Immediate Effects of Dynamic Taping and Kinesio Taping on Sport-specific Fitness Performances Among University Football Players

Authors: Kanagaraj Rengarmanujam MPT[1]

Dr S. Subbiah MPT, PhD[2]

Dr Khalid A. AlAhmari PT, PhD[3]

Affiliation:

1. *Research Scholar in Physiotherapy, Division of PMR, Government Medical College and Hospital, Cuddalore District Erstwhile RMMCH, Annamalai University, Annamalai Nagar – 608 002, India. kanagarajmpt@yahoo.com ORCID: 0000 0002 0244 7645*
2. *Lecturer in Physiotherapy, Division of PMR, Government Medical College and Hospital, Cuddalore District Erstwhile RMMCH, Annamalai University, Annamalai Nagar – 608 002, India dr.subbiahmpt@gmail.com. ORCID: 0000 0003 2371 7437*
3. *Professor, Department of Medical Rehabilitation Sciences, College of Applied Medical Sciences, King Khalid University, Abha, Kingdom of Saudi Arabia. kahmarie@kku.edu.sa ORCID: 0000 0002 6367 1317*

Correspondence Author:

Kanagaraj Rengaramanujam

kanagarajmpt@yahoo.com Mobile: +91 95974 79129

Abstract

Evidence suggests that the application of Kinesio Tape (KT) on quadriceps in sports-specific fitness performances is inconclusive. Dynamic Tape (DT) is a relatively new treatment method, which is progressively being used as an adjunctive method to improve sports performance. Studies have not investigated the application of DT among university football players. To compare the immediate effect of DT versus KT and no tape among university football players on aerobic fitness, agility, speed, power, and strength. Forty-five university football players were randomly assigned to 1 of 3 groups. Outcomes were measured at baseline and immediately post-application of tapes. No significant differences

were found between DT and KT in aerobic fitness, speed, and muscle strength (p>0.05). Improved agility and power (vertical jump, standing long jump, and single leg hop) performances were observed for the DT group than KT and control group (p<0.05). The application of DT may result improvements only in agility and power.

Keywords: Dynamic tape, Kinesio Tape, aerobic fitness, agility, speed, power, strength, and university football players

INTRODUCTION

The Dynamic taping (DT) method was developed in 2009 by a musculoskeletal physiotherapist Ryan Kendrick in Australia and is a relatively new treatment technique that is progressively more an adjunctive method to treat musculoskeletal problems. DT is made up of a visco-elastic nylon and lycra blend material; and can stretch in four directions (longitudinal and transverse) with strong elastic resistance and recoil. It has a high degree of stretch (more than 200%) with no rigid endpoint and visco-elastic properties. The tape is applied in a shortened position of the joint and the primary mode of action of DT is mechanical (deceleration of eccentric work, load absorption, and assistance of movement), while the second mode of operation is neurophysiological [1].

Kinesio Tape (KT) was originally created by a Japanese chiropractor, Kenzo Kase in 1973 and is applied in an elastic taping method to the patient's skin under tension. The tape is approximately the same thickness, and it can be longitudinally extended up to 140% of its original length, producing a lesser mechanical restraint and less mobility restriction than conventional tape. KT is generally used to correct joint malalignment, provide support for muscles, activate the endogenous analgesic system, and eliminate congestion fluids [2].

Football is an endurance sport that integrates cycles of intense exercise interspersed with lower levels of activity over 90 minutes [3]. In recent times, the execution and level of football have also increased, which led sports scientists and trainers to think and find out the various possible ways for further improvement in the field of performance. The current literature supports several options for the improvement of performances in football and these supportive options include taping [4], pre-cooling [5], nutrition [6], sports drinks [7], psychological interventions [8], etc. Among all, taping is one of the most frequent and common methods used to improve the performance of athletes [9, 10].

Physical conditioning, technical skills, and tactical performances are measurable football-specific performances [11]. Efforts to improve soccer performance often focus on techniques and tactics at the expense of physical fitness. It has been demonstrated that football players not only require sport-specific technical and tactical skills, but explosive strength and speed are also essential for optimal performance. In addition to this, football athletes need the physical and physiological characteristics of muscle power, aerobic fitness, balance, and agility [12, 13].

Studies have extensively analyzed the effect of KT on sporting performance, with mixed results. Studies reported that the KT method does not increase muscle performance [10, 14-23], whereas some studies concluded that the KT method enhances sports performance [24, 25]. A systematic review done by Renekar et al [4], with the effects of KT on sports performances among athletes, concluded that KT does not enhance sports performances. We need to examine whether another sports tape, such as DT, has an effect on sports performances. A case study was done among 2 women's with the effect of DT on vertical jump performance and concluded that the DT might improve vertical jump performance [26]. Thus, we hypothesized that the application of DT is better than KT on sport-specific fitness performances among university football players. However, no research has evaluated the impact of DT on sports performance among university football players. Thus, the present study aims to determine the effect of DT on sports-specific fitness performances among university football players.

