

Efficacy of Pall of Press Vs. Russian Twists on Core Muscles of Recreational Athletes A Randomized Trial

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ABSTRACT

Background: Over the last few years, Pall-of Press is an exercise widely used by strength and conditioning coaches in improving the rotational core strength. Pall-of Press is an isometric type exercise. Russian Twists is a dynamic type of exercise used widely over decades in any core muscles protocol. This study compares the difference between Pall-of Press (static/isometric) and Russian twists (dynamic). Aim of this study is to compare the effect of Pall-of Press and Russian Twists on stability of the rotational muscles of core. The objectives of this study were to observe if there is any difference produced in the endurance and strength of core muscles (rotational muscles) by Pall-of Press and Russian Twists. According to the methodology, 50 recreational athletes were included in the study after screening them based on the selection criteria. McGill's Torso Endurance test was used to measure endurance and Kneeling Medicine Ball Throw Test (Rotational component) was used to measure the strength of rotational muscles of core. **Result:** According to the statistical analysis, there was a difference observed within both the groups ($p < 0.05$). Both, Pall-of Press and Russian Twists showed an impact on the endurance and strength. With the comparison done between groups, there was no significant difference ($p > 0.05$). This states that, both exercises show equal effect on the endurance and strength of core muscles, especially internal and external obliques.

Conclusion: Based on the results and statistical analysis we conclude that both Pall-of Press and Russian twists can be used alternatively in an exercise protocol for the improvement of core muscle strength and endurance. Pall-of Press showed more significant results for the left side rotational muscles, whereas Russian twists showed good results for the right-side rotational muscles.

Keywords: Athletes, Muscles, Muscle strength, Pall-of Press, Russian Twists, Torso

INTRODUCTION

The term "core muscles" describes the collection of muscles found in the body's trunk, particularly in the area surrounding the lower back and abdomen. These muscles are essential for maintaining the stability of the body as a whole, as well as the spine and pelvis. The primary muscles of the core consist of the muscles like diaphragm forming the roof, abdominals as the front, paraspinals as the back and pelvic and hip muscles as the floor ^[1]. Rectus abdominis, transverse abdominis, internal obliques, external obliques, erector spinae and multifidus are the muscles that form the core of human body.

For our daily tasks including lifting, bending, twisting, and keeping good posture; core muscles are

necessary. The core, as a whole stabilizes the body and the spine. Increasing the strength of these muscles can help decrease the chance of injury, increase general stability, and improve sports performance.

The term core stability is a combination of muscular strength, flexibility, endurance, co-ordination, balance and movement efficiency. To achieve any functional movement, all these aspects should be present together [4]. Hence, strength of the core musculature becomes an important aspect for any functional movement or a sports activity.

Along with strength, endurance of the core muscles is also necessary for better postural control during any sport. If this endurance is reduced due to deconditioning or any other reason, the transfer of forces (load) is passed to the spine which causes mechanical stress [3].

Measuring strength of core muscles is done using Kneeling Medicine Ball Throw test. In the rotational medicine ball throw, the arm strength is eliminated as both the elbows are in contact with the torso throughout the test [4].

To measure endurance of core muscles in a static manner, McGill's Torso Endurance Test is primarily used. [1] The McGill's Torso Endurance test is safely performed using less technology as well as has very little monetary investment. It is an isometric technique that may be performed by any practitioner. The reliability of each component is between high moderate to excellent and has been identified as safe, sensitive to trunk muscle endurance, and of good predictive value for persons with LBP [1].

Because most of the athletic activities are performed in a closed chain, core becomes the primary path to transfer the load from lower limbs to upper limbs [4]. In this energy transfer, 4 major muscles that play role are: External obliques (lower 8 ribs to linea alba and iliac crest), Internal oblique (cartilage of last 4 ribs, xiphoid process to iliac crest and thoraco-lumbar fascia), Serratus anterior (antero-medial border of scapula to antero-lateral aspect of 1-8 ribs) and Rhomboids (scapula to spinous process)

These 4 pairs of muscles form a scarf like garment and usually work simultaneously as a unit. This simultaneous work is termed as "serape effect". The universal law of human movement is "proximal stiffness enhances distal mobility and athleticism". This requires core stiffness which is enhanced by "The Serape Effect" [6].

