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Hip Thrust for Strength and Muscle Gains: Single-Legged vs. Two-Legged Stance

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Abstract

Sports performance and body composition are driving factors shaping how people train within the gym. Despite the popularity of the hip thrust, it is still unknown whether a unilateral or bilateral stance would contribute to better overall results in strength and hypertrophy in the short term or in a Microcycle. This study determines whether the single-legged or two-legged version of the barbell hip thrust produces the most strength and muscle hypertrophy over a 12-week workout program. Initially, 8 participants were enrolled in this study, but due to the 2021 world climate and the holiday season, three participants did finish their 12-week program that focused on one type of hip thrust. Each participant performed a pre and post-5-rep max in both one-legged and two-legged hip thrusts. Each participant increased the max of their program-focused version of the hip thrust. Within-session and off-session training in sports, there is a limited amount of time allotted for workout programs. Knowing if an athlete would better perform with unilateral vs. bilateral exercises within the same movement pattern can assist with program goals of muscle hypertrophy and strength. While a small sample size, this study, showed what is possible for future research. Looking at internal vs. bilateral movements within the same movement pattern for short-term muscle hypertrophy and strength can help within-session and off-session training in sports. Part of the findings of this study was that each participant that finished the 12-week workout plan was able to show a different aspect of how one or two-legged hip thrust training could affect real-world lifters. Future research is still needed and should continue with a larger sample size.

Introduction

Sports performance and body composition are driving factors shaping how people train within the gym. Despite being a relatively new exercise, the Barbell hip thrust has grown in popularity for strength training, bodybuilding, and sports performance since 2006. Bret Contreras, Ph.D., popularized the barbell variation of the hip thrust through his work to show how it was better at glute activation over the squat (Hip thrust wiki page, 2016). The barbell hip thrust demonstrated a significantly greater EMG activity than the back squat of the upper gluteus maximus and lower gluteus maximus (Contreras, 2015). There are many social media posts about barbell squats and how they can help glute gains over hip thrust, despite the overwhelming evidence showing that the hip thrust is a better overall glute exercise.

Traditionally, the glute muscles (gluteus minimus, gluteus medius, and gluteus maximus) have been thought of as one muscle. However, its anatomy shows something more intricate. The gluteus maximus' main actions extend and rotate the hip joint laterally. Additionally, the upper fibers assist with abducting the hip, and the lower fibers help with adducting. There are different roles of the lower and upper gluteus maximus which can be illustrated with Electromyography (EMG). Between the lower and upper gluteus maximus with barbell hip thrust, there is about a 20% difference in EMG activity, whereas, with the squat, there was a 30% difference (Contreras, 2015) with the lower glutes having the higher activity. Also, on the barbell hip thrust, the upper fibers had about double the activation of the squat's EMG (Contreras, 2015). The increased activation of the gluteus maximus during the barbell hip thrust shows this movement may be better optimized for training the gluteus muscle group than the back squat (Williams, 2018).

The barbell hip thrust can be performed with different variations and styles, notably the single-legged version where one foot is lifted rather than two feet on the ground, and the other remains on the floor. Like the two-footed barbell hip thrust, all three glute muscles are activated in the single-legged version. However, while the gluteus maximus acts as the hip extensor, the gluteus medius and minimus muscles abduct and medially rotate the thigh based on the degree of hip flexion. Additionally, the tensor fasciae lata (TFL) stabilizes by counter-balancing the hip's lateral rotators (Tobey, 2017). The gluteus minimus is one of the secondary muscles that can produce hip extension; therefore, the gluteus minimus would be working more with the single-legged barbell hip thrust vs. the two-footed for the addition of stability and assisting extension of the hip. Strength and stability in the body's core are essential for distal limbs to function at their full force production (Zemková, 2016). Resistance exercises under stable conditions are more effective at moving maximum weight than if they are used with a balance component; such as squatting on a Bosu ball or one-legged exercises. Muscle strength and power of the hips and pelvis are necessary for resistance training and athletic performance in many sports.

The question remains whether training a single-legged version of the hip thrust, with the added stability component, increases overall better strength than the two-legged counterpart and potentially leads to better horizontal sprint force and strength gains? Or would using the extra amount of weight with the two-legged version of barbell hip thrust be more effective? However, with research on bilateral vs. unilateral leg training, unilateral leg training is a hot topic in regards to helping increase sports performance while training.

