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**Research Article Critique & Summary**

The article, *“EMG Activation of the Vastus Medialis Oblique and Vastus Lateralis during Four Rehabilitation Exercises”* was thought-provoking and educational. The study was conducted to compare the muscle recruitment of the Vastus Medialis Oblique (VMO) and Vastus Lateralis (VL) during four rehabilitation exercises. The four exercises performed during the study were: straight leg raises neutral (SLRN), straight leg raises w/ external hip rotation (SLRER), short arc quad neutral (SAQN) and short arc quad w/ external hip rotation (SAQER). These four exercises are commonly used in Physical Therapy clinics to treat patellofemoral pain syndrome (PFPS) and to improve proper tracking of the patella. The study was performed on 34 volunteers between the ages of 22-28 years without PFPS. Throughout the study, integrated electromyographic (iEMG) activity was used to test and record the muscle activity during these exercises. They found no significant difference between VMO/VL ratios when comparing the four exercises. However the SAQ showed significantly greater muscle recruitment for the VMO and VL in comparison with the SLR.

The article had many strengths proving reliability of the study. The researchers were careful to perform the study in the same environment, using the same EMG system. The subjects were all required to perform a health questionnaire and their height and weight were measured. They measured body fat and density prior to testing to insure an adequate signal through the subcutaneous tissues. They also measured skin impedance using an ohmmeter to ensure a good signal. They prepped the skin and removed hair and dead skin cells to confirm skin impedance. The electrodes were carefully placed parallel to the directions of the muscle fibers. They found normalized data for VMO/VL ratios by having the subject perform a max voluntary isometric contraction of the quads against manual resistance prior to beginning test. The exercises were demonstrated to the subjects and they were given time to practice prior to testing. A metronome along with verbal cues was used to ensure proper timing of each exercise. The subjects were allowed a three minute recovery period in between exercises which could help to avoid fatigue. The believe the study was well thought out.

I also found some weaknesses in the study. There were only 34 participants which isn’t very many. I believe by limiting the number of participants you are decreasing the dependability of the study. Also, all of the participants were between the ages of 22-28 years old and does not include any older adults or children. PFPS is common in elderly folks as well, so I feel they should have been participants in the study. The anthropometric characteristics were limited by excluding overweight individuals. Extra body fat can also play a role in PFPS due to the added pressure and weight on the knees. I think that the differences between males and females should have been analyzed prior to testing. Women tend to have greater Q-angles and this may have an effect on the muscle recruitment of the VMO and VL. I also think it would have been a good idea to have a test group of people diagnosed with PFPS as well. It would be interesting to compare the muscle function of this test group with the healthy individuals. I also believe muscle fatigue could have affected the results of the testing. Some people fatigue more quickly than others and may require more or less weight than the 5 lb sand bag used. Also, could performing the exercises in a planned order have an effect on the neuromuscular response? This could also disturb the test results. It may be beneficial to perform the exercises at random. I liked how the exercises were performed to the beat of the metronome but I think using a different beat for the SAQ vs SLR could have an effect on muscle recruitment.

Overall I thought the study was conducted well and had more strengths vs. weaknesses. I thought this article was very interesting and is directly related to clinical practice as a PTA. PFPS is a very common diagnosis we will see in a clinical setting. We prescribe exercises to our patients and it is important that we are able to decipher which exercises are most beneficial to them. Even something as simple as a SLR vs. SAQ can have a significant effect on the knee and make a difference in recovery. I found it interesting that they did not see much of a difference between the external hip rotation vs. neutral. I would have liked to have read about more exercises that can have a significant impact on strengthening the VMO rather than the VL. As PTs and PTAs we should be able to make sound clinical decisions to ensure we are properly treating our patients and achieving optimal results.