To improve both strength and endurance of these particular rotational core muscles, this study compares between a static and dynamic type of exercise. Pull-of Press is a static isometric type of exercise which mainly works as an anti-rotational exercise [7]. Russian Twists is another exercise that is used in the study, which is a dynamic exercise performed with a twisting movement of the trunk. Through this study, we assess if a static or dynamic way of exercise is better for rotational muscles of core.

MATERIALS AND METHOD

Permission to conduct this comparative study on recreational athletes was obtained from institutional ethics committee. Samples collected for a randomized trial were 50 collegiate level recreational athletes between the age group of 18-35. The people who had recent injuries, any back condition or had a score of less than 7 on the PAR-Q scale were excluded. The equipment's used included resistance bands, a stopwatch, a wooden board, a couch, straps, 2-kg and 3-kg medicine balls, and a measuring tape. Following the collection of pre-exercise data, participants were instructed to draw a chit, each of which indicated the assigned group. This method of randomization was employed to allocate participants into two groups. Two outcome measures were used in the study: McGill's torso Endurance Test (primary) and Kneeling Medicine Ball Throw Test (secondary).



Figure 1: Flexion



Figure 2: Extension



Figure 3: Right Side Plank



Figure 4: Left Side Plank

MCGILL'S TORSO ENDURANCE TEST



Figure 5: Right Rotation



Figure 6: Left Rotation

KNEELING MEDICINE BALL THROW TEST

A randomized trial was performed at the institute. 50 samples were randomly collected based upon the inclusion and exclusion criterion. All the participants were explained about the tests and exercises they would have to perform over a time period of 4 weeks. A general screening of age, height and weight was done for every participant. The pre-exercise tests were performed only after taking consent from the

participants. McGill Torso Endurance Test was performed first followed by the rotational component of Kneeling Medicine Ball Throw Test. After every component of McGill's Torso Endurance Test (flexion, extension, right side plank, left side plank) and Kneeling Medicine Ball throw test; 4-5 mins rest was given to the participant. Participants were randomly assigned to one of two groups by selecting a chit corresponding to either Group A or Group B. Group A was instructed to perform the Pall-of Press exercise, completing three sets of 10 repetitions per side with a 5-second hold for each repetition, twice a week for a duration of four weeks. In contrast, Group B performed Russian Twists, completing three sets of 10 repetitions each side, also twice a week for a period of four weeks. After four weeks, all the participants were re-tested for both McGill Torso Endurance Test and rotational component of Kneeling Medicine Ball Throw Test. Again, a 4-5 mins break was given to the participants between every component of both the tests. All; pre and post exercise values were recorded and an excel sheet was maintained.