Unilateral and bilateral training is shown to have similar performance results (Moran, 2021) and, when used with different levels of athletes, could have varying results. For example,

in beginners and untrained people, both styles produce similar outcomes with the possibility of added benefit for joint stabilizers with the unilateral hip thrust (Howe, 2014). Unlike these previous studies, this study aims to determine whether the single-legged or two-legged version helps produce the most strength and muscle hypertrophy over the short term. The results from this study could help coaches and athletes' better program their training blocks for optimal results, increasing their performance during a single session.

Methodology

Participants

For the study, we enrolled lifters who participated in weight room-based training for two or more years, were 18 years or older, were currently training, and had a background in performing barbell hip thrusts. The participants will be referred to as intermediate lifters. People from/living in the United States of America were recruited via Facebook, Instagram, Reddit, and word of mouth. For the number of participants, because the workouts were performed remotely and there were frequent check-ins with each person, the number would need to be manageable. Thus, eight subjects were enrolled. If a person was taking performance-enhancing drugs, had an injury that prevented them from doing pain-free workouts, was unable to perform the exercises within the 12-week program, or medical condition that could skew the overall data of the study, they were asked not to participate in this study.

Instruments

Data was collected from each workout using the True Coach app (TrueCoach.co), so each participant could see their training and keep it updated via the cloud. The single-legged group could use barbells, dumbbells, and kettlebells to perform the movement, while the two-legged group used only the barbell. However, if the participant was not using a barbell, there was a standard holding them (See Photo 1). The weight used by each participant was recorded in kilograms (kg) as the universal standard. All measurements were in centimeters for the waist,

hips, thigh, and legs, and weight will be kg (converted from pounds, if needed. 1kg = 2.20462 pounds).

Photo

Procedures

The participants were put into two groups of lifters: one performing only single-legged barbell hip thrusts and the other two-legged barbell hip thrusts. Each group performed their exercises twice a week over 12 weeks and were asked not to (barbell back/front) squat or (conventional/sumo) deadlift over the timeframe. There were two testing sessions before and one after the 12 weeks. Each week one day was strength rep ranges (smaller reps), and the other was hypertrophy/endurance rep ranges (mid to upper range) to change the volume lifted per day and the muscle fibers targeted. Evidence has shown that having a training frequency of twice a week

promotes superior hypertrophic outcomes to once a week (Schoenfeld 2016). There was a standard warm-up and cooldown for the workouts. The Rating of Perceived Exertion (RIR) scale for resistance training intensity was used to help the participants know what intensity to use during the working set (Helmsn, 2018; Zourdos, 2015).

Before the first session, the participants read and signed the informed consent plus were instructed on how the remote program would work. The weight, height, and circumference measurements of the waist, hips, thigh, legs, and BMI will be measured before, during the 12-week program (the start, week 4, week 8, and week 12), and after the research timeframe. Because the measurements were done remotely, each participant was given instructions on how to take measurements beforehand and repeated them with the help of someone else. Each person was instructed on the workouts and how to use the TrueCoach app. The True Coach app has an easy-to-follow interface so that the participants can access the workouts from their phones, input the results of their workouts, and be tracked within the app. This way, it is easier for the participants to share their workout progress and have the day's workout with them every time they go to the gym. The participants were given the entire 12-week workout plan, along with the study's hip thrust program, so that they all followed the same schedule outside of the change between hip thrust styles. The workout consisted of a push/pull and legs program. Two days were push and pull (upper body), and two days were legs (lower body). The days were 2:1:2:2; two days on, one day off, two days on, and two days off.

Each participant did a pre-test session to find their respected max with both two-legged and one-legged hip thrusts to see if the max of either hip thrust improved at the end of the 12 weeks. For calculating the max of each participation, there was a 5-rep max performed, which was then used to calculate one rep max. The 5-RM strength test is a reliable and straightforward

measurement method for healthy men and women in recreational sports (Gail, 2014). Before the first pre-test, there was at least a three-day break between any leg day session participation. In the case of an unfortunate event that someone did not want to finish the program, got injured, or did not follow the program's guidelines, they were removed from the final data of the study.

