International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2024.0383
e ISSN: 2584-2854
Volume: 02
Issue: 08 August 2024
Page No: 2638-2644

Effect of Non-Stretchable Athletic Tape Application on Speed and Agility in Players with Chronic Repetitive Inversion Ankle Sprain – A Pilot Study

Dr. Bhavik S Jhaveri[1], Dr. Anil Kumar Mishra[2]
[1]Assistant Professor, Shrimad Rajchandra College of Physiotherapy, Uka Tarsadia University, Maliba Campus, Ta. Bardoli-394350, Dist. Surat, Gujarat, India.
[2]Professor, Shrimad Rajchandra College of Physiotherapy, Uka Tarsadia University, Maliba Campus, Ta. Bardoli-394350, Dist. Surat, Gujarat, India.
Emails: *bhavik.jhaveri@utu.ac.in [1], anil.mishra@utu.ac.in[2]*

Abstract
Background – Chronic Repetitive Inversion Ankle Sprain is one of the common injuries that occurs in contact as well as non-contact sports especially combat and jumping sports. As this injury is directly related to the ligament, proprioceptive deficit is observed in such players. The effect of taping on functional performance is still a topic of discussion. The purpose of this pilot study is to evaluate whether players with chronic repetitive inversion ankle sprain have any functional deficit and whether taping with non-stretchable athletic tape improves speed and agility. Methods - Players playing contact sports between the age of 18-24 years were included in the study after the initial screening for chronic repetitive inversion ankle sprain using IdFAI index and history of their injury. Speed was assessed using 10-m Sprint test while Agility was assessed using T-test for Agility. Post-application of the tape, data was collected on three time-intervals, i.e. immediate post-application of tape, post-3 days and post-14 days of application of tape. Results - Collected data was analyzed using One-way ANOVA test and the result showed statistically non-significant results in speed and agility, i.e. p=0.954 & p=0.999 respectively. These results suggest that there is statistically non-significant improvement in speed and agility post-application of the tape but comparing with the means of pre-test measures, there is an improvement in speed and agility after the application of the tape.
Keywords: *Agility; Inversion Ankle Sprain; Speed; Sprint; Taping*

1. Introduction
Inversion ankle sprains are common sports injuries that can lead to instability and functional impairment. Players with repetitive ankle sprains often experience decrease in proprioception and balance control, which can affect their performance and raise the risk of further injury. Non-stretchable athletic tape is often used in the management of ankle sprain in order to provide support and sensory/proprioceptive feedback to the ankle joint. Despite its widespread use, the specific effects of non-stretchable athletic tape on speed and agility in players with chronic repetitive ankle sprain remain unclear. This pilot study is conducted to explore the effect of non-stretchable athletic tape application on both speed & agility in players with chronic repetitive inversion ankle sprains. Lateral Ankle Sprains (LAS) are one of the most common musculoskeletal injuries of the lower limb [1]. Still, the true incidence rate is underestimated, as many players/athletes do not seek medical attention [2]. However, the majority of players with LAS suffer long-term consequences, as they reinjure or develop long-lasting functional instability [3]. Ankle injuries can be defined either acute or chronic, with ligamentous injury be the most common diagnosis. About 85% of all ankle injuries are ankle sprains that involves the ligaments situated on lateral side of the ankle joint. Intuitively, ankle sprains are most common in contact sports, indoor sports, and sports with high frequency of jumping [4].

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2024.0383
e ISSN: 2584-2854
Volume: 02
Issue: 08 August 2024
Page No: 2638-2644

About 40% of players who sustained an ankle sprain are found to have Functional ankle instability (FAI) [5][6] which can be defined as a "disabling loss of reliable static and dynamic support of a joint" and a "tendency for the foot to give way" [7]. It has been hypothesized that players with FAI have functional performance deficits [8-10]. Functional performance tests are such assessment tests that can be used to measure joint stability, muscle flexibility, muscle strength and power, proprioception, speed and agility [7]. Many athletes from different sports think that taping and bracing is important in acute and chronic phases of an ankle injury. Certainly, many athletes believe that ankle support is important for their performance [11]. Injuries to the ankle are quite common in Basketball, and they are among the most severe as defined by time loss during the season [12-14].

