MUSCULAR STRENGTH LAB

Name_________________________ Lab_____

Introduction:
Muscular strength refers to the maximum amount of force that an individual can voluntarily generate. Thus, the stronger the individual, the greater the amount of force that can be generated. A widely used operational definition is the one-repetition maximum lift (1RM). 1RM being the maximum amount of weight that can be lifted once and only once. Obtaining the 1RM value is often time consuming and fatiguing because of the hit and miss attempts at determining the person’s maximum lift. The 1RM value may be estimated by knowing the weight that can be lifted multiple times until not another lift is possible. This estimation is based upon the linear relationship between the number of repetitions maximum and intensities between 80-100% 1RM. The predicted force of 1RM is based upon an approximate decrease of 2% for each addition repetition. Using this 2% estimation per 1RM increase it can be quantified as:

\[ 1RM \text{ (load)} = \frac{\text{lbs. at 2RM-20RM}}{[100\% - (\text{RM} \times 2)]} \]

Purpose:
The purpose of this lab is to gain experience in administering muscular strength assessments, including estimation of a 1RM from multiple repetitions performed to a subject’s fatigue point or sticking point.

Equipment/Personnel:
Bench press, standing press, barbell, handgrip dynamometer, tape measure, three subjects, and all other students participating.

Definitions:
1. **Muscular Strength**- The maximum amount of force a muscle or muscle group can generate voluntarily.
2. **Resistance Training**- A systematic program of exercises involving the exertion of force against a load, used to develop strength, endurance, and/or hypertrophy of the muscular system.

Procedures:
Students will split up into groups of 4-5 with one predetermined subject who will perform all of the strength tests. The groups will assist the subject in performing all of the following tests:

Bench Press: Lie down on the bench, with eyes directly under the barbell. With arms extended, space the hands evenly on the bar with the forearms directly perpendicular to the floor. Lower the bar down until it contacts the chest, and then forcefully push the bar back up to a straight-arm position (elbow should have a 3-5 degree bend). Breathe in as the bar is lowered, and exhale as the bar is raised.

Standing Press: Grasp the bar with hands shoulder-width apart, palms away from body. Lift the barbell from the rack and help support the weight on the chest while walking away from the rack. Position feet shoulder width apart and bend knees for balance. Without using the legs press the hands straight up above the body to
a straight-arm position (elbow should have a 3-5 degree bend). Breathe in as the bar is lowered, and exhale as the bar is raised.

Handgrip Dynamometer: Subject should be standing with head in the midposition. Grip size should be adjusted so that the middle fingers midportion is approximately at a right angle. Subject’s forearm should be placed at any angle between 90 to 180 degrees of the upper arm. Upper arm should be in the vertical position. Wrist and forearm at midprone position. Exertion should be maximal and quick. Perform two or three trials with each hand, with at least 30 seconds between trials.

NOTES: Handgrip strength is used as a measure of overall strength for several reasons. Measurements of handgrip strength have implications concerning people’s safety and convenience and concerning their neuromuscular assessment. The monitoring of grip strength can be meaningful in the diagnosis and prognosis of neck injuries. For most people handgrip strength shows a moderate correlation with the total strength of twenty-two other muscles of the body. The greatest advantages that grip strength testing offers are safety and convenience.

Questions/Speculations:
Determine the 1RM for three people for the bench press and the standing overhead press. Measure the distance the bar moves and the work performed during the lift. Obtain the following data:

Subject_______________________________________   Age_________   Height__________ in
Weight__________lbs.   Sex_______
Distance (ft.)   Force (lbs.)   Work (ft.lbs.)   Reps   Total Work
Standing Press   _________ x _________ = _________ x _________ = _________
Bench Press     _________ x _________ = _________ x _________ = _________

Predicted 1RM   % Body Wt.   Percentile rank
Standing Press   _________   _________
Bench Press     _________   _________
Grip Force  Right Hand  Trial 1 ______kg  Trial 2 ______kg
Left Hand      Trial 1 ______kg  Trial 2 ______kg

Sum of Right + Left ______kg  Grip Sum/Body Wt.= ______ratio
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Predicted 1RM % Body Wt. Percentile rank

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Grip Force

Right Hand

Trial 1 _______kg  Trial 2 _______kg

Left Hand

Trial 1 _______kg  Trial 2 _______kg

Sum of Right + Left _______kg

Grip Sum/Body Wt.= _______ratio

Subject_______________________________________   Age_________   Height__________in
Weight__________lbs.   Sex_______

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Predicted 1RM % Body Wt. Percentile rank

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Grip Force

Right Hand

Trial 1 _______kg  Trial 2 _______kg

Left Hand

Trial 1 _______kg  Trial 2 _______kg

Sum of Right + Left _______kg

Grip Sum/Body Wt.= _______ratio
1. Did the ratios for either of the 1RM and the grip strength seem to relate to one another?

2. Did the grip strength sum and the maximum lift appraisal fall in similar norm categories?

3. Can we compare the muscular strength of different muscle groups?

Revised 10/23/01