Experiment #2:
Measuring body strength

Introduction:

Grip strength is widely used for estimating whole body strength due to the portability and practicality of grip dynamometry (Bohannon 2009).

The general body strength can be measured by hand dynamometer that is used to secure an index of, also it is used to measure right hand vs. left hand strength for comparative purposes. When combined with other forms of strength measurements it allows a much more precise measurement of body strength.

Background:

Strength is the ability of muscles to work against resistance. Measuring grip strength is a good indicator for whole body strength and the muscles providing grip strength are located in the forearm and are connected to the fingers by tendons that pass through the wrist.

Exertion defined as the tension produced by muscles and transmitted through tendons to produce force. Were force should be the observable result of a specific movement or exertion.

The muscle activity can be described based on their exertion and length:
Isotonic Muscle Activity a Dynamic muscle activity where muscle either contracts or elongates.
Isometric Muscle Activity is a Muscular process where muscle tension increases, and the muscle are approximately the same length and have little or no physical movement.

There are two natures for the body strength:
Static Strength: The maximum voluntary muscular exertion (contraction) of a body part (e.g., the arms, the legs, or the back) in a restrained position without movement. A Static Load is defined as holding the same position for a period of time and it is especially stressful in combination with:

- High Force
- Awkward Posture
- Duration of time that the muscles are contracted

Dynamic Strength: The maximum voluntary muscular exertion (contraction) of a body part (e.g., the arms, the legs, or the back) while in motion and usually include repetitive movement.

Factors affecting body strength

- Gender (Women (in general) have 2/3 the strength of men).
- Conditioning (athletic conditioning -Weight lifter vs. marathon runner)
- Size: The Leverage of muscles
- Predisposing conditions such as genetic or previous injury.

Non-neutral wrist positions:

Bending the wrist creates friction when these tendons move, therefore more muscle work is required to grip an object when the wrist is bent.

The potential grip strength is reduced by the amounts shown in figure 2.2

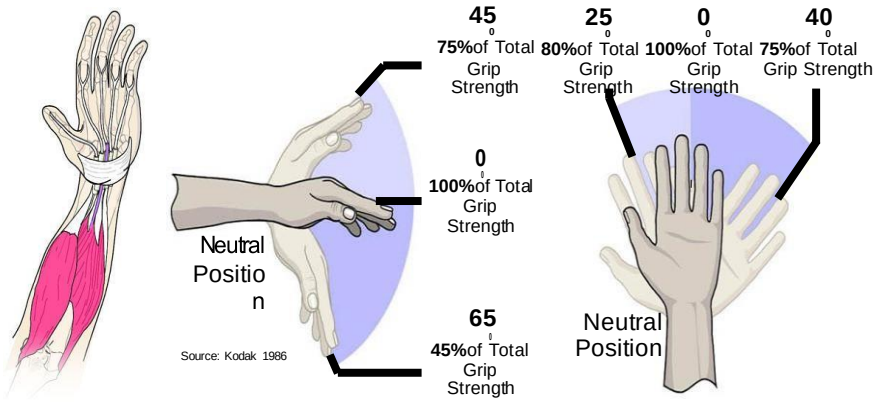


Figure 2.1: wrist deviations

Apparatus:

Hand Dynamometer is used in this test; it is accurate, repeatable and durable. Its custom-twisted spring can easily withstand accidental dropping without affecting its accuracy. Also, during a grip test, the spring compresses, providing the handle with a dynamic motion. This hand dynamometer features a dual pointer system to retain the maximum effort and 4 cm of handle adjustment for the most comfortable fit. See Figure 2.2.

