McCormick JB, Craig AW, Duce JT, Hartman OM, Hoffart EP, Lariviere BL. THE EFFECT OF BLOOD FLOW RESTRICTION (BFR) ON QUADRICEPS MUSCLE ACTIVATION. Hardin-Simmons University Department of Physical Therapy, Abilene, TX

PURPOSE: To assess quadricep muscle activation via electromyography (EMG) during long arc quadriceps (LAQs) and step-up exercises with the use of the Owens Recovery Science's Personalized Tourniquet System (PTS) for Blood Flow Restriction (BFR). **SUBJECTS:** Ten (F = 6, M = 4) healthy, active subjects aged 22.9 $\pm$ 1.1 were evaluated by five Physical Therapy students in Abilene, TX. Two subjects were dropped from the study due to a quadriceps muscle injury and equipment error. **METHODS:** Prior to participation, subjects signed a medical release for and filled out personal information. Each subject participated in three days of data collection, each a week apart. The subjects began each day with a five-minute dynamic warm up on a cycle ergometer at 100 W set to a metronome of a 100 beats per minute. The first day consisted of a 6-repetitions maximal back squat test. The weight from the maximal squat was used to calculate working weights to be used for LAQs and step-ups. On the following testing days, subjects performed either LAQs or step ups with BFR. The exercise was randomized by drawing a number out of hat. Subjects were fitted for the proper BFR cuff size and set up with EMG electrodes on the vastus medialis (VM) and vastus lateralis (VL) muscles on their dominant leg. Prior to the performing the first exercise, the subject performed a maximal volitional isometric contraction (MVIC) of knee extension at 60-degrees of knee flexion. Then, subjects performed either the LAQs or step-ups as prescribed by the Owens Recovery Science Strengthening protocol of four sets totaling 75 repetitions to a metronome at a rate of 1 repetition every 4 seconds. The electrical output is displayed on the Noraxon MyoMuscle software as percentage of MVIC. Data was processed in MyoMuscle in order to determine the mean activation during each exercise, and then exported to SPSS for statistical analysis. A one-way ANOVA was used to analyze the difference in means of the following three pairings: (1) VM during LAQ vs VM during step-ups, (2) VL during LAQ vs VL during step-ups, and (3) average activation of VM and VL during LAQ vs average activation of VM and VL during step-ups. **RESULTS:** EMG activation was analyzed for the vastus medialis and vastus lateralis during LAQ and step-ups with the use of BFR. The results of a one-way ANOVA revealed that there was no significant difference between the muscle activation of the two different exercises when looking at VM ($F(1, 14) = 0.809$, $p > 0.05$), VL ($F(1, 14) = 0.318$, $p > 0.05$), and the average of both VM and VL during both exercises ($F(1, 14) = 0.042$, $p > 0.05$). **CONCLUSIONS:** EMG activation was analyzed for the vastus medialis and vastus lateralis during LAQ and step-ups with the use of BFR. The results of paired t-tests revealed that there was no significant difference between the muscle activation of the two different exercises. **CLINICAL RELEVANCE:** Based on these results, similar quadricep activation can be achieved by either the LAQ or the step-up exercises. Clinicians can utilize this information and their best clinical judgement to select the exercise that is most appropriate for their patient's individual treatment goals and rehabilitation precautions.