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COMPARISON OF PROPRIOCEPTIVE TRAINING OVER TECHNICAL TRAINING IN PREVENTION OF RECURRENT ANKLE SPRAIN AMONG PROFESSIONAL FOOTBALLERS

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ABSTRACT

Background: Ankle sprain is one of the major causes of disability in professional footballers. Objective of this study was to find out the effectiveness and to compare the effectiveness of the proprioceptive training and technical training immediately after the end of the treatment and after three months follow up in prevention of recurrent ankle sprain among professional footballers.

Methods: 30 subjects with previous history of grade I or grade II ankle sprain, within one year were selected for the study. They were randomly divided into two groups equally treadmill 15 in each group A and group B. Group A and B received five minutes of warm-up by brisk walk on treadmill. Group A and B underwent 20 minutes of unilateral balance board training and unilateral vertical jump respectively.

Results: Pre and post data were analyzed using Mann-Whitney test, Wilcoxon's sign rank test, paired't' test. Intra group analysis showed that both groups have shown significant improvement with P < 0.001, after the treatment. Inter group were analyzed the post scores of both groups and found no significant difference on proprioceptive training over technical training on recurrence of ankle sprain among professional footballers.

Conclusion: The study concluded that proprioceptive and technical training are equally effective on prevention of recurrent ankle sprain among professional footballers with previous history of grade I or grade II ankle sprain.

Keywords: Ankle sprain, Single leg balance, Balance board, Vertical jump, Visual analogue scale.

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INTRODUCTION

Ankle joint is one of the most stable joint of the human body. Its articulations are designed in such a way that it can transmit the whole body weight, besides providing adequate mobility. The ankle joint is made up of 3 articulations: The talocrural joint, the subtalar joint, and the distal tibiofibular syndesmosis. These 3 joints work together to allow coordinated movement of the rear foot. The talocrural, or tibiotalar, joint is formed by the articulation of the dome of the talus, the medial malleolus, the tibial plafond, and the lateral malleolus. The subtalar joint is formed by the articulations between the talus and the calcaneus. The distal tibiofibular joint is the third joint of the ankle complex; it is the distal articulations between the tibia and fibula.[1]

The movements of the ankle joint are the dorsi flexion and the plantar flexion. When the body is in the erect position, the foot is at the right angles to the leg. In dorsiflexion there is approximation of the dorsum of the foot to the front of the leg, while in plantar flexion the heel is drawn up and the toes pointed downward. Other than dorsiflexion and plantar flexion, there are two more movements that occur in the ankle joint complex are inversion and eversion of the foot, which occurs in subtalar joint.[2]

Based on the severity of sprains can be classified in to three. A mild sprain is a Grade 1. A moderate sprain is a Grade 2 and a severe sprain is a Grade 3. Grade 1 sprain is slight stretching and some damage to the fibers (fibrils) of ligaments. Grade 2 sprain is partial tear of ligaments. If the ankle joint is examined and moved in certain ways, abnormal looseness (laxity) of the ankle joint occurs. Grade 3 sprain is complete tear of the ligaments and then the joint is pulled or pushed during examination of ankle motion and gross instability occurs.[3]

Competitions such as the world championship, the world league and the Olympic Games demand several exhaustive matches played very close to one another. It requires high level of repetitive performance by the players, which put great load over the joints and make them more susceptible for the injury. Because of this, players required to improve the quality and intensity of their physical and technical training significantly.

Research objective

This study focused to evaluate the efficacy of proprioceptive and technical training to prevent the recurrence of ankle sprain among professional footballers immediately after the training and after 3 months of follow up. The study was also aimed to compare the effectiveness of proprioceptive training over technical training on prevention of recurrent ankle sprain among professional footballers.

MATERIAL AND METHODS

This study was an experimental with comparative design. The study setting was in football ground at Petaling district association, Malaysia. The samples were male professional footballers with age group of 18-35 years and sample size of 30 with previous history of at least one or more ankle sprain within a year with grade 1 or grade 2 ankle sprain. Subjects with a history of ankle sprain within last three months, recent fracture in any part of body, any other pathology or weakness in lower limbs or spine were excluded from the study. Tools used for the study were single leg balance test, visual analog scale and range of motion. Materials used were balance board, pain assessment chart and clinical goniometer.[4, 5, 6, 7]

Randomization and allocation of treatment:

The selected 30 simples were randomly divided by lottery method into 15 subjects in technical training and proprioceptive training group. The data were collected before and after 36 sessions of training and after 3 months of follow up from both the groups. Each training session was maintained for 20 minutes and three days per week.

