



Gluteal Muscle Activation During Deadlift and Barbell Hip Thrust.

Makenzy Tibbot; Kelly Helm PhD

Valparaiso University Department of Kinesiology

Abstract

The purpose of this study was to compare the right and left gluteus medius (GMed) and gluteus maximus (GMax) muscle activity between a conventional deadlift and a barbell hip thrust through the use of surface electromyography (sEMG). Four participants (2M: 2F) completed the study. sEMG sensors were placed on each participant right and left gluteal muscles. Each participant completed three maximum voluntary isometric contraction (MVIC) followed by 1-repetition maximum(1RM) of each exercise. Each participant completed three trials of each lift. The MVIC was used for normalization if each repetition. The 1RM was used to calculate 80% for resistance used for each trial repetition for each lift. Descriptive statistics reveal the average mean percent activation of RGMax for deadlift was 38.01% and for hip thrust was 42.36% and deadlift LGMax was 44.27% activation while hip thrust was 58.41%. RGMed deadlift activation was 32.33 % with the hip thrust activation at 49.41% of MVIC. LGMed for deadlift showed 28.62 MVIC and for hip thrust 46.09% MVIC. The hypothesis is supported. The hip thrust is a better activator of the gluteal muscles than the deadlift. This small study supports the impact of the hip thrust exercise to strengthen the gluteal muscles.

Introduction

Barbell Hip Thrust (BHT) and Deadlift (DL) are two heavily loaded exercises that train the posterior chain (Contreras, Cronin, Schoenfeld, 2011). Studies using an sEMG to evaluate the muscle activation during the barbell hip thrust primarily place the electrodes on the vastus lateralis, gluteus maximus, and biceps femoris then have the subjects participating in study performed repetition maximums to collect activation data. (Contreras, Vigotsky, Schoenfeld, Beardsley, Cronin, 2016). When looking at the barbell hip thrust biomechanically, the hip thrust is a horizontally-loaded (relative to the body, or anteroposteriorly) bent-leg hip extension exercise (Contreras, 2019). Peak level of contraction occurs during the concentric contraction or when the muscles are the shortest with consistent tension placed on the hips throughout. (Contreras, Vigotsky, Beardlsey, 2016) The hip thrust is a loaded glute bridge performed with the back resting on a bench, which increases the exercise range of motion. The hip thrust is commonly loaded with a barbell, elastic resistance bands, or a combination of the two. (Contreras, Vigotsky, Beardlsey, 2016). The posterior chain consists of thoracic, lumbar, and hip extensor muscles (De Ridder, 2013). In this study, the gluteus maximus and the gluteus medius were the two muscles examined using sEMG. The gluteal muscles have been seen to be linked to preventative back injury measure once strengthened regularly in athletic and non-athletic populations (De Ridder, 2013). The aim for this study is to compare two commonly used exercises that target the gluteus maximus and the gluteus medius to support the previous research supporting which exercises are optimal to include in a posterior chain training program.

Methods

Setting

- Small Midwestern University kinesiology laboratory
- Spring Semester 2020

Participants

- 2 college age females, 2 college age males

Procedures

- Five-minute dynamic warm-up on exercise bike.
- Skin surface above R & L gluteus maximus and medius prepared and secured with electrode sensors.
- Progressive build to 1 RM of Hip Thrust for session 1.
- Progressive build to 1 RM of Dead Lift for session 2.
- MVIC and 80% of 1 RM of Hip Thrust and Deadlift session 3.
- Electrodes compute muscle activity from muscle via bluetooth to EMGWorks.
- Root-Mean Square (RMS) was calculated and finalized as an amplitude analysis and comparison statistics.