1.1. Need for The Study

Chronic repetitive inversion ankle sprain is one of the common injuries that occurs in sports especially combat and jumping sports. As this injury directly related to the ligament, proprioceptive deficit is observed in such players. This proprioceptive deficit is defined as difficulty walking on an uneven surface, standing on one-leg, difficulty in sudden change in the direction while running, etc. As speed along with agility is one of the major components in almost every sport, it becomes important to restore the balance at the earliest. So, the need of this study is to evaluate whether players with chronic repetitive inversion ankle sprain have any functional deficit and whether taping with non-stretchable athletic tape improves speed and agility.

1.2. Aims & Objectives

- To identify players with chronic repetitive inversion ankle sprain.
- To assess players for speed and agility without application of non- stretchable athletic tape.
- To assess players for speed and agility immediately post-application of non-stretchable athletic tape.
- To assess players for speed and agility post-3 & post-14 days of application of non- stretchable athletic tape.
- To compare the pre-post measures.

2. Method

2.1. Participants

Players (n=10) between the ages of 17 and 24 years (mean age: 20.1 ± 1.79yrs) were included in the study. Physical characteristics of participants are shown in Table-1. Ethical approval from the Ethics Committee at University was obtained and written informed consent was obtained from all subjects. The inclusion criteria were having sustained recurrent ankle inversion sprains (at least three sprains), participation at state/national level competitions, had practice session of minimum three days in a week while the exclusion criteria were 1) history of ankle fracture, 2) ankle injury within three months of participation, 3) history of anterior cruciate ligament injury, 4) current participation in supervised physical rehabilitation, 5) any neurological deficit.

2.2. Test Procedures

Functional Ankle Instability of subjects were classified according to the IdFAI. The participants were unaware of which criteria shows functional ankle instability. Selection of subjects was done on the basis of result of Idendtification of Functional Ankle Instability (IdFAI) (score >11 indicates Funactional Ankle Instability while scores ≤10 indicates Stability). The pre & post-performance tests mentioned below were performed by all subjects in two different conditions: without any taping and with non-stretchable athletic tape.

2.3. Identification of Functional Ankle Instability (IdFAI)

The Identification of Functional Ankle Instability questionnaire (IdFAI) is specifically designed to detect whether individuals meet a minimum criteria necessary for inclusion in an FAI population. The IdFAI is based on two previous FAI instruments: The CAIT (Cumberland Ankle Instability Tool) and the AII (Ankle Instability Instrument). The underlying concept of the IdFAI is to consolidate the elements of each instrument and combine them in a manner that results in a simple and concise means to identify individuals with FAI. One of the main elements included in the IdFAI, which is not in any other questionnaire, is a specific definition of giving way. This definition was provided to ensure that all individuals understood the term and answered

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2024.0383
e ISSN: 2584-2854
Volume: 02
Issue: 08 August 2024
Page No: 2638-2644

questions based on the same definition. 10-m Sprint

2.4. 10-m Sprint Test for Speed

Sprint performance was measured as the time taken by subjects to sprint 30-meters from a stationary standing start. The subjects were prompted to start using three auditory signals and the start time was synchronous with the beginning of the auditory start signal. Before the test is performed, player is asked to perform the warm-up activities such as jogging, stretching of lower extremity muscles. The standing start has been shown to have high reliability in measurements of sprint time. Sprint time was measured using a stop watch. Sprint time was calculated as time from the beginning of the auditory "go" signal to the moment the participant's chest reached the finish line (Figure 1).

2.5. T-Test for Agility

The T-Test is a test of agility for athletes, and includes forward, lateral, and backwards running. To perform the Agility T-Test a player is asked to run 10 meters forward from the start point to cone-A, then 5 meters sidestep to cone-B. From cone-B, a player will sidestep towards the cone-C and then side stepping back to cone-A and then running back to the finish (Figure 2).

2.6. Taping Method

Non-Stretchable Athletic Tape (Figure 3&4): Subject sitting with foot and lower 3rd of the leg off the bed. Foot in neutral or dorsiflexion and neutral with respect to supination/pronation. Apply anchor at Lower 3rd of the leg. Apply stirrups from medial side of anchor passing over calcaneum and malleoli to the lateral side of the anchor or hold both the ends of the tape and apply the tape however do not go distal to the calcaneum. [15]. Apply tape in figure-of Starting from medial side of anchor passing under the calcaneum and cross over the anterior aspect of ankle to finish on the anchor on the medial side. Repeat the same in reverse direction. Apply tape in figure-of-3 Starting from medial side of anchor passing under the calcaneum and cross over the posterior aspect of ankle wrapping around the anterior aspect (medial to lateral) to finish on the lateral side. To apply Heel-lock, apply the tape from Lateral side of anchor – under calcaneum – medial side – place left thumb on medial calcaneum to change direction of the tape – pull tape postero-superiorly around medial side – diagonally around Achilles tendon – finish on anchor on lateral side. Repeat the same in reverse direction.