The subjects of Group A and B were asked to do warm up thoroughly by brisk walk on tread mill for 5 minutes followed by 5 minutes mild self-stretching of the lower limb muscles with special emphasis to ankle plantar flexors and dorsi flexors to minimize the risk of muscle soreness. The subjects of Group A with proprioceptive training were asked to stand on the wobble board bilaterally followed by unilaterally on the affected side, 5minutes in each session. The subjects of Group B were instructed to perform vertical jumps bilaterally and unilaterally for the affected legs, 5 minutes in each session. The subjects were asked to jump to sub maximal level only to prevent force injuries in the affected leg.[8]

Statistical Analysis

The data collected in this study were analyzed statistically using version SPSS 20. Independent and dependent Paired t test used to analyse the ROM data between and within the groups of the study. To test the VAS within the group used Wilcoxon signed rank test and to test between the groups Mann-Whitney test were applied. The variation from pre-test, post-test and 3 months follow up were measured using the repeated measures of analysis of variance for ROM within

the group. The variation from pre-test, post-test and 3 months follow up in case of VAS is measured using Friedman's test for within the group. The changes within the time interval of pre-test to post-test and post-test to 3 months follow up of Single leg balance test were tested using McNemar and Chi-square test. This study is considered as statistically significant whenever the p-value is less than or equal to 0. 05.

RESULTS

Intra group analysis within group A and B found significant difference in effect on ROM, VAS and SLB after the training program but post- test to 3 months follow up there was no significant difference in effect. Intergroup analysis between group A and group B found no significant difference in effect between the group A and group B on ROM, VAS and SLB immediately after the training as well as 3 months after follow up.

The Range of Motion (ROM) - Dorsi Flexion (DF) (Table-1) and Plantar Flexion (PF) (Table-2) in the study was analyzed using paired t test. These findings indicate that there was a significant improvement in the ROM-DF immediately after intervention but after 3 months follow up the effect of the intervention on ROM-PF was not significant.

Table-1: Within comparison of ROM-DF of Proprioceptive group

Pair	ROM-DF	N	Mean	SD	t-value	df	p-value
1	Pre-test	15	18.73	2.22	2.276	14	< 0.039
	Post-test	15	19.93	0.26			
2	Post-test	15	19.93	0.26	1	14	> 0.334
	3 months follow up	15	20.00	0.00			

Table-2: Within comparison of ROM-PF of Proprioceptive group

Pair	ROM-PF	N	Mean	SD	t-value	df	p-value
1	Pre-test	15	47.40	2.92	3.704	14	< 0.002
	Post-test	15	49.73	0.70			
2	Post-test	15	49.73	0.70	1.468	14	> 0.164
	3months follow up	15	50.00	0.00			

The Range of Motion (ROM) - Dorsi Flexion (DF) (Table-3) and Plantar Flexion (PF) (Table-4) in the study was analyzed using paired t test. These findings indicate that there was a significant improvement in the ROM-DF immediately after intervention but after 3 months follow up the effect of the intervention on ROM-PF was not significant.

Table-3: Within comparison of ROM-DF of Technical group

Pair	ROM-DF	N	Mean	SD	t-value	df	p-value
1	Pre-test	15	18.80	2.01	2.316	14	< 0.036
	Post-test	15	20.00	0.00			
2	Post-test	15	20.00	0.00	1	14	> 0.334
	3 months follow up	15	19.73	1.03			

Table-4: Within comparison of ROM-PF of Technical group

Pair	ROM-PF	N	Mean	SD	t-value	df	p-value
1	Pre-test	15	46.47	3.87	3.445	14	< 0.004
	Post-test	15	49.60	0.83			
2	Post-test	15	49.60	0.83	0.159	14	> 0.876
	3 months follow up	15	49.67	1.29			

The Visual Analog Scale (VAS) score in this study was analyzed using Wilcoxon signed rank test (Table-5) and (Table-6) within Proprioceptive and Technical group. The findings indicate that the intervention given for the group A and B was very effective immediately after the treatment, but after 3 months no significant difference found in effect when compared with the post test.

