

ELECTROMYOGRAPHY II

- Motor unit recruitment and Fatigue

DATA REPORT

Student's Name: A. T. P. Amarasekara_____

Lab Section: EMG II_____

Date: 2023/05/04_____

Subject Profile

Name: Dilupa Bandara_____ Height: 175cm_____ Gender: Male / ~~Female~~

Age: 23 yrs_____ Weight: 65 kg_____ Dominant arm: Right / ~~Left~~

I. Data and Calculations

Motor Unit Recruitment

- A. Complete Table 2.1 using *Dominant arm and Nondominant arm* data. In the "Force (kg) Increments" column, note the force increment assigned for your recording under Peak #1; the increment was pasted to the Journal and should be noted below from Data Analysis—Step 2. For subsequent peaks, add the increment (i.e., 500, 1000, 1500). You may not need eight peaks to reach max.

Table 2.1 Increasing Clench Force Data

Peak #	Assigned Force Increment SS25L/LA = Kg SS56L = kgf/m^2	(Dominant arm)		(Nondominant arm)	
		Force at Peak	Integrated EMG (mV)	Force at Peak	Integrated EMG (mV)
		41 Mean	40 Mean	41 Mean	40 Mean
1	10	8.269885 kg	0.121599 mV-sec	8.676122 kg	0.062636 mV-sec
2	10	17.370192 kg	0.318199 mV-sec	15.771761 kg	0.080112 mV-sec
3	10	25.095955 kg	0.434455 mV-sec	23.914680 kg	0.106615 mV-sec
4	10	31.634412 kg	0.632855 mV-sec	32.013026 kg	0.125900 mV-sec
5					
6					
7					
8					

Fatigue

- B. Complete Table 2.2 using *Dominant arm and Nondominant arm* data.

Table 2.2 Maximum Clench Force Data

(Dominant arm)			(Nondominant arm)		
Maximum Clench Force	50% of Max Clench Force	Time to Fatigue	Maximum Clench Force	50% of Max Clench force	Time to fatigue
41 Value	calculate	40 Delta T	41 Value	calculate	40 Delta T
36.418956 kg	18.209478 kg	11.35 sec	33.885084 kg	16.942542 kg	19.482 sec

II. Questions

C. Is the strength of your right arm different than your left arm? Yes

D. Is there a difference in the absolute values of force generated by males and females in your class? Yes

What might explain any difference?

The value of force generated depends on the size or the cross-sectional area of the muscle fibers involved. Typically, this is larger in males compared to females due to two main reasons, levels of testosterone and the amount of physical training received. The level of testosterone increases the number of myosin and actin in muscle fibers, consequently increasing the muscle mass. Different types of physical training affect the increased synthesis of myosin and actin. Hence, the typical values of force generated are generally higher in males than in females.

E. When holding an object, does the number of motor units remain the same? Are the same motor units used for the duration of holding the object?

Yes, for a particular object once lifted up, the no. of motor units recruited by the brain is approximately the same to keep it held up. However, it cycles between different motor units to delay the fatigue by allowing the used motor units to relax and replenish their fuel source.

F. As you fatigue, the force exerted by your muscles decreases. What physiological processes explain the decline in strength?

1. During sustained muscle contractions, the stored energy such as glycogen becomes depleted and the muscle's ability to generate force diminishes.
2. Intense or prolonged muscle contractions lead to the production and accumulation of metabolic byproducts such as lactate. These byproducts may interfere with muscle contractions leading to a decline in strength.
3. Calcium ions initiate the interaction between actin and myosin filaments causing the muscle contractions. As you fatigue, the balance between calcium release and reuptake within the muscle fibers could be disrupted, impairing the efficiency of muscle contractions.
4. Fatigue may affect the excitability of motor neurons, making them less responsive to stimulations. This results in a reduction in the capacity of them to generate action potentials and transmit the signals to muscle fibers.
5. In some cases of fatigue, there may be disturbances in the neuromuscular junction, leading to a decreased release of acetylcholine which is a neurotransmitter essential for muscle contractions. This results in the reduction of muscle force.

G. Define **Motor unit**

Motor unit is the combination of a motoneuron and all of the muscle fibers controlled by that motoneuron.

H. Define **Motor unit recruitment**

Motor unit recruitment is the process of successive activation of the same and additional motor units as determined by the brain to accommodate the requirement of increasing strength of voluntary muscle contraction.

I. Define **Fatigue**

Fatigue can be defined as the reduced ability to generate force or sustain muscle contractions for a given level of stimulation.

J. Define EMG

EMG or Electromyography is a diagnostic technique used to measure and record the electrical activity produced by the skeletal muscles.

K. Define Dynamometry

Dynamometry is the measurement of force expended or power output of a muscle or group of muscles. This is done using a dynamometer which is a specialized instrument designed to quantify the amount of force generated by an individual during muscle contraction.

End of Lesson 2 Data Report