Results

Table 1.0				Subject 1				Table 2.0				Subject 2			
Glute Max		Glute Med		Glute Max		Glute Med		Glute Max		Glute Med		Glute Max		Glute Med	
Deadlift	Deadlift	Hip Thrust	Hip Thrust	Deadlift	Deadlift	Hip Thrust	Hip Thrust	Deadlift	Deadlift	Hip Thrust	Hip Thrust	Deadlift	Deadlift	Hip Thrust	Hip Thrust
Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left
19.49	42.75	59.70	81.75	27.82	37.37	39.08	394.16	19.70	61.68	19.71	19.70	29.19	94.33	29.92	37.20
24.72	23.62	64.52	65.95	44.03	27.05	42.44	441.16	14.72	64.17	17.82	14.70	24.51	84.32	22.32	41.30
17.11	25.36	52.73	62.03	29.58	41.54	38.38	416.15	18.87	59.30	17.12	18.90	23.10	93.78	22.35	32.20
Mean	20.44	30.58	58.98	69.91	33.81	35.32	39.96	17.76	61.72	18.21	17.77	25.60	90.81	24.86	36.90
SD	3.89	10.58	5.93	10.44	8.89	7.46	2.17	2.67	2.43	1.34	2.69	3.19	5.63	4.38	4.56
Table 3.0				Subject 3				Table 4.0				Subject 4			
Glute Max		Glute Med		Glute Max		Glute Med		Glute Max		Glute Med		Glute Max		Glute Med	
Deadlift	Deadlift	Hip Thrust	Hip Thrust	Deadlift	Deadlift	Hip Thrust	Hip Thrust	Deadlift	Deadlift	Hip Thrust	Hip Thrust	Deadlift	Deadlift	Hip Thrust	Hip Thrust
Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left
42.51	51.85	26.75	12.52	83.23	92.01	96.91	50.55	76.78	49.87	24.48	14.85	N/A	28.61	576.68	26.58
52.63	43.44	26.93	12.07	67.03	70.13	74.78	96.91	65.60	30.76	25.38	16.09	N/A	26.63	602.59	28.38
49.07	52.52	25.40	9.40	52.73	79.32	78.53	74.78	54.92	25.91	27.40	15.51	N/A	25.81	671.06	28.38
Mean	48.07	49.27	26.36	11.33	67.66	80.49	83.41	65.77	35.51	25.76	15.48	N/A	27.02	616.78	27.78
SD	5.14	5.06	0.84	1.69	15.26	10.98	11.84	10.93	12.66	1.49	0.62	N/A	N/A	48.76	1.04

Acknowledgements

I would like to express my greatest gratitude to all of those who helped me with this research study. I would like to thank Dr. Helm for her guidance and instruction during the progression to the completion of this research. Her generous time given has deepened my appreciation for her as a professor throughout my college career. I would also like to express appreciation to my fellow classmates for partaking as well as helping me conduct the study. They had taken the time out of their busy schedules to come in and help in any way they could for the study to run safely and smoothly. I would also like to extend gratitude to the Valparaiso University FitLab, Professor Starkoff and staff for allowing me to utilize the equipment needed in my study, as well as the ARC weight room and trainers for allowing me to use the weight room and their equipment also. Lastly, I would like to thank the Valparaiso University Kinesiology Department for challenging me, teaching me, and fueling my passion for what I am pursuing as a lifelong career in the field of Exercise Science.



Figure 1. Position and form for deadlift.



Figure 2. Lock out position in barbell hip thrust.

The hypothesis is supported. The hip thrust is a better activator of the gluteal muscles than the deadlift. This small study supports the impact of the hip thrust exercise to strengthen the gluteal muscles.

Conclusion

The conclusion of the study remains as stated, the hypothesis was supported and the barbell hip thrust has a greater gluteal muscle activation in comparison to the conventional deadlift. This supports that the barbell hip thrust exercise will greatly impact the strengthening of gluteal muscles when used in an exercise program.

References

1. Contreras, B., Vigotsky, A. D., Schoenfeld, B. J., Beardsley, C., & Cronin, J. (2016). A comparison of gluteus maximus, biceps femoris, and vastus lateralis electromyography amplitude for the barbell, band, and American hip thrust variations. *Journal of Applied Biomechanics*, 23(3), 254-260.
2. Contreras, B., Cronin, J., & Schoenfeld, B. (2011). Barbell hip thrust. *Strength & Conditioning Journal*, 33(5), 58-61. Clark, M. (n.d.). What is muscle activation? Types Of Exercise. Retrieved from <http://www.bodybuilding.com/health/nutrition/what-is-muscle-activation/>
3. Contreras, B. (2019, January 8). Hip Thrust & Glute Science. Retrieved November 7, 2019, from <https://www.contreras.com/hip-thrust-and-glute-science/>
4. Contreras, B., Vigotsky, A. D., Schoenfeld, B. J., Beardsley, C., McMaster, D. T., Reysche, J. H., & Cronin, J. B. (2017). Effects of a six-week hip thrust vs. front squat resistance training program on performance in adolescent males: a randomized controlled trial. *Journal of strength and conditioning research*, 31(6), 999-1008.
5. De Ridder, E. M., Van Oosterwijk, J. G., Vleeming, A., Van der Straeten, G. G., & Dannesku, L. A. (2013). Posterior muscle chain activity during various extension exercises: an observational study. *BMC musculoskeletal disorders*, 14(1), 204.