Exercise Protocol

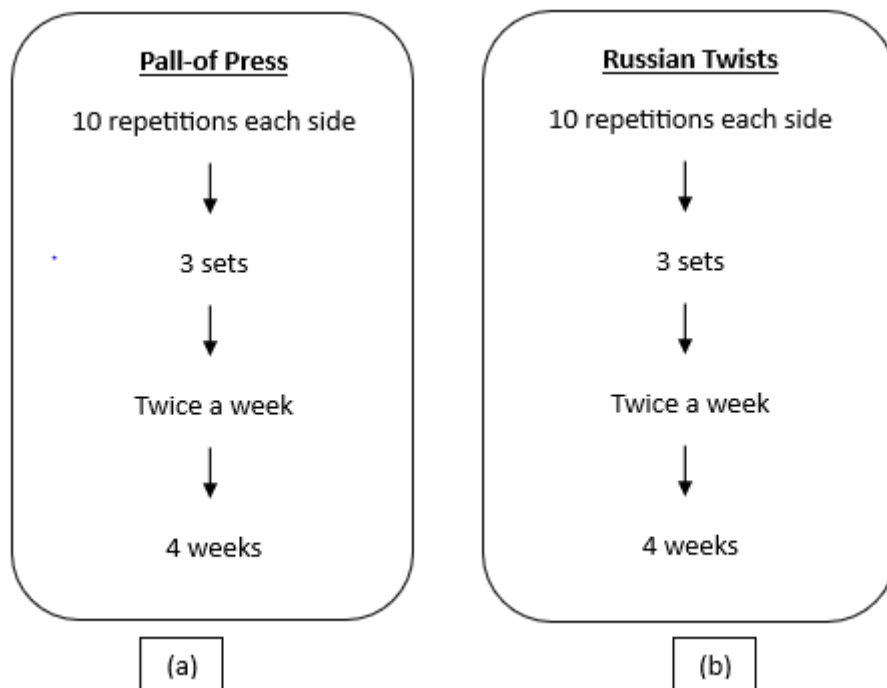


Figure 7: Pall-off Press Exercise
(a) Right side rotational muscles
(b) Left side rotational muscles



Figure 8: Russian Twist Exercise

(a) Rotation towards left

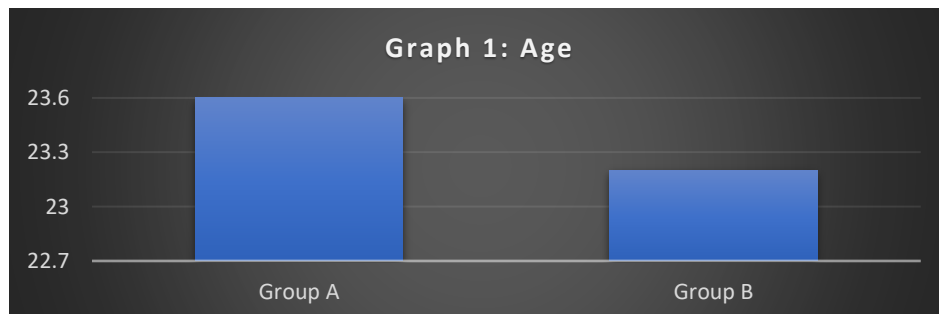
(b) Rotation towards right

STATISTICAL ANALYSIS

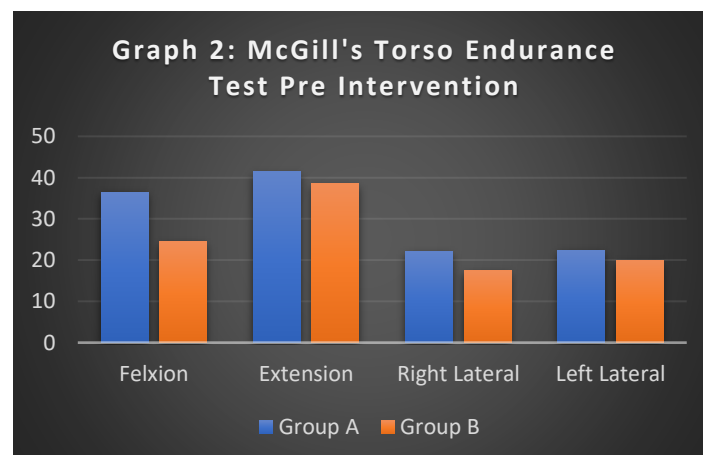
To find normality of the baseline data, Shapiro-Wilk Test was used via SPSS software. As the data was not normally distributed, Wilcoxon and Mann Whitney U tests were used for within and between group analysis respectively.

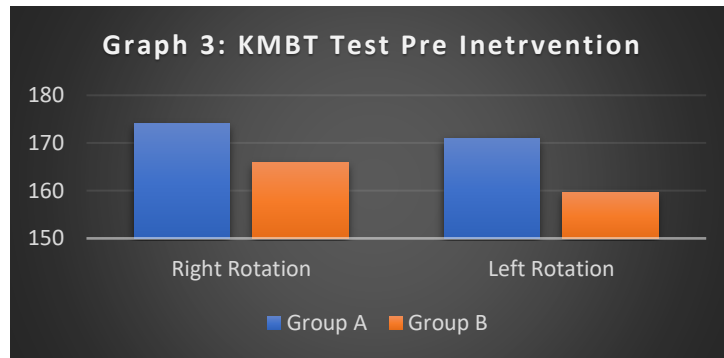
RESULT

The study included 50 recreational athletes between the age group of 18-35 years. A recreational athlete who was defined as a person who participates in any group sports activity like cricket or exercise (yoga) session for around 4-5 hours per week on an average. Graph 1 illustrates age distribution between the two groups: Group A – Pall-of Press and Group B – Russian Twists