Table-5: Comparison of Ranks of VAS within Proprioceptive group

VAS	Ranks	Mean Rank	Sum of Ranks	Mean	z- value*	p-value
VAS (Post-test) VAS (Pre-test)	Negative Ranks	5.50	55.00	1.60	2.831	< 0.005
	Positive Ranks	.00	.00	0.13		
(Post-test) VAS 3 months follow up)	Negative Ranks	1.50	3.00	0.13	1.414	> 0.157
	Positive Ranks	.00	.00	0.00		

Table-6: Comparison of Ranks of VAS within Technical group

VAS	Ranks	Mean Rank	Sum of Ranks	Mean	z- value*	p-value
VAS (Post-test) VAS (Pre-test)	Negative Ranks	5.00	45.00	1.53	2.701	< 0.007
	Positive Ranks	.00	.00	0.13		
(Post-test) VAS 3 months follow up)	Negative Ranks	1.00	1.00	0.13	0.447	> 0.655
	Positive Ranks	2.00	2.00	0.33		

*Wilcoxon signed rank test

The Single Leg Balance (SLB) pre - post test in the study (Table-7) and post test - 3 months follow up (Table-8) was analyzed using McNemar test. The findings indicate that statistically significant improvement on SLB immediately after the intervention, but after 3 months no significant difference found in effect when compared with the post test.

Table-7: Pre - post test for single leg balance of proprioceptive group

Pre-test	Post-test			McNemar Test*
	Negative	Positive	Total	
Negative	2	-	2	
Positive	12	1	13	P = 0.001
Total	14	1	15	

*Using Binomial distribution

Table-8: Post - follow up test for single leg balance of proprioceptive group

Post test	3 months follow up			McNemar Test*
	Negative	Positive	Total	
Negative	12	2	14	P = 0.50
Positive	-	1	1	
Total	12	3	15	

The Single Leg Balance (SLB) pre - 3 months follow up test in the study (Table-9) was analyzed using Chi-square test. Chi-square test has been used for this analysis because McNemar test could be done only in case of matched pair observation for a 2 X 2 table. The test has revealed the overall effect of SLB from pre test to 3 months follow up and found statistically significant on proprioceptive group.

Table-9: Pre-test to 3 months follow up single leg balance test for proprioceptive group

Time interval of Measurement	Single leg balance test			Chi-square value	df	p-value
	Negative	Positive	Total			
Pre-test	2	13	15	23.445	2	< 0.001
Post-test	14	1	15			
3 months follow up	12	3	15			
Total	28	17	45			

The Single Leg Balance (SLB) pre - post test in the study (Table-10) and post test - 3 months follow up (Table-11) was analyzed using McNemar test. The findings indicate that statistically significant improvement on SLB immediately after the intervention, but after 3 months no significant difference found in effect when compared with the post test.

Table-10: Pre - post test for single leg balance of technical group

Table-10: Pre-test	Post-test			McNemar Test*
	Negative	Positive	Total	
Negative	3	-	3	P = 0.001
Positive	11	1	12	
Total	14	1	15	

Table-11: Post test- 3months follow up for single leg balance of technical group

Post-test	3 months follow up			McNemar Test*
	Negative	Positive	Total	
Negative	12	2	14	P = 1.00 (NS)
Positive	1	-	1	
Total	13	2	15	

The Single Leg Balance (SLB) pre test - 3 months follow up (Table-12) in the present study was analyzed using Chi-square test. Chi-square test has been used for this analysis because McNemar test could be done only in case of matched pair observation for a 2 X 2 table. The test has revealed the overall effect of SLB from pre test to 3 months follow up and found statistically significant on technical group.

Table-12: Single leg balance test of technical group from Pre-test to 3 months follow up

Time interval of measurement	Single leg balance test			Chi-square value	df	p-value
	Negative	Positive	Total			
Pre-test	3	12	15			
Post-test	14	1	15	22.20	2	P < 0.001
3 months follow up	13	2	15			
Total	30	15	45			

Analysis between the groups:

Between the groups Range of Motion (ROM) - Dorsi Flexion (DF) (Table-13) and Plantar Flexion (PF) (Table-14) was analyzed using paired Independent t' test. The study found no significant difference in effect on ROM between the groups.