The data was organized into five timeframes. (1) Pre-Test, (2) Weeks 1-4, (3) Weeks 5-8, (4) Week 9-12, and (5) Post Test. After each timeframe, the subject's weight, height, circumference measurements (waist, hips, thigh, and legs), and BMI were measured using the standard ACSM Circumference measurements protocol (Circumferences, 2022). After completing Week 12, all subjects remained 4-6 days without training the lower body before re-establishing their physical capabilities to standardize the rest before testing the two exercises. The tests (both pre and post timeframe) were done with single-legged hip thrust performed before two-legged to prevent anyone from using the heavier weight of the two-legged and then making the single-legged weight feel lighter. Both legs were being tested for the single-legged hip thrust, with the average from both used for the final max weight number to standardize the weight between the two legs.

Each participant had a detailed explanation of how to perform a rep max test based on the National Strength and Conditioning Association (NSCA) (Rep Max Strength Testing, 2021). This way, there would be a standard way of performing the 5-rep max tests.

Design & Statistical Analysis

The weight lifted by each person was tracked weekly, stored within an Excel file, and compared at the end of the timeframe. The pre and post timeframe tests data were compared

within Excel and shown on statistical graphs. The data was compared for not only (potentially) how much stronger each person was within their testing exercise but also the other movement pattern. Due to the small sample size, no statistical analysis was conducted.

Table Example for data:

Timeframe	Pre	4	8	12	Post	
Single-Legged						Average
Two-Legged						Average
	Av. Pre	Av. 4	Av. 8	Av. 12	Av. Post	Av. of Av.

RESULTS

While the workout program was only 12 weeks, it was performed during the holiday season and Covid periods. Of the eight participants, five were unable to finish due to the current events and season. Therefore, the results were based on the three who completed all 12 weeks of their program.

Subject One: female and was part of the two-legged hip thrust version. She had experience with the barbell hip thrust but was not doing a formal strength program. When she first started the program, she had many questions, but as the weeks went on, she got accustomed to the flow of the program. About halfway through, she identified that she was feeling much stronger.

Starting with a two-legged 5-rep max of 38.5kg and one-legged of 20kg (for both legs), she had the potential to increase her two-legged hip thrust max. Not only did her two-legged increase (she went 63.5 for her 5-rep max), but she also set a new single-legged hip thrust of 31.75kg for her 5-rep max on both legs. What is even more interesting was that her body weight stayed about the same during the 12-week program, but her body measurements changed. Her waist went from 74cm to 72.5cm, hips from 88cm to 87.5cm, and thighs from an average of 45.5cm to 48cm. All were significant progress for a 12-week program in general, but with the strength gains and body weight relatively the same, it would be safe to say that there was a minor lean body mass increase and body fat decrease.

Subject Two: male and the only person in the single-legged group to finish the 12-week program. He comes from an athletic and CrossFit background with experience in the hip thrust exercise.

He started with a 5-rep max two-legged hip thrust of 143.2kg at a bodyweight of 91.4kg. Averaging 48.8kg (left leg: 38.6kg; right leg: 59kg), his one-legged 5-rep maxes were a little lower than expected, but he stated that he had not trained one-legged hip thrust a lot before. After the 12-week program, Subject Two had a drastic difference in his 5-rep maxes. His new one-legged hip thrust 5-rep max averaged 68.2kg (left leg: 65.9kg; right leg: 70.5kg); however, his two-legged thrust 5-rep max went down by 9.1, to 134.1kg. While his bodyweight stayed about the same (only changing +0.3kg), his thighs changed by an average of +3.75cm (+4 right and +3.5cm left).

Subject Three: female and was part of the two-legged hip thrust workout program. She has little background in a structured strength training program but usually goes to the gym for the day's workout. She started well with the program but then, a little over halfway through, found herself diagnosed with Covid. She took some time off and then continued with the workout/research.

Starting with a single-legged hip thrust of 25kg on both legs and a two-legged hip thrust of 50kg. Even with the unforeseen break from the 12-week program, the post-program 5-rep maxes went up. The single-legged hip thrust improved to 34kg (each leg), and a two-legged hip thrust of 61.2kg. Her weight went down, and her thighs and hip also became smaller. Her hips measured at 92.71cm and her thighs (averaged) 53.98cm before the program, while after the 12-weeks, her hips measured at 88.9cm and her thighs (averaged) 51.44cm. Yet, she could still archive new 5-rep maxes with the unforeseen break and losing weight.

