EFFECTIVENESS OF CORE STABILITY EXERCISES VERSUS CONVENTIONAL EXERCISES ALONG WITH KINESIOTAPING ON PAIN AND LAP TIME AMONG THE SWIMMER'S WITH BREAST STROKER'S KNEE- A COMPARATIVE STUDY

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ABSTRACT:
Competitive swimming started in Britain in the 1800's. Swimming was first considered an official sport in the United States in 1888.The four main types of competitive swimming strokes are the Backstroke, Freestyle, Butterfly, and Breaststroke. The unique motion of the breaststroke kick may lead to knee injuries that involve the tendons and ligaments (breaststroker's knee). Physiotherapy diagnosis of Breast stroker's knee includes the Valgus stress test which consists of two parts can be used. In this study, 20 subjects were selected for the study on the basis of selection criteria. The subjects were divided into Group A and Group B with 10 subjects in each group. The pre-test and post-test value of pain and Lap time was analyzed using Visual Analogue Scale and 50 Meter Breast stroke Swim Test. The subjects in Group A receiving Core Stability exercises along with Kinesiotaping and Group B were receiving Conventional exercises along with Kinesiotaping. Core stability exercises was given for 35 minutes and Conventional exercises was given for 35 minutes and Kinesiotaping for 5 minutes. First 1-2 weeks both the groups were treated with conventional therapy. Before starting the exercises all the subjects did warm up for 5 minutes. Rest period is 1 minute in between each exercise. Cool down for 5 minutes.The frequency of treatment duration 60 minutes per day for 8 weeks. The pretest and post-test values on pain and lap time was recorded using Visual Analogue Scale and 50 Meter Breast stroke Swim Test. All patients in the study were also instructed in a standardized home exercise program consisting of Isometric and active range of motion exercises to be performed every day at home. This study concluded that the both groups showed that there is significance in reducing pain and Lap time after the application of the treatment. However, Group A (Core stability exercise and Kinesio taping) showed slight improvement than the Group B (Conventional leg exercise and Kinesio taping).
KEY WORDS: Breast stroker's knee**,** Core stability exercise, Kinesiotapping, Pain, Lap time .

INTRODUCTION:

Competitive swimming started in Britain in the 1800's. Swimming was first considered an official sport in the United States in 1888. The first Olympic swimming competitions occurred in 1896. The four main types of competitive swimming strokes are the Backstroke, Freestyle, Butterfly, and Breaststroke. The breaststroke has the greatest variation in intra-cyclic velocity of the four strokes and has the most variants in style.

Swimming is as an ideal form of sport considering not many athletic injuries are documented. Although, it seems because of frequent excessive and small wounds in swimming result in injuries such as swimmer's shoulder and breaststroker's knee.

The unique motion of the breaststroke kick may lead to knee injuries that involve the tendons and ligaments (breaststroker's knee). Breaststroke swimmers have a fivefold

higher risk of knee pain (relative risk, 5.1), although most occurs in the medial compartment, whereas freestyle has a reduced relative risk (0.5) for knee pain. The biomechanics of the breaststroke generates high valgus loads due to the adducted hip position. It causes pain and affects the performance of the swimmers.

The knee is a significant cause of morbidity in the competitive swimmer. One study reported knee % of the 35 members of the 1972 Canadian Olympic swimming team. A survey of 36 competitive swimmers found that 86% reported at least 1 episode of knee pain. Many studies have reported a greater incidence of knee pain among breaststroke swimmers; the "breaststroker's knee".

An extremely high incidence of knee pain was documented both among breaststroke specialists (73%) and non-breaststrokers (48%). Age, years of competitive swimming, and specific training characteristics were positively correlated with knee pain. Both the medial collateral ligament and the inferomedial patellar border were involved.

Breast stroker's knee medically treated by Pain relievers (NSAIDS), Knee brace, Crutches. Physiotherapy management of Breast stroker's knee includes Rest, ICE, Compression, Elevation, Electrotherapy, Shockwave therapy, Dry needling, Friction massage, Acupuncture, Strengthening and Stretching exercises.

