

SUPERIORITY OF RHYTHMIC STABILIZATION AND MULLIGAN TAPING TO ISOMETRIC EXERCISE AND MULLIGAN TAPING COMBINATION FOR REDUCING SHOULDER DISABILITY IN SURFERS

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ABSTRACT

Shoulder disability is a condition where there is a limitation in the shoulder region which causes the inability of the shoulder to carry out functional movements and is often found in extreme and repetitive sports activities which involve the shoulder as the main movement maker during the sport. In this study, to improve the efficiency from physiotherapy intervention the researchers will compare the effectiveness of intervention PNF "rhythmic stabilization" with isometric exercise intervention where the two interventions focus on increasing shoulder stabilization, and both of that interventions will be combined with the Mulligan's technique taping to add external support on the shoulder. The aim of the research of this study was to know and prove the effectiveness and superiority of rhythmic stabilization and mulligan taping to isometric exercise and mulligan taping combination for reducing shoulder disability in surfers at Double Six Beach Seminyak, Badung, Bali. The research method used experimental research with a pretest before intervention and a posttest after intervention. There are 2 groups consisting of 16 samples that will get different combinations. Group 1 will received a combination of proprioceptive neuromuscular facilitation "rhythmic stabilization" and mulligan's taping, while group 2 will received isometric exercise and mulligan's taping. Disability was measured using the SPADI (Shoulder Pain and Disability Index) questionnaire. The research was conducted at a physiotherapy clinic in Denpasar. The results from the statistic T-Test all of the combination showing the signification of pre-test and post-test but from those difference the rhythmic stabilization and mulligan taping showed more greater difference which means it have indication this intervention more effective for decrease shoulder disability. The conclusion of this study is rhythmic stabilization and mulligan taping is more superior to isometric exercise and mulligan taping combination for reducing shoulder disability in surfers in order to reducing the shoulder. disability on surfers at Double Six Beach Seminyak Badung Bali.

Keyword: Proprioceptive Neuromuscular Facilitation; Rhythmic Stabilization; Isometric Exercise; Mulligan's Taping; Shoulder Disability; Shoulder Pain And Disability Index

INTRODUCTION

Surfing is one of the common reasons why foreign tourists often doing vacations in Bali. The increase in the number of foreign tourists who come just to enjoy the beauty of the waves in Bali is very high. Surfing is also one of the best sport water tourism in Bali where more than hundreds of surfers come to Bali. ¹ Surfing is one of the famous recreational sports, starting to be contested at the Olympics, and classified as a high-intensity sport that requires good preparation where more than 60-70% of surfing time is spent doing paddle movements rather than riding and surfing on the waves. ²

Paddle movement is a movement mechanism where the characteristic of this movement is the surfer lying on the surfboard facing down and only paddling with his hands. The purpose of paddling is not only as a movement for the surfer in the water but will accelerate when the surfer wants to catch up to the highest point on the wave until finally, the surfer does a pushup pattern on the surfboard to stand up. ³ Pain and disability in the shoulder region resulting from surfing sports was recorded as 25% due to shoulder impingement, 31% tendinitis of the shoulder and nearly 76% reported having bilateral shoulder pain with a combination of overuse neck, lower back, and shoulder complaints of chronic injury due to posture, repetitive movement, and muscle fatigue in paddle movements. ⁴ In shoulder problems that produce pain and disability, there is a decrease in the stabilization control, resulting in compensation movement and abnormal movement, especially in repetitive paddling movements and a full range of motion in the shoulder ⁵. Stabilization is a condition where a person consciously or unconsciously is able to adjust the magnitude and pattern of movement in the body, especially in the joints.

Shoulder instability, which is one of the causes of pain and disability in surfers, can be intervened with rhythmic stabilization and isometric exercise. The rhythmic stabilization intervention which uses the concepts of proprioceptive neuromuscular facilitation (PNF) with facilitating the proprioceptors in the joints so there is improvement in mechanical movement thereby reducing the compensatory effect on the shoulder. Rhythmic stabilization is a technique that uses isometric contractions where no movement is allowed. The important key that distinguishes rhythmic stabilization from stabilization exercise is that the patient is instructed to hold the position while the physiotherapist gives isometric contractions from various directions alternately and without relaxation in the region. This technique is indicated in cases where there is pain when moving and reduced balance of the agonist and antagonist muscle groups so it will be able to reduce muscle spasms which will have an impact on increasing the range of motion of joints that are experiencing limitations ⁶.

Isometric exercise is a conventional stabilization technique on joints by increasing intramuscular tension without changing the length of the muscle itself. Muscle contraction involves contractile elements, but because muscle has elastic and springy elements with the contractile mechanism, it is possible for contraction to occur without a significant decrease in the overall length of the muscle. The application of isometric exercise here is carried out gradually from one muscle group to another which is in other words the isometric exercise should be done on specific muscle one by one. With the provision of isometric exercise here, it is hoped that there will be strengthening of and increased endurance and synergistic in agonist muscles and antagonistic muscles, especially in the neck, upper back, and shoulder regions ⁷.

