IOSR Journal of Sports and Physical Education (IOSR-JSPE)
e-ISSN: 2347-6737, p-ISSN: 2347-6745, Volume 8, Issue 4, (Jul. – Aug. 2021), PP 18-22
www.iosrjournals.org

A Study to Find Out the Effectiveness of Hip Muscle Strengthening On Static and Dynamic Balance In Chronic Ankle Instability

Keshav Kumar Kant[1], Dr. Ajeet Kumar Saharan, PhD[2], Manisha Saharan[3], Tanubhrit Singh[4], Ashok Kumar[5]

[1]*PhD Scholar, Physiotherapy Department, Maharaj Vinayak Global University, Jaipur, India.*
[2]*Prof & Principal, Jaipur Physiotherapy College, Maharaj Vinayak Global University, Jaipur, India.*
[3]*PhD Scholar, Physiotherapy Department, Maharaj Vinayak Global University, Jaipur, India.*
[4]*PhD Scholar, Physiotherapy Department, Maharaj Vinayak Global University, Jaipur, India.*
[5]*PhD Scholar, Physiotherapy Department, Maharaj Vinayak Global University, Jaipur, India.*

Abstract
Aim: *The aim of this study was to determine a study to find out the effectiveness of hip muscle strengthening on static and dynamic balance in chronic ankle instability effect of eight weeks of hip abductor muscle strengthening with functional balance training on static balance in chronic ankle instability in normal population and cricketers.*
Design: *Pre-test post- test experimental design.*
Material & Methodology: *A total of 100 subjects (50 cricketers and 50 normal populations) with self-reported CAI were recruited according to the inclusion and exclusion criteria. The related studies were held in Launchpad India Delhi, Physiolife Physiotherapy Delhi after the coordination with the province officials' permission in order to gather the related data. The foot and ankle disability index (FADI) questionnaire are distributed and gathered only one day before the beginning of the protocol.*
Results*: The present study provided the description of effect of eight weeks of hip abductor muscle strengthening with functional balance training on static and dynamic balance in chronic ankle instability in normal population and cricketer of young population.*
Conclusions: *The results of this study demonstrate that regardless of different training groups (Cricketers, and Normal population), statistically significant improvements in balance were achieved by all the groups. Following the training the YBT composite score, significantly improved in the both the training group.*
Keywords: *Foot and ankle disability index (FADI), Y-Balance Test, Functional Balance training, Functional Ankle Instability.*

Date of Submission: 10-07-2021 Date of Acceptance: 26-07-2021

I. Introduction

With increasing amounts of leisure time and the current emphasis on physical fitness, the incidence of sports injuries has increased dramatically. The ankle joint is the second most common injured body site in sport with lateral ankle sprains being the most common type of ankle injury. Thus, ankle sprains are one of the most frequently encountered musculoskeletal injuries. Ankle sprains, account for between 3% and 5% of all Emergency Department attendances in the UK, with about 5,600 incidences per day. It has been estimated that an ankle injury occurs every day per 10,000 of the population. Up to 53% of basketball injuries and 29% of soccer injuries can be attributed to ankle injuries and 12% of time lost in football is due to ankle injuries. In the acute phase, ankle sprains are associated with pain and loss of function, and one quarter of all injured people are unable to attend school or work for more than seven days. Ankle injuries account for five percent of all sports injuries and two billion dollars in medical costs annually. In addition to its financial costs, ankle sprain can result in significant sequel, including time lost to injury and long-term disability in up to 50% of cases. Yet an estimate 55 % of people who experience an ankle sprain will not seek professional treatment. This is unfortunate since most of these individuals are young athletes with good rehabilitation potential.

The acute symptoms of ankle sprain include inflammation, swelling, throbbing pain which will worsen if there is pressure placed on the area, and a decreased ability to move the joint, and difficulty using the affected leg. The chronic symptoms of ankle dysfunction include pain, swelling, recurrent injury and feeling of "giving way".

Chronic ankle instability (CAI) is a frequent consequence after lateral ankle sprain and it is estimated that approximately 40% of the individuals suffering an initial ankle sprain will develop long standing ankle dysfunction. To explain the phenomenon of CAI; the concepts of functional and mechanical ankle instability have been introduced. Mechanical ankle instability (MAI) refers to objective measurements of ligament laxity; whereas Functional ankle instability (FAI) is defined as recurrent or the subjective feeling of "giving way". Tropp et.al, described FAI as joint motion beyond voluntary control not necessarily exceeding physiological range of motion and MAI as ankle joint motion that exceeds the physiologic range. Clinical diagnosis of FAI is predicted on the patient's self-reported episode of "giving way". Manual examination and stress radiographic measurements of joint translation and increased range of motion (ROM) are useful to the clinical diagnosis of MAI. Some authors reported symptoms of functional instability in the absence of mechanical instability. Vaes recently reported only 35% of 117 functionally unstable ankle demonstrated mechanical instability. This percentage is consistent with similar previously reported studies which show joint laxity itself does not predict the presence/ severity of functional instability. These studies support the notion that mechanical instability alone is of little clinical significance. However the combinations of mechanical instability and decreased neuromuscular control resulting from deficits in joint proprioception may result in functional instability of the ankle joint.