2.7. Tables

Table 1 Demographic Characteristics of Players

N=10	Age (year)	Weight (kg)	Height (cm)	BMI (kg/m^2)
Mean	20.1	68	159.5	26.588
Max.	23	113	185	37.36
Min.	17	43	135	17.22
SD	1.79196	21.48902	13.97021	6.78589845

2.8. Figures

Figure 1 Player Performing 10-m Sprint Test

Figure 2 Player Performing T-Test for Agility

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2024.0383
e ISSN: 2584-2854
Volume: 02
Issue: 08 August 2024
Page No: 2638-2644

Figure 3 Non-Stretchable Athletic Tape

Figure 4 Application of Athletic Tape

3. Results and Discussion

3.1. Results

SPSS Version 21 software was used. Statistical analyses performed consisted of one-way ANOVA tests to examine difference in pre-post measurements while post-hoc analysis was done to analyze improvement on frequent time-intervals. The means and standard deviation scores on each of the functional performance tests are presented in Table 2 & Table 3.

Table 2 Baseline/Pre-Data of Outcome Variables

Variables	Mean	S.D.
Speed	2.856	0.548658971
Agility	14.012	2.57917

Table 3 Baseline/Post-Data of Outcome Variables

Variables	Immediate (Mean ± SD)	Post 3 days (Mean ± SD)	Post 14 days (Mean ± SD)
Speed	2.65 ± 0.53761	2.64 ± 0.53071	2.63 ± 0.55942
Agility	13.64 ± 2.66875	13.70 ± 2.6071	13.66 ± 2.45922

The collected data of Speed and Agility was analyzed using one-Way ANOVA to examine the pre-post statistical difference (Table 4 & Table 5) while the post-hoc analysis was done using Bonferroni test (Table 6).

Table 4 One-Way ANOVA for Speed

Speed	Sum of Squares	df	Mean Square	F	Sig.
Between Group	.027	2	.014	.047	.954
Within Group	7.791	27	.289		
Total	7.818	29			

Table 5 One-Way ANOVA for Agility

Agility	Sum of Squares	df	Mean Square	F	Sig.
Between Group	.017	2	.009	.001	.999
Within Group	188.487	27	6.981		
Total	188.505	29			

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2024.0383
e ISSN: 2584-2854
Volume: 02
Issue: 08 August 2024
Page No: 2638-2644

Table 6 Results of Post-Hoc Analysis

VARIABLE	(I) GROUP	(J) GROUP	M.D.	Sig.
Speed	Immediate	Post-3 days	-.012	1.00
		Post-14 days	-.069	1.00
	Post-3 days	Immediate	-.012	1.00
		Post-14 days	-.057	1.00
	Post-14 days	Immediate	.069	1.00
		Post-3 days	.057	1.00
Agility	Immediate	Post-3 days	-.310	1.00
		Post-14 days	-.059	1.00
	Post-3 days	Immediate	.310	1.00
		Post-14 days	-.028	1.00
	Post-14 days	Immediate	.059	1.00
		Post-3 days	.028	1.00