The core can be described as a muscular box with the abdominals in the front, paraspinals and gluteal in the back, the diaphragm as the roof, and the pelvic floor and hip girdle musculature as the bottom. Within this box are 29 pairs of muscles that help to stabilize the spine, pelvis, and kinetic chain during functional movements. Core stability (or core strengthening) has become a well-known fitness trend that has started to transcend into the sports medicine world. Popular fitness programs, such as Pilates, yoga, and Tai Chi, follow core strengthening principles. Broad benefits of core stabilization have been touted, from improving athletic performance and preventing injuries.

Leg exercises can help to prevent injuries by strengthening the muscles in the legs, resulting in more stable joints and better overall balance," Increased muscular strength and endurance in the leg muscles. It improves balance and stability, Reduced risk of injuries, more stable lower body joints and Improved athletic performance.

Kinesio Taping Method is a therapeutic tool utilized by rehabilitation specialists in all programs (pediatric, geriatric, orthopedic, neurological, oncology and others) and levels of care (acute care, inpatient rehabilitation, outpatient, home care and Day Rehab).

To measure pain VAS was used and for measuring on lap time among the swimmers with Breast stroker's knee 50 meters Breast stroke swim test was used.

Hence the need of the study is to find out the effectiveness of Core stability exercises versus Conventional exercises along with Kinesiotaping on pain and lap time on among swimmers with Breast stroker's knee.

NEED OF THE STUDY:

Breast stroke Swimmer's Knee refers to MCL strain usually a result of the breaststroke swimming technique, causing inflammation and irritation. This stress and strain to the MCL increases the susceptibility of developing Swimmer's Knee, causing swelling, pain and inflammation in the knee.

Competitive swimmers have a high incidence of breaststroke-related knee injuries. Although previous investigators have implicated the terminal phase of the kick in the injury mechanism, athletes often complain of pain during the initial phase of rearward thrust. It also affects their performance.

Many studies have proven that stretching, strengthening exercise, soft tissue mobilization, shock wave therapy and cryotherapy are effective for Breast Stroker's knee. Up to date there are few studies comparing the effectiveness of Core stability exercise and Conventional exercises on Breast stroker's knee.

Hence the need of the study is to find out the effectiveness of Core stability exercises versus Conventional exercises along with Kinesiotaping on pain and lap time on among swimmers with Breast stroker's knee.

2. METHODOLOGY

STUDY DESIGN:

The study was a comparative study with pre and post-test evaluation.

SUBJECTS: Those subjects with VAS scale 3-7, Swimming 50 m Breast stroke style average time 01.01-01.10, Medial collateral ligament sprain grade II, Valgus stress test positive were taken for this study. The need and objectives of the study was clearly explained to the ethical committee of PPG COLLEGE OF PHYSIOTHERAPY and permission was obtained. After obtained permission the study was conducted at PPG SPORTS ACADEMY. Prior to the treatment the procedure was clearly explained to the subjects. Each subject was asked to read and sign the consent form.

20 subjects were selected for the study on the basis of selection criteria. The subjects were divided into Group A and Group B with 10 subjects in each group. The treatment technique involves Core stability exercise and Kinesiotaping for Group A and Conventional exercise and Kinesiotaping for Group B. The pre-test and post-test value of pain and Lap time was analyzed using Visual Analogue Scale and 50 Meter Breast stroke Swim Test.The data were recorded and analyzed.

The subjects in Group A receiving Core Stability exercises along with Kinesiotaping and Group B were receiving Conventional exercises along with Kinesiotaping. Core stability exercises was given for 35 minutes and Conventional exercises was given for 35 minutes and Kinesiotaping for 5 minutes. First 1-2 weeks both the groups were treated with conventional therapy. Before starting the exercises, all the subjects did warm up for 5 minutes. Rest period is 1 minute in between each exercise. Cool down for 5 minutes.

The frequency of treatment duration 60 minutes per day for 8 weeks. The pretest and post test values on pain and lap time was recorded using Visual Analogue Scale and 50 Meter Breast stroke Swim Test. All patients in the study were also instructed in a standardized home exercise program consisting of Isometric and active range of motion exercises to be performed every day at home.

