



ORIGINAL RESEARCH PAPER

Physiotherapy

THE EFFECTIVENESS OF WRIST ROLLING EXERCISE AND ARM CYCLING IN COLLEGE STUDENT WITH HYPERMOBILITY OF WRIST JOINT- A COMPARATIVE STUDY

KEY WORDS: Hypermobility of wrist joint, wrist rolling exercise, arm cycling, hydraulic hand dynamometer, goniometer, modified beighton scale.

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ABSTRACT

BACKGROUND: Hypermobility syndrome is different from localized joint hypermobility and other disorder that have generalized joint hypermobility. Hypermobility syndrome occur also in genetic disorder. It is a condition where joint laxity is associated with various musculoskeletal complaints. Exercise therapy at present has grown up to high standard in treating the musculoskeletal disease and arm cycling improves maximum upper body strength and power. Hence the study was done to evaluate the effectiveness of wrist rolling exercise and arm cycling in college student with hypermobility of wrist joint.

MATERIALS AND METHODOLOGY: A Comparative study was conducted with a purposive Sampling technique. Study Setting- KMCH institute of physiotherapy. A sample of 20 subjects between the ages of 18-25years, they were allocated into 2 groups. Group-A with 10 individuals received wrist rolling exercise. Group-B with 10 individuals received arm cycling. Outcome measures were reduction in wrist joint ROM and increase muscle strength.

RESULTS: Statistical analysis were done using independent 't'test and paired 't'test. There was a significant difference in the both groups. On comparing the post-test values of Group-A and Group-B, it found that there was a significant effect in Group A wrist rolling Exercise and Group B arm cycling.

CONCLUSION: From this study it is concluded that both exercise are very much effective in reducing the hypermobility of wrist joint. But the wrist rolling exercise can be more effective in increasing the muscle strength in hypermobility of wrist joint than arm cycling among college students. It is suggested that portable arm cycling can be used in home to get better effect.

INTRODUCTION

Wrist joint is a synovial joint of the ellipsoid variety between lower end of radius and articular disc of inferior radioulnar joint proximally and three lateral bones of proximal row of carpus i.e. scaphoid, lunate, and triquetral distally. The pisiform does not play a role in the radiocarpal articulation. It is a sesamoid bone acting as a pulley for flexor carpi ulnaris.⁽¹⁾

The human hand is designed: for grasping, for precise movements and for serving as a tactile organ. There is a big area in the motor cortex of brain for muscle of hand. The skin of the palm is thick for protection for protection of underlying tissues. Immobile because of its firm attachment to the underlying palmar aponeurosis. The skin is supplied by spinal nerves c6-c8. The deep fascia is specialized to form the flexor retinaculum at the wrist, the palmar aponeurosis in the palm, the fibrous flexor sheaths in the finger.⁽¹⁾

The normal ROM of a joint is sometimes called the anatomic and physiologic, ROM, referring to the amount of motion available to a joint within the anatomic limits of the joint structure. The extend of the anatomic range is determined by a number of factors, shape of joint, joint capsule, ligament, muscle bulk, and bony structure. A ROM is considered to be pathological when motion at a joint either exceeds or fails to reach the normal anatomic limits of motion. When ROM exceeds the normal limits the joints is called hypermobility.⁽²⁾

Goniometry are the instrument, which is used for measuring the range of motion of the joint. The term goniometry is derived from Greek words Gonio - angle and metron - measurement. To measure a range of motion of a particular joint the therapist should have the thorough knowledge on the range of motion of an individual joint, types of range of motion, osteo and arthrokinematic of the joint and axis and plane of the joint.⁽³⁾

Hydraulic hand dynamometer:

Grip strength can be measured quantitatively using a hand dynamometer. However, the method used to characterize grip strength varies considerably, for example with regard to the

choice of dynamometer or the measurement protocol used. This has the potential to introduce measurement error.

Modified beighton scale:

This scale is the most commonly used scale in determining the hypermobility. In this scale 5 joints are checked using specific technique at different joints. For example, at wrist (the classical technique is ask the patient to touch on to the volar aspect of forearm). Out of the 5 joints checked 3 should be hypermobile, including the wrist joint which is under study.⁽⁶⁾

Wrist rolling exercise:

The wrist rolling exercise has benefit to strength the forearm and improve grip strength, reinforce an athletic stance and practice essential postural habits. The muscles worked here are wrist extensors, wrist flexors, erector spinae, and transverse abdominis. The precautions are make an effort to keep the core braced and avoid the temptation to stand up too tall and overarch at the low back when practicing this exercise.⁽⁶⁾

Arm cycling:

The appropriate type of exercise will depend on many factors and in particular whether power output needs to be monitored, however, training effects are quite specific to the way patients exercise. So training on arm ergometers will improve patients exercise capacity when performing this type of exercise but the benefits will not be fully transferable to other forms of exercise.