The pre intervention data for both the groups did not reveal any significant difference between the strength and endurance of the core muscles. The graphs 2 and 3 depict the same.





Results for within group analysis for both; Pall-of Press and Russian Twists groups show a significant difference in the strength and endurance. This states that there is a measurable improvement in the strength and endurance of core muscles after undergoing a 4 weeks training session of either Pall-of Press or Russian Twists.

Table 1 and 2 depict the difference observed within the group that performed Pall-of Press exercise for 4 weeks.

Group A	Pre	Post	Mean Difference	Median	IQR	p Value
Flexion	36.44	41.544	5.104	4.7	5.8	$p < 0.05$
Extension	41.4	47.352	5.952	6	4.8	$p < 0.05$
Right Lateral	22.112	26.5	4.388	6	5.5	$p < 0.05$
Left Lateral	22.44	27.164	4.724	5	6.2	$p < 0.05$

Table 1: McGill's torso Endurance Test Within Group Comparison (Pall-of Press)

Group A	Pre	Post	Mean Difference	Median	IQR	p Value
Right rotation	174.08	177.76	3.68	4	4	$p < 0.05$
Left rotation	171.04	176.72	5.68	4	3	$p < 0.05$

Table 2: KMBT Test Within Group Analysis (Pall-of Press)

Tables 3 and 4 depict the within group difference observed in the samples performing Russian Twists for 4 weeks.

Group A	Pre	Post	Mean Difference	Median	IQR	p Value
Flexion	24.4	29.804	5.404	6	5	$p < 0.05$
Extension	38.53	43.54	5	5	4	$p < 0.05$
Right Lateral	17.372	23.196	5.824	6.1	6.4	$p < 0.05$
Left Lateral	17.912	23.392	5.48	6	6.5	$p < 0.05$

Table 3: McGill's torso Endurance Test Within Group Comparison (Russian Twists)

Group A	Pre	Post	Mean Difference	Median	IQR	p Value
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Right rotation	165.88	173.2	7.32	6	3	$p < 0.05$
Left rotation	159.72	164.2	4.48	5	3	$p < 0.05$
Table 4: KMBT Test Within Group Analysis (Russian Twists)						

Between group analysis, when performed using Mann Whitney U test showed that there is no significant difference observed when comparing both groups. This states that, both the exercises Pall-of Press and Russian Twists are equally effective in the improvement of strength and endurance of the core muscles.

Table 5 shows these results for between the group analysis.

		Pall-of Press	Russian Twists	IQR (Pall-of Press)	IQR (Russian Twists)	p Value
McGill's Torso Endurance Test	Flexion	40.3	25	17	17	$p > 0.05$
	Extension	30	42	30	32	$p > 0.05$
	Right Lateral	26.8	20	15	10	$p > 0.05$
	Left Lateral	27	22	14	9	$p > 0.05$
Kneeling Medicine Ball Throw	Right Rotation	170	173	73	47	$p > 0.05$
	Left Rotation	168	165	66	51	$p > 0.05$
Table 7: Post intervention data						

DISCUSSION

In this study titled, “Efficacy of Pall-of Press vs Russian Twists on core muscles: a randomized trial”: a recreational athlete was defined as a person between the age group of 18-35 years, who participates in team sports like cricket or exercise activities like yoga for at least 4-5 hours a week ^[11]. This study was done to identify whether an isometric or a dynamic type of exercise is beneficial for improving the endurance and strength of the core muscles. The isometric exercise that was advised, was Pall-of Press and dynamic exercise was Russian Twists.