Table-13: Comparison of ROM-DF between the groups

Time interval	Study group	Mean	SD	t-value	p-value
Pre-test	Proprioceptive	18.73	2.22	0.086	P > 0.932
	Technical	18.80	2.01		
Post-test	Proprioceptive	19.93	0.26	1	P > 0.326
	Technical	20.00	0.00		
3 months follow up	Proprioceptive	20.00	0.00	1	P > 0.326
	Technical	19.73	1.03		

Table-14: Comparison of ROM-PF between the groups

Time interval	Study group	Mean	SD	t-value	p-value
Pre-test	Proprioceptive	47.40	2.92	0.745	P > 0.462
	Technical	46.47	3.87		
Post-test	Proprioceptive	49.73	0.70	0.475	P > 0.638
	Technical	49.60	0.83		
3 months follow up	Proprioceptive	50.00	0.00	1	P > 0.326
	Technical	49.67	1.29		

Between the groups Visual Analog Scale (VAS) (Table-15) was analyzed using Mann-Whitney test. It has revealed no significant difference in the pre-post test of VAS between the groups.

Table-15: Comparison of VAS between the groups

Time interval	Study group	Mean	SD	z-value*	p-value
Pre-test	Proprioceptive	1.60	1.72	0.236	P > 0.813
	Technical	1.53	1.77		
Post-test	Proprioceptive	0.13	0.35	0	P > 1
	Technical	0.13	0.35		
3 months follow up	Proprioceptive	0.00	0.00	1.438	P > 0.539
	Technical	0.33	1.05		

Between the groups analysis of pre test and post test on Single Leg Balance (SLB) in the study (Table-16) and (Table-17) was analyzed using Chi-Square test. The results indicate no significant difference in SLB between the groups on pre test and post test.

Table-16: Comparison of Single leg balance at pre test between the groups

Pre-test	Proprioceptive	Technical	Total	Chi-square value	p-value
Negative	2	3	5	0.24	P > 0.624
Positive	13	12	25		
Total	15	15	30		

Table-17: Comparison of Single leg balance at post test between the groups

Post-test	Proprioceptive	Technical	Total	Chi-square value	p-value
Negative	14	14	28	0	P > 1
Positive	1	1	2		
Total	15	15	30		

Between the groups analysis of Single Leg Balance (SLB) test after 3 months follow up in the study (Table-18) was analyzed using Chi-Square test. The results indicate no significant difference in SLB between the groups after 3 months.

Table-18: Comparisons of Single leg balance at 3 months follow up between the groups

3months follow up	Proprioceptive	Technical	Total	Chi-square value	p-value
Negative	2	3	5	0.24	P > 0.624
Positive	13	12	25		
Total	15	15	30		

DISCUSSION

Recurrent ankle sprains are a major cause of disability and affect the player's performance to a great extent. Exercises designed to prevent recurrence and to reduce pain do really help them get better. In the field of health care system including pharmacological and non-pharmacological, have attended the different ways to find solution for prevention of recurrence and reducing pain and improving their physical function.[9,10]

Football is very popular sport all over the world, which demands extensive training and match session to be played. In Footballer needs to do agitated movements several times in order to smash or block the ball this puts great level of load over the ankle and make it more and more susceptible to recurrent injuries. Recurrent ankle sprains are a major cause of disability and affect the player's performance to a great extent. Exercises designed to prevent recurrence and to reduce pain do really help them get better. In the field of health care system including pharmacological and non-pharmacological, have attended the different ways to find solution for prevention of recurrence and reducing pain and improving their physical function.[11,12]

Here in this study, it was focused on finding out the effectiveness of proprioceptive training and technical training in order to prevent recurrence of ankle sprain, in subjects with previous history of grade I or grade II ankle sprain, and the objective of the study was to find out the efficacy of proprioceptive training and technical training individually, immediately after the end of training session and after three months, and also to compare the effectiveness of one training over another training immediately after the end of the trainings and after three months also; with alternate hypothesis stating that technical training or proprioceptive training may have a statistically significant effect in reducing the number of recurrence of ankle sprain with subjects having previous history of ankle sprain, and null hypothesis stating that technical training or proprioceptive training may not have a statistically significant effect in reducing the number of recurrence of ankle sprain with subjects having previous history of ankle sprain.[13,14,15]

CONCLUSION

This study concluded that the parameters of ankle range of movement, single leg standing balance have improved and ankle joint pain found reduced after the training program in proprioception and technical training group. There was significant difference in effect within the groups after the training program, but there was no difference in effect between post treatment and after 3 months of follow up among professional footballers.

The study also concluded that there was no remarkable difference in effect between the proprioceptive training group and technical training group. The training was equally effective immediately after the training and even after three months of follow up in both groups.

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