AIM:

To find the effect in hand strength and reduction in range of motion of wrist joint for hypermobility person.

OBJECTIVE:

1. To study the effect in hand strength and reduction in ROM by using wrist rolling exercise among college student with hypermobility of wrist joint.
2. To study the effect in hand strength and reduction in ROM by using arm cycling among college student with hypermobility of wrist joint.

- To compare the effectiveness in hand strength and reduction in ROM by using wrist rolling exercise and arm cycling among college student with hypermobility of wrist joint.

MATERIAL AND METHODOLOGY

This is a comparative study done among college students to find the effect of wrist rolling exercise and arm cycling for hypermobility of wrist joint. A total of 20 samples were purposively taken based on selection criteria and they were divided into 2 groups, each group containing 10 members.

Inclusion Criterria

- Age between 18-25 years are more prone to physical injuries.
- Both gender
- Patients with hypermobility were diagnosed with goniometer, hydraulic hand dynamometer and modified beighton scale
- Both wrist were used

Exclusion Criterria

- Dance
- Gymnast's
- Musculoskeletal injuries around wrist joint
- Previous surgery on wrist joint
- Soft tissue injuries around wrist joint.
- Rheumatoid arthritis
- Psoriasis arthritis
- Infection of wrist joint
- Pseudo gout
- Gout
- Carpal tunnel syndrome
- Guyton's canal syndrome
- A total of 20 participants were taken based on inclusion and exclusion criteria. The selected subjects were randomly divided into 2 groups A and B.

GROUP A – 10 subjects with wrist rolling exercise

GROUP B – 10 subjects with arm cycling

- Weekly 6days for 4 weeks is my treatment duration and the measurement scales are goniometer, hydraulic hand dynamometer, modified beighton score.

Outcome Measure:

Increasing the muscle strength and reduction in range of motion

Procedure

After obtaining permission from the authorities of Kmch College of physiotherapy then I met the physiotherapy students availability on each day after explaining the study, obtained their written consent.

Group A

10 subjects (wrist rolling exercise)

Exercise type:

Progressive resisted exercise

Strengthening device:

- A two foot dowel is taken, a chain is attached to the center of it and two small barriers are connect on either sides is the central attachment of the dowel , so that while rolling the weights, the chain should not roll on to one side of the dowel.
- Weight plates are attached to the other end of chain.

Position the patient:

Patient is asked to sit, two pillows are placed on the lap. The forearm is rested over the pillow. The elbow is at 90 degree.

Step1:

Forearm pronated

The patient is given the strengthening device

He is taught to role the weight approach gradually and then release downwards gradually.

Step2:

Forearm supinated

He is taught to role the weight approach gradually and then release downwards gradually.

Repetition:

10 times per 3 set

GROUP B:

10 subjects

Patient position:

Sitting

Step1:

The elbow should be extended with forearm pronation

Hold the handler and rotate the arm cycle in forward motion.

Step2:

The elbow should be extended with forearm supination

Hold the handler and rotate the arm cycling in backward motion.

Duration:

4 to 6mins for 4 weeks.

Photographic Illustration:

Group A: Wrist Rolling Exercise



Group B: Arm Cycling



Data Presentation

Paired 't' Test:

GROUP A: Wrist rolling exercise

Sides	Muscle strength		ROM		Calculated 't' value	Table 't' value	p-value level of significance
	Pre-test	post-test	Pre-test	post-test			
Right hand	39.4	42.8			7.143	2.262	P<0.05 significant
Right hand flexion			93.7	85.3	5.118	2.262	P<0.05 significant
Right hand extension			90.5	83.5	6.333	2.262	P<0.05 significant
Left hand	37.4	40.9			8.179	2.262	P<0.05 significant
Left hand flexion			91	82.5	5.666	2.262	P<0.05 significant
Left hand extension			89.5	82.5	5.157	2.262	P<0.05 significant

GROUP B: Arm cycling

Sides	Muscle strength		Range of motion		Calculated 't' value	Table 't' value	p-value level of significance
	Pre-test	post-test	Pre-test	post-test			
Right hand	35.8	38.1			6.846	2.262	P<0.05 significant
Right hand flexion			92	86.5	6.127	2.262	P<0.05 significant
Right hand extension			97.7	91	3.798	2.262	P<0.05 significant
Left hand	37.8	39.9			5.842	2.262	P<0.05 significant
Left hand flexion			92.4	88.5	6.074	2.262	P<0.05 significant
Left hand extension			96.5	82	6.127	2.262	P<0.05 significant

