THE COMPARISON OF MUSCLE ACTIVATION AND PERFORMANCE IN A NEUTRAL AND SUPINATED GRIP BICEP CURL

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Abstract

BACKGROUND: When performing a bicep curl, there are many muscles that must activate in order to achieve this motion much like any other body part. Changing the hand formation from a supinated to a neutral grip can change the biomechanics of the arm during elbow flexion. For this study, the brachioradialis was compared to determine whether or not it was more involved during the initial 40 degrees of elbow flexion during a neutral grip bicep curl compared to a supinated grip bicep curl. According to the literature, most studies found no significant difference in performance and muscle activity between a neutral grip and supinated grip.
PURPOSE: The purpose of this study was to compare the muscle activity and performance of the brachioradialis during a supinated and neutral grip bicep curl.
METHOD: A total of 5 male participants (Age 23.6 ± 1.1 yrs) were chosen randomly at the University of Texas at Arlington. The participants performed physical activity at least 3-5 times a week. Demographic data (height, weight, age) were recorded prior to the experiment. Two electromyographic (EMG) sensors as well as a ground electrode were placed on the participant's bicep branchii and brachioradialis. Participant was stationed at the Biodex dynamometer and began warming up by performing bicep curls on the Biodex. The participant then performed 3 trials of an isometric and isokinetic elbow extension test on a neutral grip with a 2-minute rest period in between each trial. After these trials were completed, the participant performed the 3 trials of the same tests with a supinated grip instead of a neutral grip with the same number of trials and rest periods. Participant's torque, power, and EMG activity were recorded. The data obtained during the experiment was converted to average torque, power, and EMG activity during the initial 0-40 degrees of elbow flexion. The maximum voluntary contraction percentage (MVC%) for the brachioradialis during the initial 40 degrees of elbow flexion was also calculated.
RESULTS: According to the data the mean value of average during the initial 40 degrees of elbow flexion during a neutral grip was 34.22 ± 6.14 N*m and 33.84 ± 7.56 N*m during a supinated bicep curl which did not reach a significant difference (p>.05). The mean value for power during the initial 40 degrees of elbow flexion during a neutral grip bicep curl were 49.35 ± 8.61 watts and 53.04 ± 14.70 watts during a supinated bicep curl which also did not show a significant difference (p>.05). The mean value for MVC% for the brachioradialis during the first 40 degrees was 67.70 ± 9.08% during a neutral grip bicep curl and 63.84 ± 8.19% during a supinated bicep curl which did have a significant difference (p>.05). The mean value for the average EMG activity for the brachioradialis during a neutral grip bicep curl was 565.17 ± 163.80 µvolts and 541.80 ± 165.46 µvolts during a supinated bicep curl was close in approaching significant difference (p>. 051).
CONCLUSION: The results of this study indicated that there was not a significant difference in muscle activity and performance between a neutral grip and supinated grip bicep curl.

Purpose

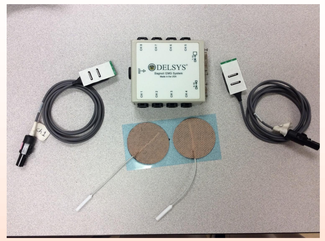
The purpose of this study is to compare the muscle activity and performance of the brachioradialis during a supinated and neutral grip bicep curl.

Methods

Subject
- 5 male participants
- UTA Students
- Exercised at least 3x a day

Instrumentation:
- System 3 Biodex Dynanometer
  - Torque
  - Power
- Delsys Bagnoli EMG System
  - EMG
- Microsoft Excel

Variables Measured:
•Average Brachioradialis Electromyography (EMG) activity (0-40° ROM)
•Average Torque (0-40° ROM)
•Average Power (0-40° ROM)
•Maximal Voluntary Contraction Percentage (MVC%) (0-40° ROM)



Methods (cont'd)

Protocol:
This experiment was a 1 day session. Participant's demographics (height, weight, and age) were measured prior to the experiment. Participant was first prepped and cleaned for EMG placement. EMG sensors were placed on the subjects brachioradialis and bicep branchii muscle. After the participant's EMG sensors were placed, the participant was stationed on the Biodex dynamometer to where the participant is comfortable. Participant performed an isometric elbow flexion at 90 degrees with a neutral grip. The participant performed 3 trials of this with a 2 minute rest period in between. After the participant completed the isometric test, they performed a neutral grip isokinetic elbow flexion test at 90 degrees/second with the same number of trials and rest period. After the participant has finished both isometric and isokinetic tests, the participant performed the same tests with a supinated grip instead of a neutral grip.