Pall-of press is an exercise which challenges the core by making the person maintain a braced position. This exercise minimizes the repetitive loads on the spine as what happens during crunches (repeated flexion movement). Another advantage of Pall-of Press is that it enhances the muscle stiffness thereby aiding the load transfer from lower limb to upper limb. This helps in activities like throwing, pushing, pulling where contralateral forces from the core to the shoulder are required ^[7].

Russian Twists is a dynamic type of exercise which helps in strengthening the abdominal muscles especially the transverse abdominis, internal obliques and external obliques. This exercise primarily helps in improving the strength of core muscles thereby maintaining a proper alignment of the spine especially while performing any twisting/rotatory movements. An additional point regarding Russian twists is that it enhances balance, coordination and flexibility ^[12].

According to the study “The Serape Effect” by Gene E. Logan & Wayne C. McKinney, while performing

right side shoulder rotation simultaneously with left side pelvic rotation, the right serratus anterior, right external oblique and left internal oblique are eccentrically contracted and their respective pairs concentrically contract. For the opposite rotation to occur, the eccentrically contracted muscles should concentrically contract. This will summate the internal forces and aid perform opposite rotation. During this concentric contraction the contralateral pairs (left serratus anterior, left external oblique and right internal oblique) of the respective muscles eccentrically contract to provide dynamic stability^[5].

In this study, it has been proven that both the exercises Pall-of Press and Russian Twists enhance the strength of internal and external obliques along with some other muscles of the core. This proves that both the exercises help improve the mechanics of the serape effect. According to serape effect, the stiffening of muscles while performing a movement is essential^[6]. As discussed earlier, Pall-of Press and Russian Twists improve this bracing capacity of the muscles of the core thereby aiding the action of serape.

With regard to the results of this study, we understand that Pall-of Press and Russian twists are two such exercises which improve the endurance and strength of core muscles, especially internal obliques and external obliques. The McGill's Torso Endurance Test (McGill's Test) was used to measure the endurance of the core muscles through all 4 aspects: flexion, extension and side bridges. To measure the strength of the core muscles, especially the rotational muscles; Kneeling Medicine Ball Throw Test was used (KMBT). The results of both exercises show a significant difference when performed individually. With this we state that both of these exercises can be used in the exercise protocol for enhancing the strength and endurance of rotational muscles of core.

The between group analysis done using SPSS software, shows no difference in the effect produced by both exercises. Considering these results, it can be stated that both: Pall-of Press or Russian Twists can be used in an alternating manner in an exercise protocol. According to a study which explains the Pall-of Press exercise, states that with this exercise one learns to brace the core muscles while performing any movement. As it is an isometric type of workout, does not load the spine as much as Russian Twists.

Based on all the outcomes and their statistical analysis, the null hypothesis is getting accepted which says that there is no significant difference observed in the strength and endurance of the core muscles after performing either Pall-of Press or Russian Twists. This suggests that both the exercises, isometric and dynamic type of exercises are equally effective. According to the study "The Pall-of Press" this exercise helps learning the bracing of core muscles during any activity. So, Pall-of Press can be used even by any back pain population.

From the results and combination of all the literatures acquired, this study states that "use of both, Pall-of Press and Russian Twists can be done alternatively for improving endurance and strength of the rotational muscles of the core including internal and external obliques". This study also states that both the exercises have an effect on Serape Effect (which includes internal and external obliques, serratus anterior and rhomboids). These exercises enhance the working of the rotational movements which are controlled by "The Serape Effect".

Considering all the results, this study states the similarity in the effect of two exercises which work on the same muscles but their mechanism of action is different on every muscle.

CONCLUSION

From the results we conclude that, though there is no statistical difference observed in the improvement of strength by Pall-of Press or Russian Twists, there is still some clinically significant difference observed in the strength. With Pall-of Press, there was a clinically significant difference observed more on the left

side and with Russian Twists, a clinically significant difference was observed on the strength of right-side muscles

Declaration – There was no source of funding and no conflict of interest for the research.

All the images added in the manuscript have the consent of the participant regarding the same.

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