Independent 't' test:

Muscle strength:

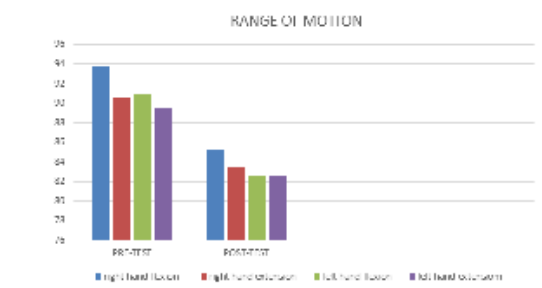
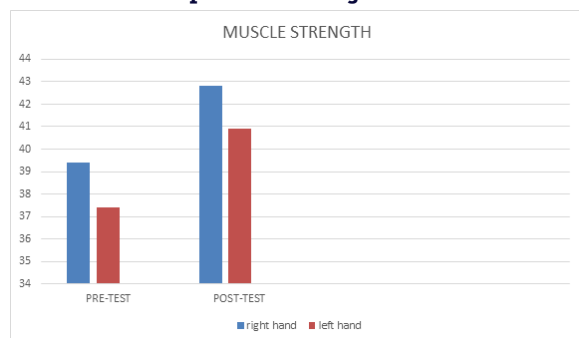
Sides	mean value				Calculate d 't' value		Table 't' value	P- value level of significant
	Group A		Group B					
	Pre- test	post- test	pre- test	post- test	pre- test	post- test		
Right hand	39.4	42.8	35.8	38.1	0.66	0.91	2.262	p>0.05 not significant
Left hand	37.4	40.9	37.8	39.9	0.08	0.21	2.262	p>0.05 not significant

Range of motion

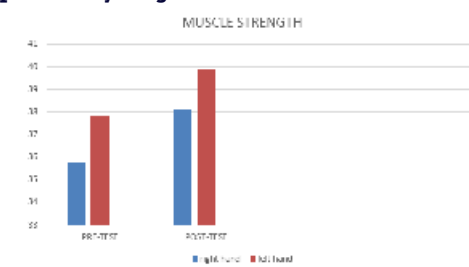
Sides	Mean value				Calculated 't' value		Table 't' value	p-value level of significant
	Group A		Group B		Pre-test post-test			
	Pre-test	post-test	pre-test	post-test				
Right hand flexion	93.7	85.3	92	86.5	0.31	0.28	2.262	p>0.05 not significant
Right hand extension	90.5	83.5	97.7	90.5	1.32	1.23	2.262	p>0.05 not significant
Left hand flexion	91	81.5	92.4	88.5	0.21	1.14	2.262	p>0.05 not significant
Left hand extension	89.5	78	96.5	89.5	1.19	2.11	2.262	p>0.05 not significant

Graphical presentation

Paired 't' test Group A:Wrist rolling exercise

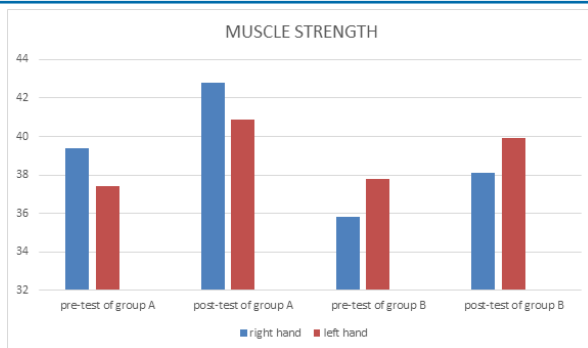


Group B: Arm cycling

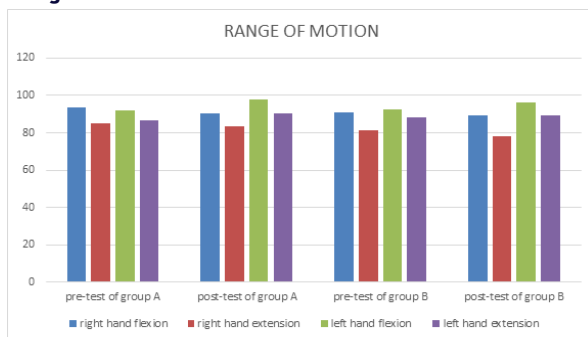


Independent 't' test

Muscle strength



Range of motion



Data Analysis And Interpretation

Paired 't' Test

Group A (wrist Rolling Exercise)

For 9 degree of freedom at 5% level of significance the calculated 't' value is greater than the table 't' value. Since the calculated 't' value is greater than table 't' value, the null hypothesis is rejected. So, there is significant difference between pre-test and post-test values of group A in wrist rolling exercise.