Many shoulder problem patients report that complaints or pain disappear suddenly after treatment and return afterward for a very short time after intervention stabilization, so many researchers are looking for the source of the shoulder problem pathology itself. The concept of taping was created to be able to solve this problem. Taping is basically a support device that is applied to the patient's body so the effect of stability will be felt longer even when surfing. Mulligan's taping is a technique of providing accessory mobilization in a physiological direction that is applied by taping and active physiological movement during movement. This technique can also stimulate the proprioceptive nerves in the joints to be able to restore physiological joint loading thereby reducing shoulder muscle fatigue and reducing pain which is usually a barrier in carrying out patient functional activities and is the main cause of surfer disability when paddling ⁸.

Based on the background of the problems above, the authors are interested in conducting research with the formulation of the research problem superiority of rhythmic stabilization and mulligan taping to

isometric exercise and mulligan taping combination for reducing shoulder disability in surfers . It is hoped that this research can provide benefits for researchers, subjects, and the progress of the Indonesian nation.

METHODS

a. Methodology

Study design

The design used in this study was in the form of a pre-test and post-test two-group design or random design. The results of the two groups were interpreted together with the results of the examination of the patient's shoulder disability as measured by the Shoulder Pain and Disability Index (SPADI).

Subjects recruitment

This research was conducted at a private Physiotherapy clinic in the clinic Physiotherapy Petanu Medical Center at Jl. Tukad Petanu No.9C, Sidakarya, Denpasar Selatan, Kota Denpasar, Bali from March until November 2022.

Sampling technique

The sampling technique in this research is used purposive sampling. The target population in this study were all patients who were indicated to have shoulder surfer pain and disability at Double Six Seminyak Beach, Badung based on the examinations carried out by physiotherapist. The reachable population in this study were shoulder pain and disability patients who came to the Petanu Medical Center Physiotherapy clinic. Sampling was carried out based on the inclusion criteria, as follows: a) Subjects with shoulder pain and disability based on the results of a physiotherapist's examination, b) Age between 40 - 50 years., c) Has been surfing at Double Six Seminyak Beach for more than 6 months, d) Surfing average 7-9 hours per week, e) Not taking doctor's medicine, f) Able to communicate well, g) Cooperative and willing to participate in research programs. A sample of 32 people will be divided into 2 groups where each group has 16 people in the number of samples. Group 1 will receive a combination intervention *proprioceptive neuromuscular facilitation "rhythmic stabilization"* and *mulligan's* taping while group 2 will receive a combination intervention *isometric exercise* and *mulligan's* taping.

b. Material and procedure

The application procedure of PNF technique uses the isometric contraction principle muscles, where in its application the patient may not make any movements or the patient must resist the movements given by the therapist. Resistance or contraction Isometrics are performed starting from the direction where the muscles are stronger then the therapist give the push and the patient must resist it and continue without it decrease in muscle relaxation is given isometric contraction on the other side so there is no relaxation hase of the muscles. This exercise is done for 10 repetitions, 3 sets and given 3 times intervention 24 times a week. Isometric exercise application procedure Resistance or contraction Isometrics are performed starting from the direction where the muscles are stronger then the therapist give the push and the patient must resist it on each rotator cuff muscle. This exercise is done for 10 repetitions, 3 sets and given 3 times intervention 24 times a week. Mulligan taping application procedure Mulligan's tapping is one of the techniques in application taping on the human body where Mulligan's tapping is facilitated accessory mobilization in a physiological direction applied by taping and active physiological movement while moving. All of the result is concluded by SPADI.

III. RESULTS

The table of study sample characteristics which include age, gender, and SPADI values before treatment in Group 1 and Group 2 are presented in Table 1.

Table 1. Characteristic Sample Research

Characteristic	Group 1			Group 2		
	n	Mean	SD	n	Mean	SD
Age	16	45,73	3,494	16	45,41	3,221
Man	14			12		
Woman	2			4		
Pre Test SPADI Score	16	77,94%	4,668	16	82,91%	2,121

Table 1 showed the descriptive results characteristic on the sample of this research such as age, Pre test SPADI before treatment each group. It presented the number of genders each group where are at the group 1 has 14 male with an age range of 45.73 ± 3.494 and at the group 2 female and at group 2 there were 12 male subjects and 4 female subjects with an age range of 45.41 ± 3.221 . The mean SPADI score before treatment in group 1 was $77.94\% \pm 4.668$ and the mean SPADI score in group 2 was 82.91 ± 2.121 with an interpretation of the SPADI results before treatment in group 1 and group 2 was high shoulder disability.