Discussion

This study initially began with eight people, but five could not finish due to the 2021 world climate and holiday season. However, despite that happening, of the three that finished, much information came from it. Comparing the single-legged to two-legged hip thrust adds a stability component. If all movements are single-legged, the stability is present with each movement. Part of this research was to see if having the added stability component with the gluteus minimus and medius would carry over to a better performance with the two-legged version. However, this could also do the opposite, as it could make it harder for some to do the single-legged hip thrust in general because of the stability factor. Therefore, for this research, having enough strength to complete the rep ranges in single-legged hip thrust is very important, and practical application would also need someone with enough strength.

Looking at *Subject 1*, she did not have much background in a structured strength training plan. Therefore, we were hopeful for her to have some overall results during the 12-week program. However, because she was doing the two-legged workout plan, it was unknown how her post-workout plan single-legged 5-rep max would improve. She ultimately improved her single-leg 5-rep max with 50%+ more weight, but she might have benefited from the "newbie gains." Newbie gains refer to a beginner lifter building muscles or gaining strength faster than more experienced lifters (Hughes, 2018). Muscle gain comes easier early on when training dramatically spikes muscle protein synthesis rates than not doing strength training. Even stretching can affect strength gains in a beginner by increasing overall results (Kokkonen, 2010). While she did have a few years of experience, the newbie gains could still affect her because she had not done a structured strength training program before. Her background was more based on

class-based training at commercial gyms. Also, the workout plan had her do lower body twice a week, whereas before, she would train once a week; thus, training twice a week could have promoted superior hypertrophic outcomes (Schoenfeld, 2016).

Additionally, the amount of volume one does per week can affect their strength gains (Ralston, 2017) and a 4-day workout plan helps maximize strength gains (González, 2005). Moving from a non-structured commercial gym-style class route to a planned 12-week strength-based program based around strength and hypertrophy, multiple days a week with lower body training would, in theory, bring strength gains. *Subject 1* was in an excellent position to make gains.

Although it is easy to call any beginner gains in the gym newbie gains, that does not answer every question regarding *Subject 1*'s results. She was part of the two-legged workout plan group; therefore, her strength gains in the two-legged hip thrust would make sense. However, the newbie gains would not fully explain the gains in strength with the single-legged hip thrust. The 12-week plan had a few exercises each week targeting the gluteus minimus and gluteus medius (upper glutes) muscles with high reps (40 to 70 reps in some exercises). Having stronger gluteus minimus and gluteus medius muscles and being used to heavier loads of weight during the two-legged hip thrust could translate to better single-leg hip thrusts because of the neurological and morphological factors of strength training (Folland, 2007). Program design could also play a role in the single-legged hip thrust gains with *Subject 1* since she was placed in the two-legged workout plan if *Subject 1* had weaker upper glutes before the program. It would be interesting to compare having another study where participants did the same 12-week workout plan without the higher reps of upper glute exercises. Then compare if strengthening the upper glutes with additional isolation exercises versus only doing single-legged hip thrust would play a role in a

better 5-rep max single-legged hip thrust. This is because of the upper glutes' role within the single-legged hip thrust with stability.

Subject 2 was another interesting outcome. Unlike *Subject 1*, *Subject 2* had a strength training background and a 5-rep max showing his weight training background (CrossFit). His 5-rep max two-legged hip thrust of 143.2kg at a bodyweight of 91.4kg was a great starting point. However, his one-legged hip thrust was another story. Averaging 48.8kg (38.6kg left and 59kg right), his one-legged hip thrust showed weakness within the single-leg movements. Being part of the one-legged 12-week group, the big question was how this would translate into the two-legged hip thrust. After the 12-weeks, the post-5-rep max showed something original of interest.