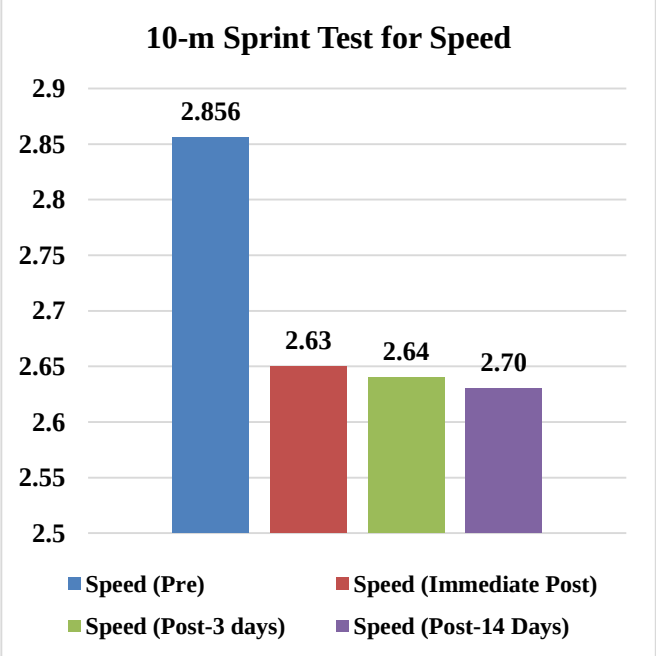

Figure 5 Mean Values of Speed

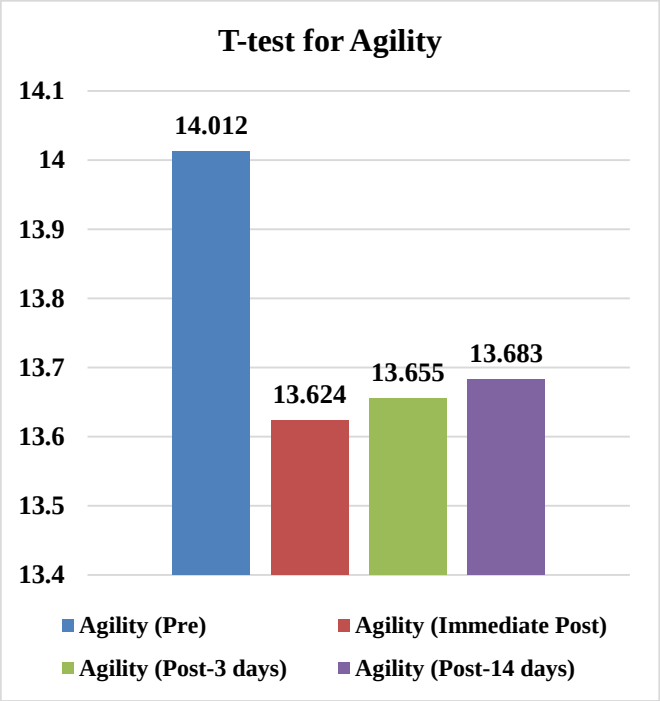

Figure 6 Mean Values of Agility

These data points show how the speed and agility measurements change over time intervals (immediate post, post 3-days, post 14-days) after the application of tape. The one-way ANOVA tests showed non-significant differences in both Speed (p=0.954) and Agility (p=0.999) post-application of tape (Table 4 & 5). The post-hoc analysis further explored the specific time intervals to understand the prolonged effects of tape on Speed and Agility, Figure 5 & Figure 6. Results of post-hoc analysis for Speed showed non-significant differences between immediate-post, post-3 days and post 14-days, i.e. p=1.00, p=1.00 & p=1.00 respectively, indicating that statistically non-significant improvement was observed before and after the application of non-stretchable athletic tape on different time-intervals. Results of post-hoc analysis for Agility also showed non-significant differences between immediate-post, post-3 days and post 14-days, i.e. p=1.00, p=1.00 & p=1.00 respectively, indicating that statistically non-significant improvement was observed before and after the application of non-stretchable athletic tape. Graph 1 & 2 shows mean values of Speed & Agility before, immediate, post-3 and post-14 days of application of tape. It shows that there is an

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2024.0383
e ISSN: 2584-2854
Volume: 02
Issue: 08 August 2024
Page No: 2638-2644

improvement in speed and agility after the application of tape which means the time taken to complete the 10-m sprint test and T-test for agility is less than the time taken before the application of tape.

3.2. Discussion

The result of the current study showed that there is an immediate improvement in speed and agility post-application of non-stretchable athletic tape and it was sustained for next 3-days until the removal of the tape. The non-significant results from the one-way ANOVA indicate that tape application had no measurable effect on both Speed and Agility in the players. The post-hoc analysis provided deeper insight. For Speed, immediate improvements were sustained even after 3 days & 14 days and this is the reason for non-significant results between immediate-post, post-3 & post-14days, i.e. p=1.00, p=1.00 & p=1.00, respectively. For Agility, immediate improvements were sustained even after 3-days & 14-days and this is the reason for non-significant results between immediate-post, post-3 & post-14days, i.e. p=1.00, p=1.00 & p=1.00, respectively. Though these results suggest non-significant results, there is an improvement in speed and agility after the application of tape which is observed while comparing the mean values of Speed and Agility on frequent time-intervals (Graph 1 & 2). The sustainability of the immediate results to post-14 days was not seen in Speed and Agility. Possible rationale for not getting prolonged effect may be that the tape was applied for a single time. Ankle injuries, especially lateral ankle sprains, are common during sports activities, and the popularity of prophylactic ankle supports has increased in recent years [16]. A recent Cochrane review evaluated 14 randomized trials of ankle bracing (with data for 8279 participants) [17]. A significant reduction in the number of ankle sprains was evident for players using external ankle support. Although the findings of the present study suggest that some prophylactic benefits could be obtained for taping of the ankle, our results suggest these may be task specific [18].