The following will display the value of testing the normality and homogeneity results using the SPSS Shapiro-Wilk test and Levene's on both group interventions 1 and 2. The results and the elaboration of the test scores in both groups can be seen in Table 2.

Table2 Test Normality and Homogenity

Group Data	Test Normalitas with <i>Shapiro Wilk Test</i>				Test Homogenitas (<i>Levene's Test</i>) Score p
	Group 1		Group 2		
	Statistik	score p	Statistik	score p	
SPADI Before Intervention	0,891	0,137	0,890	0,118	1,000
SPADI after Intervention	0,883	0,131	0,859	0,137	0,877

In the presentation presented in Table 2, it showed the value of normality and homogeneity test with $p > 0.05$. It is interpreted that the data in both groups normally distributed and homogeneous.

To test the average decrease in the SPADI score before the combined intervention in group 1 which will receive the PNF "Rhythmic Stabilization" and Taping Mulligan intervention, while group 2 will receive the Isometric Exercise and Taping Mulligan intervention, the Paired Sample T-test is used to determine the difference in average functional decline before and after the intervention. The test results are listed in Tables 3 and 4.

Table3. Score Decreasing SPADI on Group 1

	Before Intervention	After Intervention	Different Mean	Score p
Group 1	77,94±4,668	43,25±2,312	34,69±2,356	0,001

Table 4. Decreasing Score SPADI on Group 2

	Before Intervention	After Intervention	Different Mean	Score p
Group 2	82,91±4,122	63,76±1,781	19,15±3,341	0,001

Comparative test results of the difference in the decrease in the mean SPADI score on shoulder disability before the combination of interventions and after the combination of interventions in groups 1 and 2 were measured by the SPSS Independent t-test presented in table 5.

Table 5. Result Test Independent T-Test

	Group	N	Diffence Mean± SD	Score p
Score SPADI Before Intervention	Group 1	16	77,94±4,668	
Score SPADI After Intervention	Group 2	16	82,91±4,122	
	Group 1	16	43,25±2,312	
	Group 2	16	63,76±1,781	0,002

DISCUSSION

In Table 3, the results of the SPSS test can be seen, namely the Paired Sample T-test in the combination group 1 which received the PNF intervention "Rhythmic Stabilization" and Taping mulligan, the mean SPADI score before the intervention was 77.94 ± 4.668 and after the intervention was $43.25 \pm 2,312$. With a value of $p = 0.001$ ($p < 0.05$) with the interpretation that there was a significant difference between the scores before the intervention of the combination treatment of PNF "Rhythmic Stabilization" and Taping mulligan and after the intervention of PNF "Rhythmic Stabilization" and Taping mulligan. This value can be an interpretation and proves that the combination of interventions applied to group 1, namely PNF "Rhythmic Stabilization" and Taping mulligan can reduce shoulder disability in patients.

The results of this study were supported by research from Victoria et al., in 2013 which described the effectiveness of proprioceptive neuromuscular facilitation (PNF) interventions, which is a concept that facilitates proprioceptive muscles, Golgi tendon organs and muscle spindles as motion receptors in muscles. This concept is used as a supporting part of interventions that can initiate feedback on muscles better, resulting in changes in adaptive responses more quickly ⁹.

PNF "Rhythmic Stabilization" is one part of the application of the concept of proprioceptive muscle stimulation with the applying the isometric contraction method without pause while changing the direction of contraction. Isometric contraction is a type of contraction that results in changes in muscle tone without being accompanied by movement in the joints. In this type of contraction, the focus on the application of isometric contraction intervention techniques serves to increase stability in the joints.

Consecutive isometric contractions without being accompanied by muscle relaxation and changes in the direction of isometric contractions aim to increase awareness and co-contraction in the joints ¹⁰.

The concept of co-contraction here itself is a mechanism for working muscle contractions simultaneously by contracting prime muscles and stability muscles to be able to produce movements during functional movements. This concept also emphasizes the importance of synergistic contractions in a movement, where good synergy will provide the effectiveness of muscle contractions during movement, such as the shoulder muscles, which prioritizes each rotator cuff muscle to be able to contract simultaneously, causing the quality of the paddling movement to be controlled and in accordance with the biomechanics of the paddling itself ¹¹.

The effectiveness of muscle contraction is very important as this will reduce overwork compensation from inactive or weak muscles in the shoulder. One of the most common causes of shoulder motion limitation pain experienced by surfers is the repetitive overhead movement of the shoulder done over a long duration. This will result in fatigue that accumulates on the shoulders of surfing players every day ¹².