Results

Table 1: Subject Demographic Data.

Variable	*Mean*	*± SD*
Height (cm)	178.2	5.9
Weight (kg)	79.8	10.4
Age (yrs)	23.6	1.1

The mean values and standard deviation for the subject's demographics is listed on Table 1. Figure 1 showed the comparison of the brachioradialis's average EMG activity during the first 40° of both bicep curls. The mean value for a neutral grip bicep curl was 565.17 ± 163.803 µvolts and 541.80 ± 165.46 µvolts during a supinated bicep curl (p >.05). Figure 2 showed the comparison of average torque during the first 40° of both bicep curls. The mean value for a neutral grip bicep curl was 34.22 ± 6.14 N*m and 33.84 ± 7.56 N*m during a supinated grip bicep curl (p >.05). Figure 3 showed the comparison of average power during the first 40° of a bicep curl. The mean value for a neutral grip bicep curl was 49.36 ± 8.62 watts and 53.04 ± 14.70 watts during a supinated grip bicep curl (p >.05). Figure 4 showed the comparison of the brachioradialis's MVC% during the first 40° of both bicep curls. The mean value for a neutral grip bicep curl was 67.70 ± 9.08% and 63.84 ± 8.19% during a supinated grip bicep curl (p >.05).

Results (cont'd)

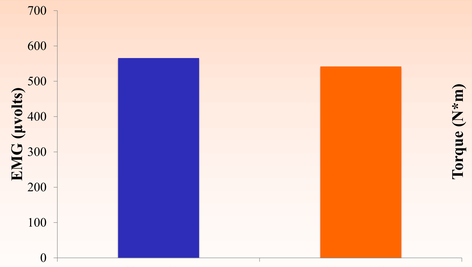


Figure 1: Average EMG Activity on the Brachioradialis (0-40° ROM) in Neutral and Supinated Grip Bicep Curl

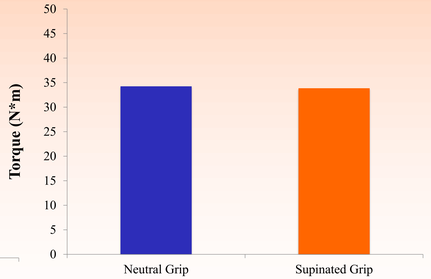


Figure 2: Average Torque (0-40° ROM) Comparison Between Neutral and Supinated Grip Bicep Curl

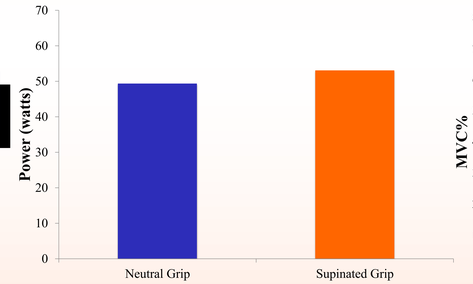


Figure 3: Average Power (0-40° ROM) Comparison Between Neutral and Supinated Grip Bicep Curl

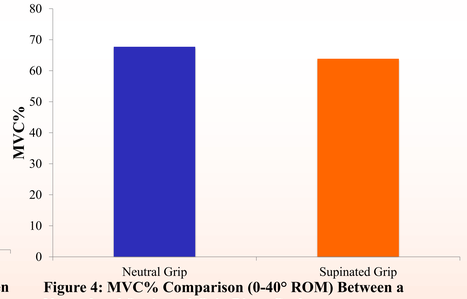


Figure 4: MVC% Comparison (0-40° ROM) Between a Neutral and Supinated Grip Bicep Curl

Conclusions

The study yielded no significant difference between the muscle activity and performance during a supinated and neutral grip bicep curl. Most studies supported this conclusion. The literature stated that the brachioradialis acted mostly as a synergist muscle during neutral and supinated elbow flexion at heavy loads. Various literature stated that when performing a bicep curl in a pronated hand position, there was a noticeable increase in muscle activity on the brachioradialis due to the bicep branchii at a biomechanical disadvantage to perform an elbow flexion. This can inferred that during a neutral and supinated bicep curl, the bicep branchii is at an optimal position to perform both bicep curls efficiently. The brachioradalis did not have to activiate as much when compared to a pronated grip bicep curl.