Subject 2 gave great insight into the answer to that question. While his one-legged hip thrust gained a great deal of strength throughout the program, his two-legged hip thrust went down a little (5 rep-max down by 9.1kg). At first, this could seem like the program did not help the two-legged hip thrust. However, taking a closer look at the overall gains from doing one-legged hip thrust over the 12-weeks is also important. During the 12-week program, *Subject 2* was training with a weight substantially less than 100kg doing a single-legged hip thrust. This is where looking at the program in an athletic, strength, or physical (how one looks) way is essential. If the program's goal were absolute strength gains in a two-legged hip thrust, one would want to focus on that lift. However, *Subject 2* improved his single-leg hip thrust and kept his two-legged five rep max hip thrust around the same weight as the baseline before the 12-week program. This would show that a short-term single-legged program could keep the strength of the two-legged counterpart while at the same time progressing the one-legged version. While resistance training is important, general strength training is potentially helpful in

increasing muscle mass, helping to decrease the risk of soft-tissue injuries, and creating core stability. Hypertrophy and strength exercises can enhance sports performance with the addition of optimal training with a specific exercise program (Young, 2006). Even though *Subject 2* did not increase in two-legged hip thrust 5-rep max, the jump with his one-legged hip thrust 12-week program helped bring changes to his body, with his thighs gaining on average by 3.75cm in circumference. Another area of interest would be the post-study follow-up to see how *Subject 2*'s CrossFit style training was after this program. When looking at this in the way of helping coaches and athletes' better program their training blocks for optimal results and increasing their performance. An athlete with a substantially weaker overall one-legged hip thrust than a two-legged hip thrust could benefit from this programming style for long-term goals by helping to reduce the bilateral deficit, a reduction in performance during bilateral exercises compared to the sum of the same unilateral movement (Beurskens, 2015).

Subject 3 was similar to *Subject 1* in that she had not much experience with a structured strength program. Unfortunately, she started well with the program but was diagnosed with Covid and took off time from training halfway through. Once *Subject 3* felt better and could work out again, she returned to the program's workouts. This is a common scenario in team sports and athletics. An athlete might become sick or take time off during the middle of a program during a school break; it is important to know what type of results may occur in such a situation. *Subject 3* took roughly 3-4 weeks off around week seven before returning to training. Even with this break, she still set new 5-rep maxes in both the one-legged and two-legged hip thrust. However, she lost weight and circumference around her thighs, hips, and waist. At the same time, she was still fully recovering from Covid. Potentially, "newbie gains" could help improve strength and follow a structured plan when before she did not. It is relatively unknown

if these gains could still occur in an advanced lifter. However, newbie gains could come into play for someone who fits a beginner to intermediate and has little experience with a standard program.

Looking at *Subject 3*'s weight loss from Covid, at the end of the 12-week program, she was down about 1.3kg (2.8 pounds) in body weight, and her waist measurement went from 73.66cm (29") to 68.58 cm (27 inches). It is clear from her waist measurements that she did also lose some fat mass with the weight loss. What makes this substantial is that "newbie gains" is commonly believed to be one of few times that someone can gain muscle and strength while losing body fat at the same time and see results in both (Barakat, 2020). Usually, maintaining muscle mass and improving muscle strength and physical function is the goal while someone is in a fat loss phase (Cava, 2017); in *Subject 3*'s case, her weight loss was due to Covid. However, it is possible for trained individuals can also experience body recomposition while building muscle and losing fat simultaneously (Barakat, 2020).

Limitations

A limitation of this study was the lack of control over the participants' nutritional diets. Nutrition can impact strength gains (Pasdar, 2021) and muscle hypertrophy (Phillips, 2011)**.** If someone were to gain a significant amount of weight, not only muscle, the amount of weight that they could potentially lift would be higher (Ten 2018). This limitation could also be controlled with a standardized diet that maintains each participant's calories.

Equipment. Being a remote workout and not in a controlled setting, each participant would be using different equipment for the workouts. Working to make sure people are using and using the correct equipment would be important to this research in the future.

Cardio is also a question that did come up. Each person was asked to do a maximum of 2-3 High-Intensity Interval Training (HIIT) workouts a week for no more than 15 minutes with the cardio machine, run, walk, swim, and anything else that does not require jumping or weights. Each person was allowed to do their own HIIT-style workouts for this study. For example, *Subject 2* used air bikes with off and on (fast to rest) style, and *Subject 1* used a StairMaster while doing intervals of fast and slow speeds with the machine.