Table 4 can be seen from the presentation of the results of the SPSS Paired Sample T-test in group 2 which received a combination of intervention 2, namely Isometric Exercise and Taping Mulligan, in the mean SPADI score, there was a difference between the intervention before the combination of Isometric Exercise and Taping Mulligan and after the Isometric Exercise intervention and Taping Mulligan with an average before of 82.91 ± 4.122 and after of 63.76 ± 1.781 with a value of $p = 0.001$ ($p < 0.05$). The p value can indicate a significant difference between before the Isometric Exercise and Taping Mulligan intervention and after the Isometric Exercise and Taping Mulligan intervention and proves that the two combinations can improve functional S in patients with shoulder disability.

The results of this study supported with research conducted by Clifford et al., in 2020 concerning the effectiveness of providing isometric resistance training to athletes with shoulder joint instability which proves that there is a change in shoulder pain after periodic isometric exercise interventions ¹³.

Isometric exercise is a method or exercise program which is characterized by when the muscles contract they do not experience shortening and elongation or muscle contractions where the fibers do not shorten while there is tension in the muscles. It can also be said that a muscle that contracts isometrically is when the muscle stretches but there is no change in the length of the muscle fiber concerned. People who are doing isometric exercises mean they are lifting weights, but the weights are not lifted repeatedly like in isotonic exercises meanwhile just hold on certain second ¹⁴.

Isometrics muscle training causes stimulation so the neuromuscular response will be active. Mitochondrial metabolism will be enhanced through the extremity smooth muscle mechanism and will produce Adenosine Triphosphate (ATP) which can be used as energy for contraction thereby increasing limb smooth muscle tone. The focus of isometric exercises is to facilitate the tendons and connective tissue in the joints to increase existing stability ¹⁵.

Weak and fatigued shoulders after doing repetitive contractions while surfing will certainly find it difficult to maintain their posture in a physiological alignment. A study conducted by Farley et al., in 2012 proved that there is an increasing problem in the shoulder due to abnormal posture of the shoulder towards protraction or rounded shoulder, which will cause tendinitis and a capsular pattern on the shoulder ¹⁶.

Therefore, the two types of PNF intervention "Rhythmic Stabilization" and Isometric Exercise are combined by mulligan taping where the application of mulligan taping aims to provide external stabilization of the shoulder so that when the muscles are too tired to contract and the shoulder posture begins to malalignment there is a second support which can be a stability helper on the shoulder. The use of taping that can be felt even when doing surfing sports is one of the advantages of this technique application ¹⁷.

In table 5 showed the difference in the decrease of SPADI score in group 1 was (34.69 ± 2.356) or 44.15% and group 2 was (19.15 ± 3.341) or 18.29% towards the patient's functional improvement. That statistic was measured by an Independent simple-t test, a bigger difference between pre-test and post-test was used to determine and compared the effective each intervention. The result showed us that the

Intervention on group 1 have greater effect then the intervention in group 2. In addition, a value of $p = 0.002$ ($p < 0.05$) was obtained which proved that Group 1 which received a combination of the PNF intervention "Rhythmic Stabilization" and Taping Mulligan was better than group 2 which received Isometric Exercise and Taping Mulligan intervention in reducing shoulder disability in patient.

These results are supported by research conducted by Hsiao et al., in 2015 which put forward a theory regarding a significant difference between adding proprioceptive stimulation to shoulder pain to reduce disability and improve shoulder functionality. The concept of PNF intervention is to increase joint awareness by more optimally stimulating the Golgi tendon organs and muscle spindles. Intervention to increase joint awareness through a rhythmic stabilization mechanism can also increase co-contraction of the rotator cuff muscles of the shoulder so that complaints on the shoulder which are usually symptom-oriented can be corrected more thoroughly¹⁸.

Sharman et al., (2006) in their research explained that in order to reduce disability in the long term, an assessment is needed, and an understanding is needed regarding the source of the pathological problems encountered (source-oriented). In shoulder pain disability that is chronic in nature, there has been a compensatory change in malalignment or awkward posture which usually results in compensatory movements that are carried out during conventional activities every day. Shoulder stability is not only determined by the glenohumeral joint or the strength of the rotator cuff muscle, but Taylor et al., in 2006 explained that the stability of the shoulder is more influenced by the muscles in the upper back, especially muscles that control the scapula rhythm, such as the rhomboid muscle, subscapular muscle, infraspinatus and mid trapezius and with activation exercises on these muscles.

CONCLUSION

The two types of combinations where Group 1 will receive the PNF intervention "Rhythmic Stabilization" and Taping Mulligan while Group 2 will receive the Isometric Exercise intervention and Taping Mulligan intervention has been carried out well and showed significant results between before and after treatment. But when compared to the average difference in functional improvement resulting from the data obtained it shows that the results of the combination of PNF "Rhythmic Stabilization" and Taping mulligan are better for improving the patient's Shoulder functionality.

CONFLICT OF INTEREST

The authors declare no conflict of interest

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