional area of the thigh muscles (CSAT) and the cross-sectional area of the upper arm muscles (CSAA).

CSAT (cm2) = (4.68 \* thigh cirumference) – (2.09 \* thigh skinfold) – 80.99

CSAA (cm2) = 0.785 \* [(arm circumference/3.14)-(tricep skinfold/10)]2

Where circumferences are in cm and skinfolds are in mm.

1. Create a variable called **arm 1 RM** by averaging the values for the arm curl 1 RM and the arm extension 1 RM and then dividing by 2 (since we are just using the size of one arm we have to just use the strength of one arm). Create a second variable called **arm reps** by averaging the arm curl reps and the arm extension reps.
2. Using Excel, determine the average for males and the average for females for each of the following variables: leg press 1RM, leg press reps, arm 1 RM, arm reps, Peak Watts, CSAT, CSAA
3. Using Excel, compute **correlations (CORREL)** between each of the following variables for males and females **separately**:
   1. CSAT and Leg Press 1RM; CSAT and Leg Press Reps., CSAT and Peak Watts
   2. CSAA and arm 1 RM; CSAA and Arm Reps.
   3. Leg Press 1 RM and Leg Press Reps
   4. Arm 1 RM and Arm Reps

**Last Name(s):**

**Lab Section:**

**Fill in the charts below with the appropriate means and correlation coefficients.**

|  |  |  |
| --- | --- | --- |
| **Varialbles** | **Means**  **Females** | **Means**  **Males** |
| CSAT |  |  |
| CSAT |  |  |
| Peak Watts |  |  |
| Arm 1RM |  |  |
| ARM Reps |  |  |
| Leg Press 1RM |  |  |
| Leg Press Reps |  |  |
| Arm 1RM |  |  |
| Arm Reps |  |  |

|  |  |  |
| --- | --- | --- |
| **Varialbles** | **Correlations**  **Females** | **Correlations**  **Males** |
| CSAT and Leg Press 1RM |  |  |
| CSAT and Leg Press Reps |  |  |
| CSAT and Peak Watts |  |  |
| CSAA and Arm 1RM |  |  |
| CSAA and ARM Reps |  |  |
| Leg Press 1RM and Leg Press Reps |  |  |
| Arm 1RM and Arm Reps |  |  |

Answer each of the following under each question using MS Word. For each answer, support your answer with data from the charts above or with data that you can compute.

1. Who has the greatest **absolute** strength, males or females? **Explain** why.
2. **Relative** strength is strength expressed per unit of muscle mass. Who is relatively stronger, males or females? If males are stronger than females in relative strength, what does this say about the “quality of muscle” in males and females (the capacity of the same quantity of muscle)?
3. What is the relationship between muscular strength (1RM) and muscle size (CSAT and CSAA) in males and females? Is the relationship the same for males and females? Explain. Is the relationship the same for the arm and thigh? **Explain**.
4. What is the relationship between muscular power (Peak Watts) and muscle size (CSAT) in males and females? Is the relationship the same for males and females? **Explain**.
5. What is the relationship between muscular endurance (Reps) and muscle size (CSAT and CSAA) in males and females? Is the relationship the same for males and females? Explain. Is the relationship the same for the arm and the thigh? **Explain**.
6. What is the relationship between muscular strength (1RM) and muscular endurance (Reps) for both males and females? **Explain** using a physiological rationale why someone who has good muscular strength may not have good muscular endurance or visa versa.
7. What is the relationship between muscular strength (Leg Press 1 RM) and power (Peak Watts) for both males and females? **Explain** why someone may have a high level of strength but not a high power in those muscles.

**Muscular Strength and Endurance**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Age \_\_\_\_\_\_\_\_ Gender \_\_\_\_\_\_\_

Height \_\_\_\_\_\_\_\_ inches Weight \_\_\_\_\_\_\_\_\_\_\_ lbs

Leg Press 1 RM =\_\_\_\_\_\_\_\_\_\_ lbs Leg Press reps @ 50% = \_\_\_\_\_\_\_\_\_\_\_

Leg Press Reps @ \_\_\_\_\_% = \_\_\_\_\_\_\_\_\_\_\_

Arm Curl 1 RM = \_\_\_\_\_\_\_\_\_ lbs Arm Curl Reps @ 50% = \_\_\_\_\_\_\_\_\_\_

Arm Curl Reps @ \_\_\_\_% = \_\_\_\_\_\_\_\_\_\_

Arm Extension 1 RM = \_\_\_\_\_\_ lbs Arm Extension Reps @ 50% = \_\_\_\_\_\_\_\_\_

Arm Extension Reps @ \_\_\_\_\_% = \_\_\_\_\_\_\_\_

Thigh Circumference (cm) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Thigh Skinfold (mm) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Arm Circumference (cm) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Triceps Skinfold (mm) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_