DESCRIPTION OF TREATMENT TECHNIQUE:

GROUP A	1-2 Weeks	2-4 Weeks	4-6 Weeks	6-8 weeks
Conventional Physiotherapy Treatment	Rest ICE Knee Brace Ultrasound Bike Prone leg Curls, per ROM limits Leg extension, per ROM limits SLR Calf strengthening Leg press, Forward lunges	----------	----------	----------
Warm Up		5 min Shoulder - Rotation Slow march jack Hip rotation Backward leg raises Slow Stretch for upper and lower limb	5 min Continue the same	5 min Continue the same
Core Stability exercises		X Crunch up 20 repetitions Flutter Kicks 30-60 sec Towel Slides 10 repetition	X Crunch up 30 repetitions Flutter kick 90 sec Towel Slides 20 repetition	Knee bent bunkie with adduction and hip internal rotation hold for 30 seconds

		Super Man Plank 5-10 rep each side Reverse wood chop 15-25 reps Knee bent bunkie with adduction and hip internal rotation hold for 30 seconds	Super Man Plank 15-20 rep each side Reverse wood chop 25-35 reps Knee bent bunkie with adduction and hip internal rotation hold for 60 seconds	Swiss ball 30-45 sec Walking Plank Plank Hip Dips Plank Crunch Toe Reaches Crab Toe touches
Cool Down		5 Min Light jogging or walking Seated forward bend Upper body and lower body stretch	5 Min Continue the same	5 Min Continue the same

GROUP B	**1-2 Weeks**	**2-4 weeks**	**4-6 weeks**	**6-8 weeks**
Conventional Physiotherapy Treatment	Rest ICE Knee Brace Ultrasound Bike Prone leg Curls, per ROM limits Leg extension, per ROM limits SLR			

	Calf strengthening Leg press, Forward lunges			
Warm Up		5 min Shoulder - Rotation Slow march jack Hip rotation Backward leg raises Slow Stretch for upper and lower limb	5 min Continue the same	5 min Continue the same
Conventional Leg Exercise		Single leg Glute bridge 15 rep x 2 set Lying Glute side rise 15 rep x 2 sets Glute kick backs Single leg Box Squat Pistol Squat Box step up	Single leg Glute bridge 15 x 3 set Lying Glute side rise 15 x 3 sets Glute kick back with band Calm Shell with band Barbell step up Surrenders Side sumo walk	Glute kick back with band Calm Shell with band Barbell step up Surrenders Side sumo walk Jump Squat Frog Jump Wall sit
Cool down		5 Min Light jogging walking Seated forward bend	Continue the same	Continue the same

		Upper and lower body stretch		

STATISTICAL ANALYSIS:

The section with the analysis and interpretation of data collected from before and intervention of group A and group B who underwent Core stability exercise and Conventional leg exercise respectively. The statistical tools used in the study are paired t-test and unpaired t-test.

1. RESULTS:

DEMOGRAPHIC DATA:

Table 1: Demographic data of subjects

AGE	**A**	**B**
18-22	**7**	**6**
22-25	**3**	**4**
GENDER	**A**	**B**
MALE	**7**	**8**
FEMALE	**3**	**2**

Table 2: **ANALYSIS OF PAIN IN GROUP A USING VASSCALE**

TEST	**MEAN VALUE**	**STANDARD DEVIATION**	**CALCULATED "T" VALUE**	**TABLE "T" VALUE**	**p-VALUE**
PRE-TEST	**5.3**	**1.1**	**16.71**	**2.26**	**P<0.05 Significant**
POST TEST	**1.4**	**0.49**			

The pretest and post test values of VAS scale for pain were MEAN 5.3 and 1.4, SD 1.1 and 0.49 respectively. The results are enlisted in the above table paired t values for Pain was 16.71

and table t value was 2.26. The obtained t value is greater than the value at the level of significant p<0.05 with degrees of freedom.

