COMPARING UNILATERAL TRANSFER OF MUCSLE ACTIVITY FOR REACTION TIME FOR RIGHT AND LEFT HANDED INDIVIDUALS

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Abstract

•INTRODUCTION: Fitts' law is a descriptive model of human movement that states the time required to rapidly move to a target areas is a function of the ratio between the distance to the target and the width of the target. This means for simple tasks such as a simple bicep curl, the distance and targeted area are short and easy to hit. If one side of the body goes through this simple task, the opposite side will have a better idea of what to expect through what is called bilateral transfer. However unilateral transfer of muscle activity, were someone works solely on one side of the body, has been shown to also have very similar affects to the opposite limb. During most simple tasks the first and initial movement time (MT) is called reaction time (RT). This is the interval of time between the presentation of a stimulus and the initiation of the muscular response to that stimulus. Research has shown a low resting heart rate (HR) to be a good indicator of physical fitness as well as alertness. If this is the case, individuals with a lower HR should have a quicker RT to a stimulus.

•PURPOSE: The purpose of this study was to figure out if one side of the body's RT/MT could be decreased by stimulating muscle activity in the opposite side.

•METHODS: Ten male students (M; age 24.7 +/- 3.4 yrs) five left handed (LH) and five right handed (RH) of the UTA Kinesiology department, volunteered to participate in this study. Each subject had resting heart rate (HR) taken and soon after were asked to find out their one repetition max (1RM) for a fully extended bicep curl. Each subject had an electromyogram (EMG) pad placed on the belly of either the left or right bicep, a ground lead on the C7 vertebra, and an electro-goniometer placed on the arm with the EMG pad. The subject then performed a simple bicep curl as quickly as possible and the EMG and electro-goniometer RT readings were recorded. This was done 2 to 5 times with 30 seconds of rest in between each curl. The subject was then asked to hold 50% of the 1RM in the opposite hand while performing the same quick bicep curl. The same set up and process was then performed on the opposite arm on which the subject started with.

•RESULTS: For the LH subjects: Right CON RT (CON: 46.97 +/- 13.8 msec; 50%1RM: 48.16 +/- 13.5 msec); Left CON RT (CON: 49.65 +/- 11.6 msec; 50%1RM: 51.29 +/- 11.1 msec) did show a faster reaction time for the right side over the left on both groups, however showed no significant difference when comparing right to right and left to left (p > 0.05). Although for the RH subjects: Right CON RT (CON: 52.02 +/- 10.9 msec; 50%1RM: 46.46 +/- 10.0 msec); Left CON RT (CON: 60.43 +/- 16.8 msec; 50%1RM: 50.56 +/- 15.2 msec) showed significant difference in comparing both right to left and same arms to each other (p < 0.05). Resting HR between the two groups was compared in order to see if fitter individuals had a quicker RT (RH: 67.4 +/- 10.0 bpm; LH: 62.4 +/- 9.5 bpm), showing the LH subjects to have a slightly lower average resting HR.

•CONCLUSION: The results of this study indicate that even though LH individuals seem to have a lower base RT on both arms, when muscle activity is unilaterally transferred RH individuals benefit from this extra activity whereas LH individuals are slightly hindered.

Purpose

The purpose of this study was to determine if one side of the body's MT/RT could be decreased by stimulating muscle activity in the opposite side.

Methods

Ten UTA Kinesiology students were asked to participate in a study over reaction/movement time (RT/MT). 5 of them were right handed (RH) and the other 5 were left handed (LH). A coin was flipped twice to decide whether the subject started with your left or right arm reaction, along with whether they would be holding 50% of their 1RM. A brief explanation of what the subject was about to do was explained while their arm was cleaned and prepped for the electromyography pad (EMG) to be attached to either their right or left bicep. A pad was also placed on the subjects C7 vertebra to ground the EMG lead. Once the pads were in place, an electronic goniometer was placed on the same arm.

The program provided by Dr. Mark Ricard, which recorded the elbow angle in degrees, bicep muscle activity in micro volts, and

Methods (cont'd)

Reaction/Movement Time (RT) was then started.

The subject was then asked to go through a simple bicep curl in order to make sure the program is collecting data correctly. Once the program was collecting data, on GO, the subject was asked to perform a bicep curl as quickly as possible. During this time, RT/MT was gathered from the program. Once their RT/MT was recorded, they were asked to relax their arm and this process was repeated 2-5 times depending on the EMG readings, with 30 secs rest in between each trial.