II. Materials And Methods

A Pre-Test –Post Test Experimental Design was carried out to see the effect of eight weeks of hip abductor muscle strengthening with functional balance training on static balance in chronic ankle instability. Total of 100 samples are recruited for the study. Out of these 100 samples 50 Normal Population and 50 cricketers were selected.

Group 1- Cricketers (50 subjects)

Group 2- Normal Population (50 subjects)

Inclusion criteria:

- Gender: Males
- Age group: 18-30 years,
- Subject having a history of more than one ankle sprain and residual symptoms, including episodes of the ankle giving way.
- Subjects will self-report symptoms of disability due to ankle sprains qualified by a score of 90% or less on the Foot and Ankle Disability Index (FADI) and the FADI Sport surveys.
- If a subject reported bilateral ankle instability, the self-reported worse limb was used for analysis and training.

Exclusion Criteria:

- History of head injury (concussion) within the previous 12 weeks.
- Subjects having history of lower extremity injury, including ankle sprain within the past 6-week, history of lower-extremity surgery, and balance disorders, neuropathies, diabetes, or other conditions known to affect balance.

Tools and measuring method:

Measuring tape, 30 cm box, Treatment table, Stop watch, Protractor, Ink pad, Microspore

Procedure:

All subjects were given a questionnaire to fill out regarding their previous ankle injuries, and the Foot and Ankle Disability Index (FADI). Healthy subjects must score 100% on both sections of the FADI; while CAI subjects must score less than 90% on the FADI. ADL section and less than 80% on the FADI sports section [(16)]. All subjects read and signed an informed consent form that was be approved by the University Institutional Review Board.

Statistical analyses:

All data were analyzed using statistical tests, which were performed using SPSS 19.00 software package. Demographic data of subjects including age and gender, involved and dominant leg were descriptively summarized to project the results. The dependents variables for the statistical analysis were analyzed using parametric tests like Independent T-Test and Paired T-Test. The data was analyzed both between and within the groups. A 0.05 level of significance was used for all comparisons.

III. Results

Descriptive data:

100 samples (50 cricketers and 50 Normal Population) were recruited for the study. Mean and standard deviation of age and Right lower Limb (RLL) were given below. (Table 1).

Table. 1.

Descriptive Statistics for the Variables

	AGE		RLL	
	MEAN	SD	MEAN	SD
G1	24.10	0.36	84.78	0.79
G2	23.34	0.39	85.00	0.91

Within group comparisons of composite scores both legs for Y-balance test

Mean and SD of pretest and posttest composite scores of Y- Balance test for both left leg and right leg in all three groups were given below in table 2 and Figure 1.

Table 2.0

Within group comparisons of composite scores both legs for Y-balance test

GROUP	YBTLC0		YBTLC8		YBTRC0		YBTRC8	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
G1	0.90	0.01	0.94	0.01	0.92	0.01	0.96	0.01
G2	0.94	0.01	1.00	0.01	0.95	0.01	1.01	0.01