Figure 2.2: Hand Dynamometer

Experiment procedure:

1. Adjust the hand dynamometer on 5 cm grip span.
2. Zero the readings for the Hand Dynamometer.
3. Hold the Hand Dynamometer along the sides, in an upright position and Have the subject sit with his/her back straight and feet flat on the floor.
4. . The elbow should be at a 90° angle, with supporting the forearm by the chair armrest.
5. The Hand Dynamometer should be held in the dominant hand first and then with the non dominant hand with full gripping of the hand in both situations.
6. Instruct the subject to grip the hand dynamometer with full strength for 3 seconds
7. Record the amount registered for each student. and calculate the average for each hand separately.
8. Repeat the process on the dominant hand with adjusting the grip span ones on the minimum value on the Hand dynamometer (3.5 cm). And again on the maximum value of (6.5) and record the result for each subject then calculate the average.
9. repeat the first three steps of the experiment on the Ulnar deviation of about 45° and full gripping by the dominant hand, instruct the subject to grip the hand dynamometer with full strength for 3 seconds and Record the amount registered for each student.
10. Repeat the first four steps of the process and apply a precise griping of 3 fingers on the dominant hand and instruct the subject to grip the hand dynamometer with full strength for 3 seconds and Record the amount registered for each student.

Important notes:

- The subject should exert maximum effort with each grip throughout the duration of the experiment.
- It is important that the dials be returned to the "0" position after each trial.
- Readings are taken to the nearest whole kilogram.

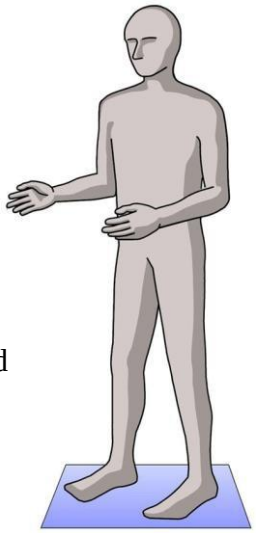
Scoring and requirements:

The score is the reading in kilograms on hand-dynamometer.
Using the recorded scores for each student Compare and discuses the relationship for each of the following:

- The maximum score and the minimum score of each trial .
- Strength of the dominant hand and the non dominant hand for each subject where do we find more strength, in dominant or non-dominant hand? Why?
- Using full griping of the hand (power grip) and precise griping(3 fingers)
- Changing the grip size (5cm,3.5cm,6.5cm) for each subject.
- The gender affect on the score.
- Natural and Ulnar deviation of the hand for each subject.

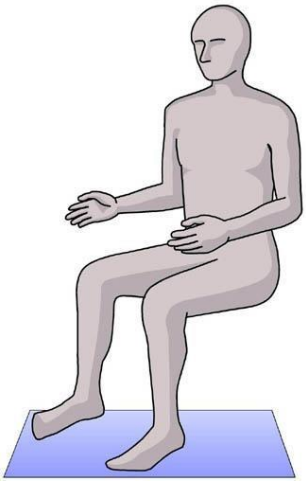
NEUTRAL POSTURE: Standing
Work position where your body is strongest and most efficient

- **Arms** loosely at your side
- **Forearms** parallel with floor
- **Hands** in the "handshake" position
- **Back** has a natural "S" curve
- **Knees** slightly bent
- **Feet** should be a shoulder width apart, pointing slightly outward
- **Head** looking forward, slightly downward



NEUTRAL POSTURE: Seated
Work position where your body is strongest and most efficient

- **Arms** loosely at your side
- **Forearms** parallel with floor
- **Hands** in the "handshake" position
- **Back** has a natural "S" curve
- **Knees** bent 90-105 degrees
- **Feet** should be a shoulder width apart, pointing slightly outv
- **Head** looking forward, slightly downward



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score:

Name	Dominant hand scores					Non-dominant hand scores
	Full grip			3 fingers grip (5 cm grip size)	Ulnar deviation Full grip 5 cm grip size	Full griping with 5 cm grip size
	5cm	6.5cm	3.5cm			
X_1						
X_2						
X_3						
X_4						
X_5						
X_6						
X_7						
X_8						
X_9						
X_{10}						
X_{11}						
X_{12}						