The other trial was the same simple bicep curl, however the subject was holding 50% of their 1RM in their opposite hand at a 90 degree angle at the elbow. The same rest time was given between each trial and the weight was taken away after each reaction time to reduce the amount of potential fatigue.

After one of the trials was recorded and the subject had been given about a minute of rest, they repeated the entire process for the opposite arm.

Results

Table 1: Group 1 Demographics

	Mean	SD
Age	23.2	± .84
Weight (kg)	80.2	± 9.52
Height (cm)	177.0	± 10.22
1RM	41.0	± 10.84

Table 2: Group 2 Demographics

	Mean	SD
Age	26.2	± 4.44
Weight (kg)	76.7	± 11.51
Height (cm)	176.8	± 6.14
1RM	56.0	± 18.17

Results (cont'd)

Figure 1 — Muscle Activity and Elbow Angle During a Bicep Curl

Figure 2 — Average Reaction time for Right and Left Handed Individuals

Figure 3 — Average RT for RH individuals on CON and 50%1RM

Figure 4 — Heart rate and its relationship to average reaction time
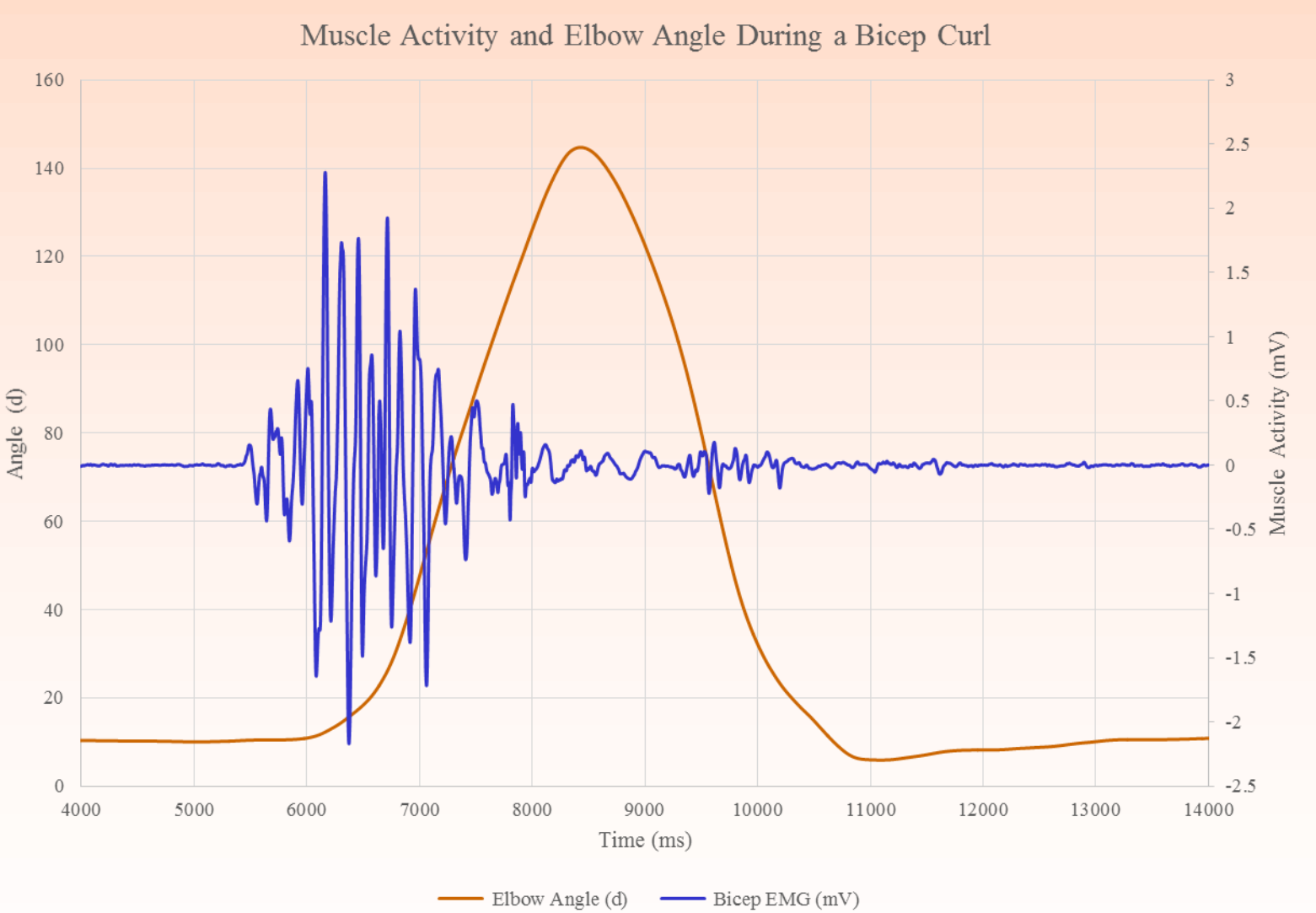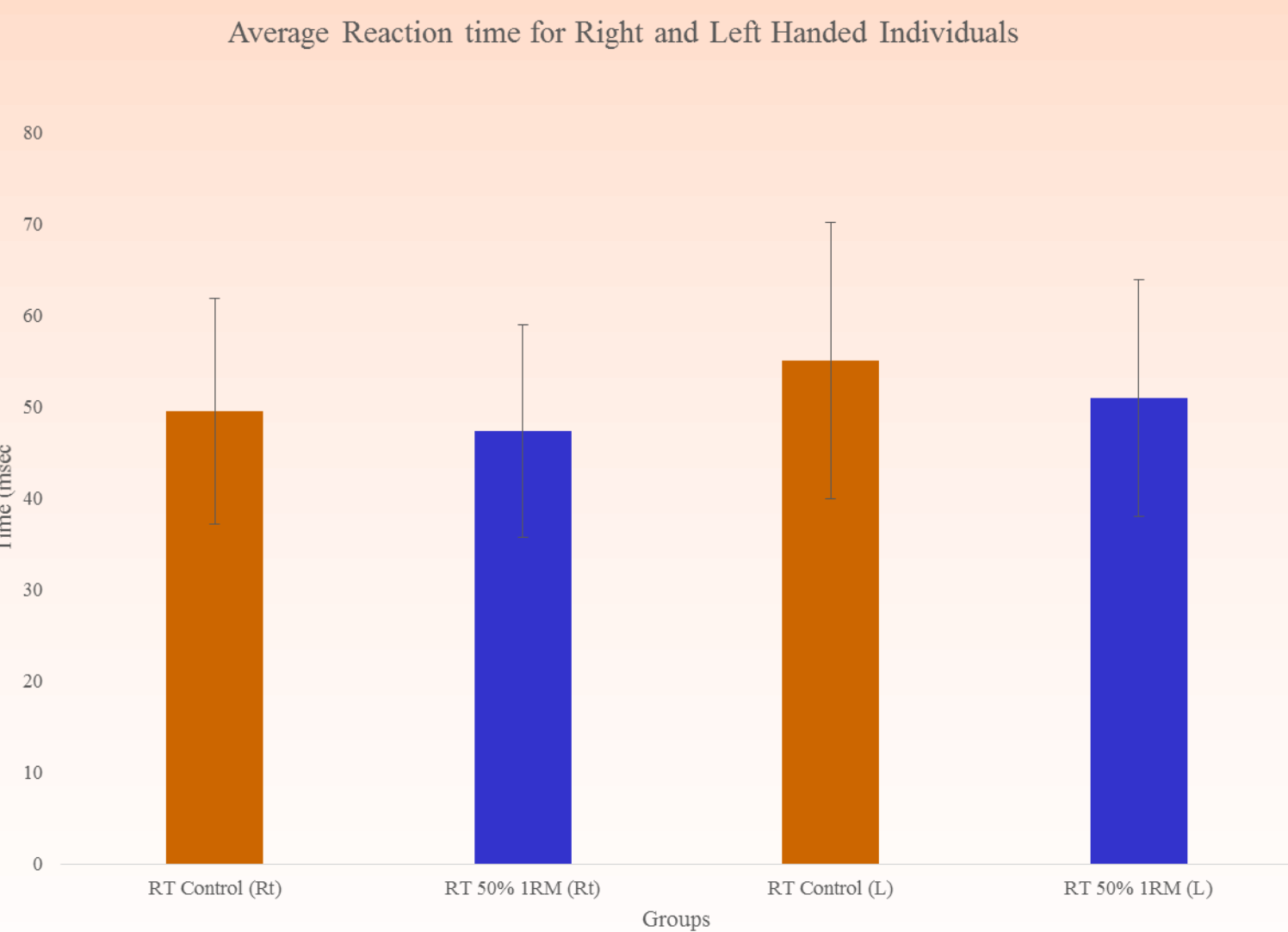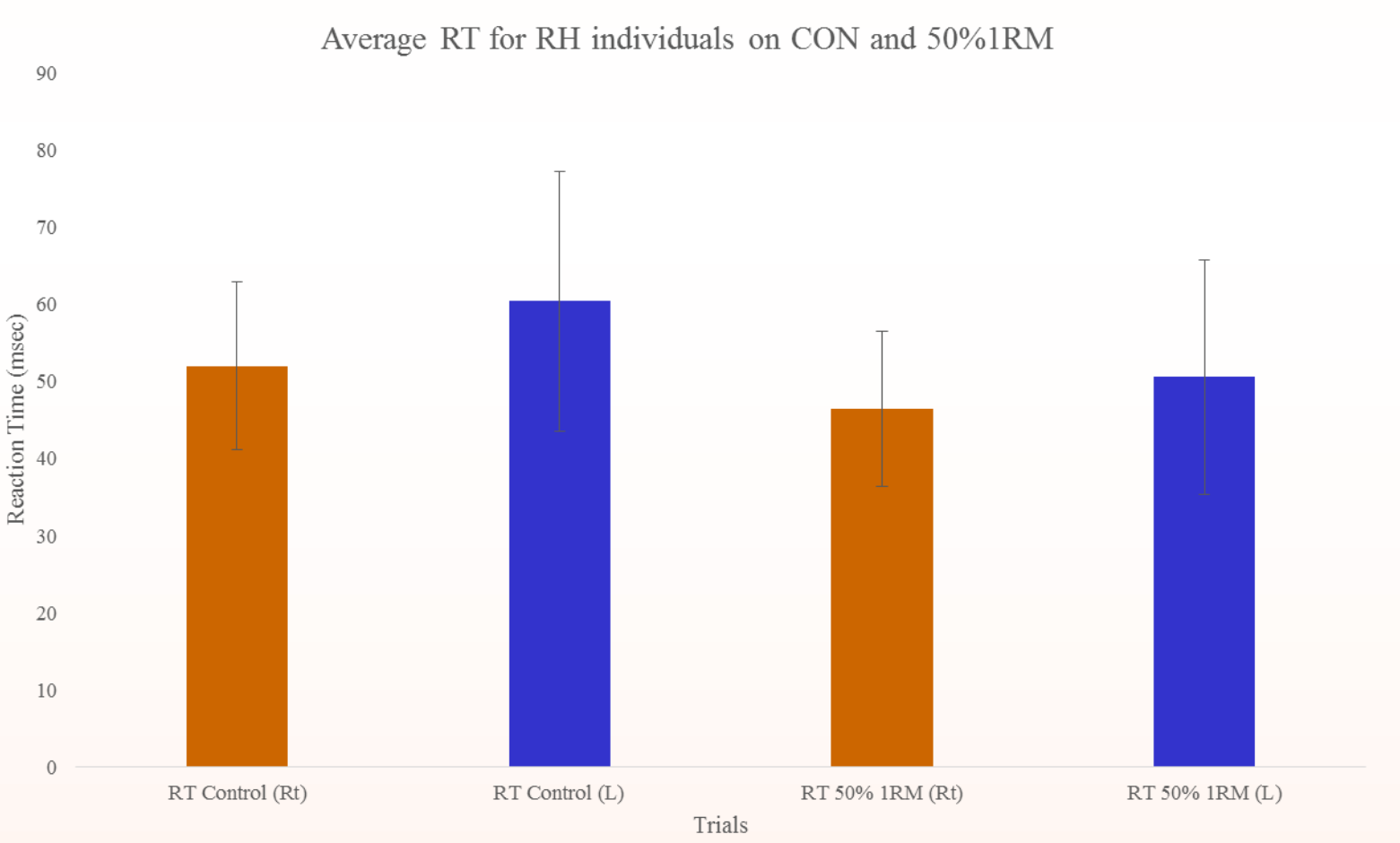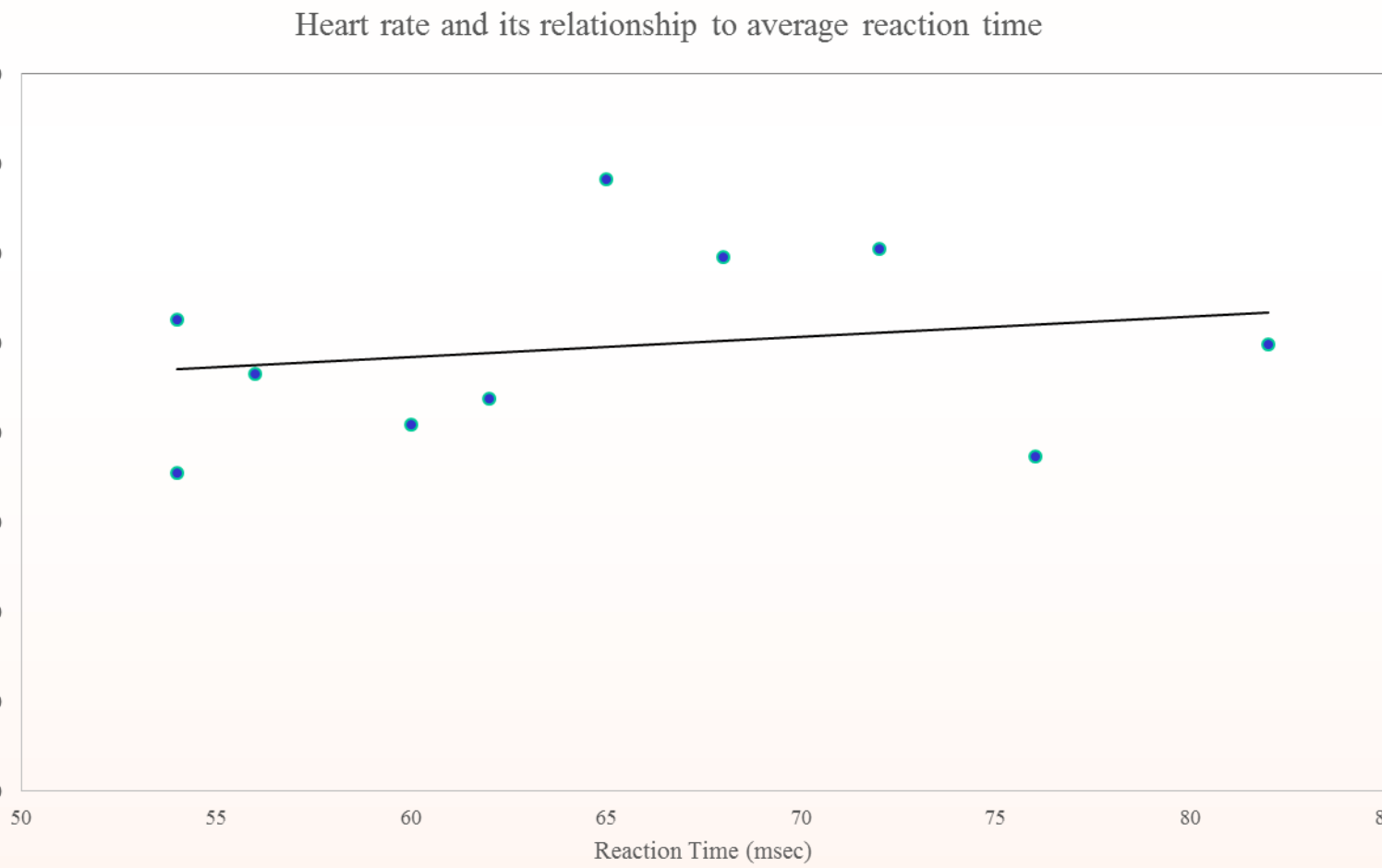
Figure 1 shows the EMG muscle activity along with the elbow joint angle. Figure 2 yields no significant difference between the average RT for both groups during the CON and 50%1RM trial (p > .05). Figure 3 shows there to be a significant difference when only looking at the RH individuals (p < .05). Figure 4 shows no correlation between RHR and RT (r = .20)

Conclusions

The results showed no significant difference when both groups reaction times were averaged together, and compared to those done at 50% 1RM. It also showed the LH individuals to have a quicker RT on their right hand side as opposed to their left. This might be due to the fact verbal stimulus enters into the left hemisphere of the brain first and then must cross over to the right hemisphere in order to react on the left side. However, when just looking at the RH individual's CON and 50% 1RM, there was significant difference in the RT recorded.