Table 3: **Analysis of Lap time in Group A using 50 Meter Breast stroke swim test**

TEST	MEAN VALUE	STANDARD DEVIATION	CALCULATED "t" Value	Table "t' value	p-value
Pre test	**1.09**	**0.020**	**34.29**	**2.26**	**P<0.05 significant**
Post test	**1.03**	**0.019**			

The mean and standard deviation of pretest and post test values of 50 meter Breast stroke swim test 1.09 and 1.03, 0.020 and 0.19 respectively. The results are enlisted in the above table paired t value for performance 34.29 and table t value was 2.26. The obtained t value is greater than the value at the level of significant p<0.05 with degrees of freedom.

Table 4: **PAIN ANALYSIS IN GROUP B USING VAS SCALE**

TEST	MEAN VALUE	STANDARD DEVIATION	CALCULATED "t" Value	Table "t' value	p-value
PRE TEST	**5.2**	**1.4**	**11.69**	**2.26**	**P<0.05 significant**
POST TEST	**3.09**	**1.2**			

The pretest and post test values of VAS scale for pain were MEAN 5.2 and 3.09, SD 1.4 and 1.2 respectively. The results are enlisted in the above table paired t value for Pain was 11.69 and table t value was 2.26. The obtained t value is greater than the value at the level of significant p<0.05 with degrees of freedom.

Table 5: **Analysis of Lap time in Group B using 50 Meter Breast stroke swim test**

TEST	MEAN VALUE	STANDARD DEVIATION	CALCULATED "t" Value	Table "t' value	p-value
Pre test	**1.09**	**0.014**	**14.0**	**2.26**	**P<0.05**

Post test	**1.07**	**0.017**			**significant**

The mean and standard deviation of pretest and post test values of 50 meter Breast stroke swim test 1.09 and 1.07, 0.014 and 0.17 respectively. The results are enlisted in the above table paired t value for performance 14.0 and table t value was 2.26. The obtained t value is greater than the value at the level of significant $p<0.05$ with degrees of freedom.

Table 6: **BETWEEN GROUP ANALYSES**

VAS	GROUP	SAMPLE	MEAN	SD	CALCULATED t VALUE	TABLE t Value	P VALUE
PRE TEST	A	10	5.3	1.1	0.01	2.101	p>0.05 Not significant
	B	10	5.2	1.4			
POST TEST	A	10	1.4	0.49	5.02	2.101	P<0.05 significant
	B	10	3.09	1.2			

The mean and standard deviation value of pretest for Group A and B were 5.3, 5.2 and 1.1, 1.4 respectively, the result is enlisted in the above. The obtained t value 0.01 is lesser than the table value at the significant level of $p>0.05$ with 18 degrees of freedom.

The mean and standard deviation value of post test for Group A and B were 1.4, 3.09 and 0.49, 1.2. The obtained t value is greater than the table t value 5.02 at the significant level of $p<0.05$ with 18 degrees of freedom.

Table 7: **BETWEEN ANALYSIS OF LAP TIME BY USING 50 METER BREAST STROKE SWIM TEST:**

50 M SWIM TEST	GROUP	SAMPLE	MEAN	SD	CALCULATED t VALUE	TABLE t Value	P VALUE
PRE TEST	A	10	1.09	0.020	0.55	2.101	p>0.05 Not significant
	B	10	1.09	0.014			
POST TEST	A	10	1.03	0.019	5.82	2.101	P<0.05 significant
	B	10	1.07	0.017			

The mean and standard deviation value of pretest for Group A and B were 1.09, 1.09 and 0.020, 0.014 respectively, the result is enlisted in the above. The obtained t value 0.55 is lesser than the table value at the significant level of $p>0.05$ with 18 degrees of freedom.

The mean and standard deviation value of post test for Group A and B were 1.03, 1.07 and 0.19, 0.017. The obtained t value is greater than the table t value 5.02 at the significant level of $p<0.05$ with 18 degrees of freedom.