Conclusion

The statistical analyses and results provided valuable insights into the effects of tape application on speed and agility in players. This study concludes that application of non-stretchable athletic tape improves performance on speed and agility but these results are statistically non-significant though the results of statistical analysis using ANOVA and post-hoc tests show non-significant improvement, they underscore the importance of using both ANOVA and post-hoc analyses to comprehensively understand the temporal dynamics of treatment effects.

Acknowledgements

This pilot study was self-funded.

References

[1]. Gribble PA, Bleakley CM, Caulfield BM, et al. Evidence reviews for the 2016 international ankle consortium consensus statement on the prevalence, impact and long-term consequences of lateral ankle sprains. Br J Sports Med. 2016; 50(24):1496–1505.

[2]. Doherty C, Delahunt E, Caulfield B, et al. The incidence and prevalence of ankle sprain injury: A systematic review and meta-analysis of prospective epidemiological studies. Sport Med. 2014;44(1):123–140.

[3]. Fong DT, Hong Y, Chan L, et al. Review on ankle injury and ankle sprain in sports. Sport Med. 2007;37 (1):73–94.

[4]. Engebretsen L. Preventing ankle injuries. Handbook of Sports Medicine and Science Sports Injury Prevention. Willey-Blackwell; 2009.

[5]. Gerber JP, Williams GN, Scoville CR, et al. Persistent disability associated with ankle sprains: A prospective examination of an athletic population. Foot Ankle Int. 1998; 19:653–660.

[6]. Bosien WR, Staples OS, Russell SW. Residual disability following acute ankle sprains. J Bone Joint Surg. 1955; 37(6):1237–1243.

[7]. Docherty CL, Arnold BL, Gansneder BM, et al. Functional performance defi cits in volunteers with functional ankle instability. J Athl Train. 2005; 40(1):30–34.

[8]. Freeman MA. Instability of the foot after injuries to the lateral ligament of the ankle. J Bone Joint Surg. 1965; 47(4):669–677.

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2024.0383
e ISSN: 2584-2854
Volume: 02
Issue: 08 August 2024
Page No: 2638-2644

[9]. Vaes PH, Duquet W, Casteleyn P, et al. Static and dynamic roentgenographic analysis of ankle stability in braced and nonbraced stable and functionally unstable ankles. Am J Sports Med. 1998; 26(5):692–702.
[10]. Munn J, Beard DJ, Refshauge KM, et al. Do functional performance tests detect impairment in subjects with ankle instability? J Sport Rehabil. 2002; 11(1):40–50.
[11]. Garrick JG, Requa RK. Role of external support in the prevention of ankle sprains. Med Sci Sports Exerc.1973; 5:200-3.
[12]. Colliander E, Eriksson E, Herkel M, et al. Injuries in the Swedish elite basketball. Orthopaedics.1986; 9:225–7.
[13]. Messina DF, Farney WC, DeLee JC. The incidence of injury in Texas high school basketball: a prospective study among male and female athletes. Am J Sports Med. 1999; 27: 294–9.
[14]. Plisky PJ, Rauh MJ, Kaminski TW, et al. Star Excursion Balance Test as a predictor of lower extremity injury in high school basketball players.J Orthop Sports Phys Ther. 2006; 36(12): 911-9.
[15]. Perrin DH. Athletic Taping and Bracing 2nd edt, 2005 pp. 20-31.
[16]. Handoll HHG, Rowe BH, Quinn KM, de Bie R. Interventions for preventing ankle ligament injuries. Cochrane Database Syst Rev. 2005;3(CD000018).
[17]. Handoll HHG, Rowe BH, Quinn KM, de Bie R. Interventions for preventing ankle ligament injuries. Cochrane Database Syst Rev. 2005;3(CD000018)
[18]. Surve I, Schwellnus MP, Noakes T, Lombard C. A fivefold reduction in the incidence of recurrent ankle sprains in soccer players using the sport-stirrup orthosis. Am J Sports Med. 1994;22(5):601–6.