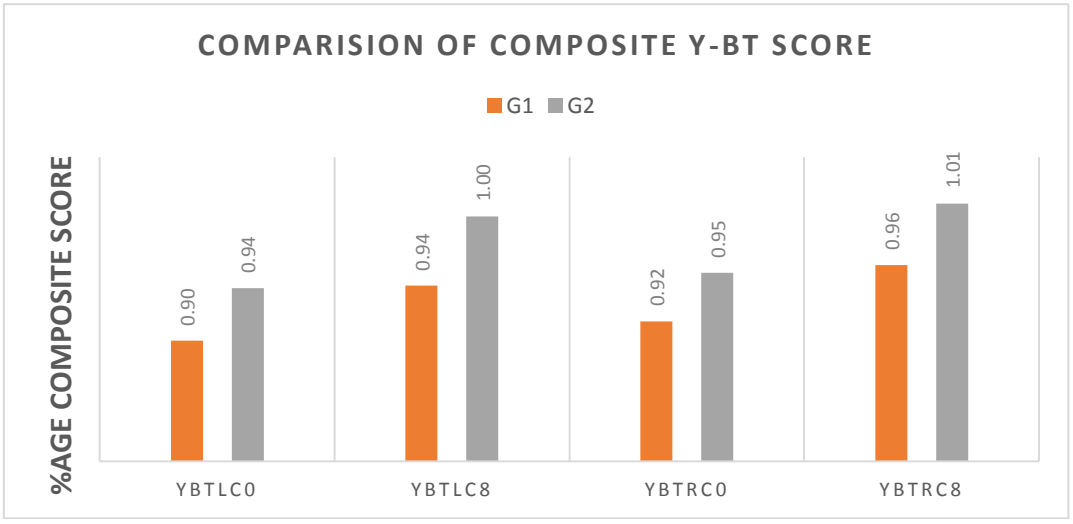

Figure 1.0 Within groups comparisons of composite scores both legs for Y-balance test

IV. Discussion

The primary purpose of this study was to determine which training group (cricketer and normal population) will perform better when training balance for chronic ankle instability. The overall result of this study shows that all the trainings groups are getting effective results when training balance for chronic ankle instability. The results are summarized as:

- However, both groups improved statistically significantly from day 0 to week 8.
- There was marginally better improvement in the score of dynamic balance in cricketer group as compared to normal population as assessed on anterior direction of Y-Balance Test.
- There was statistically significant difference between groups for the composite score of dynamic balance. Cricketers registered better improvement in composite score of dynamic balance than that of normal population.

The results of this study demonstrate that regardless of different training groups (Cricketers, and Normal population), statistically significant improvements in balance were achieved by all the groups. Following the training the YBT composite score, significantly improved in the both the training group.

We found that dynamic postural stability also improved after our functional balance training program, as the dynamic movement associated with our program challenged the postural control system more than a standard coordination training program.

Overall, there is a better correlation noted between gluteus medius strength and balance. This could be due to following reasons:

1. Strong stabilization at the pelvis by this muscle would have minimized the lateral postural sway during unilateral activities and allowed the participants with strong gluteus medius strength to reach farther while maintaining balance on the involved extremity Friel et al. (2006), MacKinnon CD, Winter DA (1993).
2. The lower extremity is a serial linkage of multiple joints where the problem at one joint can be caused or corrected by compensation by the other joints Powers CM (2010). Foot moments during single leg stance can be influenced and compensated by hip abductor strength Friel (2006), Powers CM (2010).

Within group improvements for anterior direction in all groups could be explained on the basis of fact that vastus medialis obliqus could have been weak on day 0 because of proximal muscle changes associated with ankle sprain. So, reach distance improved as the muscle strengthened during 8 weeks of training.

Improvement in the composite score of dynamic Y-Balance test in the both the groups was mainly based on the improvement of posteromedial and posterolateral direction. Improvements in the posterolateral and posteromedial direction are likely the result of improved neuromuscular control and dynamic balance, and less related to lower extremity strength, as was suggested by Thorpe and Ebersole T (2008).

One important observation of this study was that significant improvement occurred from day 0 to week 8. These findings suggest that 8 weeks of training is sufficient time to promote reflex muscular activation patterns necessary for the maintenance of posture and balance Rozzi (1999).

Limitations

- Larger sample size would have brought in more clarity in observed trends.
- Due to lack of funds and infrastructure, many of the resources like EMG Force plate, and Biofeedback could not be used to make the results clearer.
- The various activities of the subjects during the course of study were not completely under control. Though the subjects were instructed to continue only with their regular activity and were asked to report participation in any new activity.

Future scope

- Generalizability of the results should be increased by carrying the study on large sample size.
- Studies can be done for longer durations (12-16 weeks), to make the picture of results clearer.
- EMG, Force plate, and Biofeedback can be used to make the results clearer.

V. Conclusions

Sports physiotherapist, sports trainers, coaches and others in situation where they are unable to decide which type of training is more beneficial for their athletes having CAI, they should be aware of the impact that Functional balance training with Gluteal Muscle strengthening is effective in improving static balance. However, Footballers can give better results than that of Cricketers in improving static and dynamic balance. Thus, we can say that Functional Balance Training with Gluteal Muscle strengthening is clinically relevant for the rehabilitation of chronic ankle instability. The results of this study demonstrate that regardless of different training groups (Footballers and Cricketers), statistically significant improvements in balance were achieved by both the groups. Following the training, SLST time significantly improved in the both the training group.

Acknowledgement

The researchers would like to thanks to Launchpad India, and Physiolife Physiotherapy Clinic in-charge Dr. Payal Pal for their participation in my study. Who has helped us by providing platform to collect data for the study. Our acknowledgement cannot be completed without expressing thanks to our subjects for their co-operation.