DISCUSSION:

Core muscle strengthen allows the system to stabilize the spine mechanically and then distribute and deliver translational, compressive and shear forces to and from the rest of the body. The core or the compound of muscles consists of the static and dynamic anatomy at the zone that serves as the foundation in order to move the extremity. This core stability exercises strengthens the core and also hip internal rotators and superior adductors (groin) so as applying less pressure on knee and thus core muscles help to propel forward and also reduce lap time. Core strength training altered the Vastus medialis and vastus lateralis activation ratio. The preparatory motor control strategy can be modified by training, thereby promoting dynamic joint stability. A more stable core allows more efficient distal segment movements. Core strengthening induces appropriate neuro muscular adaptations in the medial and lateral quadriceps, which leads to more neural coronal alignment or prevent knee joint valgus collapse. The powerful frog kick is the major action that propels the body through the water. Because legs do most of the propulsion work, hamstrings and inner thighs get a good workout. While bending knees toward the torso, the hamstring muscles and hip flexors work together to support the action. When extend legs and push back at the end of the frog kick, gluteal muscles work with quadriceps to push body forward. Proper leg exercises for swimmers can lead to improved swimming performance. And also, it reduces the valgus and varus stress in the knee joint while doing kick. It reduces the tension in the medial compartment of knee joint. Muscle explosive power that will be needed to return to the sport as well as breaststroke, the most dominant muscle explosive power used is the explosive power of the leg muscle. Therefore, increased muscle strength can produce a higher maximum force at swimming speeds. All explosive maximum effort depends on power. Leg muscle strength is also one of the factors affecting swimming speed. Physical ability, especially leg muscle strength is the main forward

diving force, in support of breast stroke swimming technique for swimming speed of 50 meters swim stroke. Kicking in the breast stroke requires strength to produce forward thrust. The greater the power produced by the strength of the leg muscles, the faster the forward thrust produced so that the time taken will be faster. So, the relationship between the leg muscles strength and breast stroke swimming speed is directly proportional, because the greater the power produced, the faster the swimming speed.

Kinesio tape can help reduce pain and inflammation by lifting the skin slightly, promoting better blood and lymphatic flow. The tape's elastic properties can support the knee joint and provide added stability during physical activities. Kinesio tape can improve proprioception, the body's awareness of its position in space, thereby enhancing movement control and reducing injury risk. The application of Kinesio tape can facilitate muscle activation and support weak or fatigued muscles around the knee. Kinesio taping is a non-invasive and drug-free method that can be used alongside other treatments or preventive measures. This activates the spinal inhibitory system through stimulation of touch receptors and activates the descending inhibitory system to decrease pain via the Gate control theory. The second was stimulation of cutaneous mechanoreceptors which activates nerve impulses when mechanical load which create deformation. It helps in restoring correct muscle function by supporting weakened muscles.

Chivate, Dhaval et.al, (2019) conducted a study on Effectiveness of Core Stability Exercises on Swimmer's Knee in Breaststroke Swimmers. Breaststroker's knee also known as swimmer's knee, is the second leading cause of injury holding 25% of all swimming injuries. Core instability also results in lower extremity injuries. The purpose of this study is to compare the effect of core stability exercises on swimmer's knee in breaststroke swimmers. The results showed a significant difference in the reduction of swimmer's knee between the groups with a p-value difference of 0.0001. This emphasizes core stability exercises is better than conventional exercises to reduce swimmer's knee.

Athanasios A. Dalamitros et.al, (2015),The purpose of the current study was to examine the effects of a six-month training period on knee flexor and extensor peak torque values, examine a possible bilateral strength deficit and evaluate the unilateral strength balance in competitive swimmers. However, all results were nonsignificant ($p > 0.05$). According to the data presented, a six-month regular combined swim and dry-land strength training period caused non-

significant alterations for all the parameters evaluated during isokinetic testing. This study highlights the fact that competitive adolescent swimmers demonstrated unilateral knee strength imbalances throughout a long period of their yearly training macrocycle.

LIMITATIONS:

1. Sample size of the study was smaller
2. Follow up effect of treatment technique was not done.
3. The follow-up was not conducted after the study

SUGGESTIONS:

1. Sample size can be increased with inclusion of a greater number of subjects to generalize the effect in large population**.**
2. Further studies can be done with other variables
3. Further studies can be conducted with other treatment techniques.
4. Further studies can be done in different age

CONCLUSION:

This study concluded that the both groups showed that there is significance in reducing pain and Lap time after the application of the treatment. However, Group A (Core stability exercise and Kinesio taping) showed slight improvement than the Group B (Conventional leg exercise and Kinesio taping).

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