The workouts being remote were also a limiting factor. Being unsupervised, each participant was given a workout program and explained how it should be done. However, there is no standard way of verifying that each person did the workout plan as intended.

This study was a small sample size and limited the amount of data that could be used. The limited size of this stuff made it hard to have a specific population or give enough data to test the original hypothesis. Future studies based on the same research would need a more significant participation size to help give more profound insight.

Due to the limited size of subjects, participants' differences in experience levels limited the workout plan design. A beginner and advanced lifter could potentially do the same workout and have different results. Having a program designed for different levels of participants' experience was a limitation. Having a study designed for only beginners or advocated lifters could potentially show different outcomes.

Subjects' time and the current world situation (Covid) came up a few times. Unfortunately, some subjects would get busy with their lives or the limiting factor of gyms

closing and not having equipment at home. This was very unseen and did affect some of the 12-week programs. At the start of the 12-week plan, each participant had no problem doing the workouts. However, after a few weeks, the holiday season and traveling to see family took a few people away from the gym. For the participants who were able to keep constant going to the gym, the current world situation and being in a public setting brought up potential situations of catching covid.

Practical Applications

The study design was a simple pre-post design to determine if the same movement pattern was performed. The hip thrust, especially the single-legged version, has been known as an assistance exercise that aids in building strength and power within the lower body (Tobey, 2017). Additionally, as mentioned before, the barbell hip thrust is shown to have more transition within horizontal sprint force (Williams, 2018). Therefore, in athletics with running (soccer, football, and track) or vertical jumping (basketball, volleyball, and jump events within track meet), the key is hip thrust can be a useful tool for strength programs alike (González-García, 2019; Neto, 2019). Likewise, for non-athletes or athletes of events like bodybuilding, the hip thrust can be an excellent tool for building the lower body.

However, in the case of time-sensitive sessions or peaking for an event date, one cannot do every exercise every week. Thus, strength-based programs would be essential to get the most out of the timeframe. Knowing if the one-legged or two-legged version of the hip thrust could be crucial for sports performance. If some work better than the other over a short time for either

strength or hypotrophy gains, it would be within the program's best interest to put the one that best fits.

Conclusion

Using the hip thrust has become a growing trend, with the glute being the muscle of choice when it comes to building the physic of sports performance (Neto 2019, Williams, 2018). The glute muscles play some of the most important roles in body movements and learning how to train them as effectively could be crucial for some athletes (Williams, 2018). Understanding how single-legged hip thrust could affect the overall power output of two-legged hip thrust (or vis versa) could open the door to new research and coaching styles. The results of the three subjects from this 12-week program could be used for future studies and research on the difference between doing a short-term one-legged hip thrust and if it would not affect the overall strength of the two-legged version. Additionally, doing a one-legged dominant program short-term could have a base to assist with athletic performance with the added stability component. While this may not be true of every athlete, those who are a two-legged hip thrust strong, compared to a weaker one-legged hip thrust, could have better benefits than those who are stronger in one-legged hip thrust than two-legged hip thrust. Training bilateral movements within the lower body have shown improvements in the change of direction performance (Appleby, 2020). Thus giving a performance reason to strengthen bilateral movements, such as the single-legged hip thrust.

Recommendations for Further Research

This research should open the door to more conversation around the same pattern exercises comparison. While many bilateral and unilateral exercises use the same movement

patterns (i.e., the Romanian deadlift and other similar movements), research on single-legged vs. two-legged exercises is still vital to optimal programming. Box height, hip thrust hinge vs. scoop, feet elevated, and different variations of hip thrusts could be looked at to compare the single vs. two-legged hip thrusts. Additionally, programing each version would be most appropriate for short training times during a sports season. By comparing bilateral and unilateral exercises using the same movement patterns, like the single-legged vs. two-legged hip thrust, a workout program could be written to better understand the long-term goals for athletics. In situations where time is limited, a better understanding of one-legged or two-legged exercises would fit an athlete better and could be potentially substantial short-term for athletes of different levels.

While a small sample size, this study, showed what is possible for future research. Looking at internal vs. bilateral movements within the same movement pattern for short-term muscle hypertrophy and strength can help within-session and off-session training in sports. The significants of the findings within this study were that each participant was able to show a different aspect of how training could affect real-world lifters.

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