Bibliography

[1]. Berg K, Latin Richard W. Comparison of physical and performance characteristics of NCAA Division I basketball and football players, Journal of strength and conditioning research 1995:9(1):22–26.
[2]. Beynnon BD, Renstrom PA, Alosa DM, Baumhauer JF, Vacek PM. Ankle ligament injury risk factors: A prospective study of college athletes. J Orthop Res. 2001;19(2): 213-20.
[3]. Bosien W R, Staples O S, Russell S W. Residual disability following acute ankle sprains. J Bone Joint Surg Am. 1955;37:1237–1243.

[4]. Cooke MW, Lamb SE, Marsh J, Dale J: A survey of current consultant practice of treatment of severe ankle sprains in emergency departments in the United Kingdom.Emerg Med J 2003, 20**:**505-507.
[5]. De Bie RA, de Vet HC, van den Wildenberg FA, Lenssen T, Knipschild PG: The prognosis of ankle sprains.Int J Sports Med 1997, 18**:**285-289.
[6]. Eils E, Rosenbaum D. A multi-station proprioception exercise program in patients with ankle instability. MedSci Sports Exerc. 2001;33:1991–1998.
[7]. Fong DT, Hong Y, Chan LK, Yung PS, Chan KM: A systematic review on ankle injury and ankle sprain in sports.Sports Med 2007, 37**:**73-94.
[8]. Freeman M.A. Instability of the foot after injuries to the lateral ligament of the ankle. J Bone Joint Surg Br. 1965;47(4):669–677.
[9]. Gerber JP, Williams GN, Scoville CR, et al. Persistent disability with ankle sprains: a prospective examination of an athletic population. Foot Ankle Int 1998;19(10):653-660.
[10]. Herbert RD, Gabriel M. Effects of stretching before and after exercising on muscle soreness and risk of injury: systematic review. BMJ. 2002 Aug 31;325(7362):468. DOI: 10.1136/bmj.325.7362.468. PMID: 12202327; PMCID: PMC119442.
[11]. Hertel J, Braham RA, Hale SA, Olmsted-Kramer LC: Simplifying the star excursion balance test: analyses of subjects with and without chronic ankle instability. J Orthop Sports PhysTher 2006, 36:131-137.
[12]. Hubbard, T.J., T.W. Kaminski, R.A. Vander Griend, and J.E. Kovaleski. Quantitative Assessment of Mechanical Laxity in the Functionally Unstable Ankle. Med Sci. Sports Exerc. 2001; vol 36, No.5, pp 760-766.
[13]. Isakov E, Mizrahi J. Is balance impaired by recurrent sprained ankle? Br J Sports Med.1997;31:65–67.
[14]. Kannus P, Renstrom P. Treatment for acute tears of the lateral ligaments of the ankle: operation, cast or early controlled mobilization. J Bone Joint Surg [Am] 1991;73-A:305-12
[15]. Lynch SA,Renstrom P. Treatment of Acute Lateral Ankle Ligament Rupture in the Athlete: Conservative vs. Surgical Treatment. Sports Med 1999; 27:61-71.
[16]. McKay GD, et al. Ankle injuries in basketball: injury rate and risk factors. Br J Sports Med2001;35:103-108.
[17]. McKeon PO, Ingersoll CD, Kerrigan DC, Saliba E, Bennett BC, Hertel J. Balance training improves function and postural control in those with chronic ankle instability. Med Sci Sports Exerc. 2008;40(10):1810–1819.
[18]. Osborne MD, Chou LS, Laskowski ER, Smith J, Kaufman KR. The effect of ankle disk training on muscle reaction time in subjects with a history of ankle sprain. Am J Sports Med. 2001;29:627–632.
[19]. Richard C. Clark. Associations between three clinical assessment tools for postural stability. North American Journal of Sports Physical Therapy | Volume 5, Number 3:September 2010:Page 122-130
[20]. Thomas B. Michell*; Scott E. Ross†; J. Troy Blackburn‡; Christopher J. Hirth‡; Kevin M. Guskiewicz‡ Journal of Athletic Training 2006;41(4):393–398
[21]. Tropp H, Odenrick P, Gillquist J. Stabilometry recordings in functional and mechanical instability of the ankle joint. Int J Sports Med. 1985;6:180–182.
[22]. Vaes PH, Duquet W, Casteleyn PP, Handelberg F, Opdecam P. Static and dynamic roentgenographic analysis of ankle stability in braced and nonbraced stable and functionally unstable ankles. Am J Sports Med. 1998;26:692–702.

Keshav Kumar Kant, et. al. "A Study to Find Out the Effectiveness of Hip Muscle Strengthening On Static and Dynamic Balance In Chronic Ankle Instability." *IOSR Journal of Sports and Physical Education (IOSR-JSPE,) 8*(4) (2021): 18-22.