Group B (arm Cycling)

For 9 degree of freedom at 5% level of significance the calculated 't' value is greater than the table 't' value. Since the calculated 't' value is greater than table 't' value, the null hypothesis is rejected. So, there is significant difference between pre-test and post-test values of group B in arm cycling.

Independent 't' Test

Pre Test Values Of Group A

For 9 degree of freedom at 5% level of significance the calculated 't' value is lesser than the table 't' value. The null hypothesis is accepted. So, there is no significant difference in Group A of hypermobility of wrist joint.

Pre Test Values Of Group B

For 9 degree of freedom at 5% level of significance the calculated 't' value is lesser than the table 't' value. The null hypothesis is accepted. So, there is no significant difference in Group B of hypermobility of wrist joint.

Post Test Values Of Group A

For 9 degree of freedom at 5% level of significance the calculated 't' value is lesser than the table 't' value. Null hypothesis is accepted. So, there is no significant difference in Group A of hypermobility of wrist joint.

Post Test Values Of Group B

For 9 degree of freedom at 5% level of significance the calculated 't' value is lesser than the table 't' value. Null hypothesis is accepted. So, there is no significant difference in Group B of hypermobility of wrist joint.

RESULT

- The aim of this study is to decrease the hypermobility in wrist joint among college students. Hypermobility is a

condition in which the range of motion beyond the normal limit it's easy and at many times it's painless. It will decrease the muscle strength around the joint.

- In this we had given the wrist rolling exercise and arm cycling for hypermobility of wrist joint to increase the muscle strength and reduce the range of motion.
- Wrist rolling exercise and arm cycling shows significant difference between them
- Wrist rolling exercise shows more improvement in muscle strength whereas arm cycling shows more reduction in range of motion.

DISCUSSION

- Exercise therapy at present has grown up to high standard in treating the musculoskeletal disease and in rehabilitation purposes. Now a days it has become the main concern in the physiotherapy treatment. There are many technique used in exercise therapy like progressive resisted exercise, proprioceptive exercise, coordination exercise etc., used for treatment purposes.
- Range of motion is the movement of the joint to extend possible without causing pain. It will promote and maintain the joint mobility but in hypermobility it acts more than the range.
- Using exercise always improve the joint mobility. In this studies exercise therapy is used to reduce the excessive range of motion.
- In my project study, the wrist rolling exercise and arm cycling is studied. The individual are instructed that they should not voluntarily do any form of exercise at the wrist joint during the period of study i.e., before or after the strengthening techniques is given until the entire project study is over.
- The study concludes that there is significant increase in muscle strength around the wrist joint for muscles and reduction in the hyper mobility.

SUMMARY AND CONCLUSION

- To summarize, the wrist rolling exercise and arm cycling has effects in increasing the muscle strength of the wrist joint and therefore reducing the wrist joint hypermobility.
- In order to investigate this claim, a comparative study with wrist rolling exercise, arm cycling, hydraulic hand dynamometer, and goniometer as a measurement tool was performed for 4 weeks.
- This study was done to find out the effect of wrist rolling exercise and arm cycling in college students with hypermobility of wrist joint.
- The variables are recorded on the first day and at the end of the 4 week. The result were analyzed statistically with paired 't' test and independence 't' test which proved that both the wrist rolling exercise and arm cycling improves the muscle strength and reduce the range of motion in hypermobility of wrist joint.
- For assessing the muscle strength and range of motion, hydraulic hand dynamometer and goniometer were used before the intervention and after the intervention for a period of 4 weeks.
- Pre-test and post-test values of the study were collected and assessed by using independent 't' test and paired 't' test.
- Thus, the study is proving that wrist rolling exercise improves muscle strength whereas arm cycling reduce ROM in wrist joint

Limitation And Suggestion

Limitation:

- Sample size is small.
- Only age group of 18 to 25 were taken.
- Study duration was too short.

Suggestion:

- The study should have control group
- Future study should be done with large population

- More specific analysis should be done like EMG and ultrasound scanning for muscle strength.
- Hypermobility of other joints can also be include for further study
- Portable arm cycling be used in home setting to get better result.
- It can be used in clinical settings for better functional outcome.

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