MATERIALS AND METHODS

Design and setting

This study was performed in a monocentric, randomized controlled design to test the effectiveness of DT compared to KT on sport-specific fitness performances among university football players and was conducted at the university playground, King Khalid University located in Saudi Arabia. The study was approved by the Institutional Review Board at King Khalid University, Saudi Arabia (ECM#2020-3208).

Participants and sample allocation:

University male football players were selected for eligibility. Healthy male football players between 18 to 25 years of age, free from injury, and players who had more than 4 years of playing experience and received the same type, frequency, and intensity of training were included in the study. The exclusion criteria were history of any injuries in the past 6 months, any present injury that could affect the performance, history of surgery, back pain, and allergic to adhesive materials. The participants were advised to abstain from strenuous exercise for at least 48 hours and not consume a heavy meal before testing. Written informed consent was obtained from all participants prior to study enrollment, and all rights were protected.

Following the initial examination, the participants were randomly assigned into the DT group (n=15), KT group (n=15), and control group (n=15) using the method on the website http://randomizer.org/ (Social Psychology Network, Connecticut, USA). Concealed allocation was performed using a computer-generated randomized table of numbers (1 for the DT group, 2 for the KT group, and 3 for the control group) created before the start of data collection. The random numerical sequence was placed in sealed opaque envelopes and the participants were allocated with tape application to the group assignment.

Outcome measures:

The data collected in the initial assessment included age, body weight (kg), height (cm), body mass index (weight in kilograms divided by height in meters squared), education, years of experience, hours of training per day, smoking, as well as regular exercise. The outcome measures were assessed before and after the tape application. The post-tape assessment was performed one week later than the pre-tape assessment. The outcome measures were aerobic fitness, speed, agility, functional performance tests for power (vertical jump, standing long jump, single-leg hop), and muscle strength. The pre and post data was collected by the independent assessor and the assessor was blinded from the allocation of the participants in the group.

The aerobic fitness was assessed using Yo-Yo Intermittent Recovery Test level 1 (YYIRT1). It is a test of the ability to do repeated high-intensity exercise for aerobic fitness and the total distance covered in meters was collected from the test [27]. The athlete's speed was measured using the 30m sprint test. This test aims to determine acceleration and speed as well as measures the effectiveness of athletes' sprint training [27]. The athletes performed 2 trials and the best time was used for the assessment. The agility was measured using Sprint 9-3-6-3-9 m with backward and forward running (SBF) test. In this test, athletes ran forward and backward with a total of 30 meters [27]; and performed 3 trials, and the best one was used for the assessment. Functional performance was assessed using the vertical jump test, standing long jump test, and single leg hop test [28], and the mean of the three trials was taken for the assessment. The dominant leg was used for the single leg hop test. Muscle strength was assessed using a hand-held dynamometer for quadriceps muscles [29]. Each fitness test was performed after warming up sessions of jogging and stretching as recommended. Fifteen minutes of rest time is given between each component of physical fitness. Necessary precautions were taken for injury prevention during tests.

Intervention:

After completing the initial assessment to include the study participants, a piece of DT & KT was applied on the right and left side forearm, respectively. The absence of an allergic reaction was confirmed after 24 hours of tape application, and the participants were excluded from the study if any allergic reaction was present. The participants were randomly allocated into three groups (DT, KT, and Control) after completing the baseline measurement. The surface of the skin was prepared by shaving before the application of tape. Both DT and KT were applied in a standardized manner (origin to insertion), from a point 10 cm below the anterior superior iliac spine (ASIS). DT (7.5 cm wide) applied with gentle tension to the point of resistance while the athlete was in a sitting position with knee complete extension from a point 10 cm below the ASIS, anterior thigh, knee joint, and finishing approximately 2/3rds down the length of the tibia bilaterally [1] (Figure 1). KT (5 cm) applied from a point 10 cm below the ASIS to the superior pole of the patella, without any tension. The athlete was then asked to perform maximal knee extension and the KT was divided for the medial and lateral patella edges, finishing at the anterior tuberosity of the tibia, without tension [2] (Figure 2).

Statistical analysis:

Data were analyzed with SPSS Version 21.0 (IBM-SPSS Inc, Armonk, NY). The Shapiro-Wilk test was used to verify the normality of the distribution of all the variables. One-way analysis of variance (ANOVA) and chi-square test was used to compare the baseline characteristics between groups for parametric and non-parametric variables respectively. Repeated measures of one-way analysis of variance (ANOVA) were used to determine intergroup and intragroup differences and the p-value <0.05 was considered significant.

RESULTS

A total of 50 athletes were selected and the final sample included 45 athletes with a mean age of 20.93 ± 1.62 (range 18-25 years). There were no statistically significant differences (p<0.05) in the demographic and baseline comparisons between groups (Table 1 & 2). There were significant differences (p<0.05) found within the DT group outcomes only in agility and power; and no significant differences (p>0.05) were found in aerobic fitness, speed, and strength.

Between-group comparisons, a statistically significant difference (p<0.05) was found in the DT group compared with KT and control group only in agility, and power (vertical jump, standing long jump, and single leg hop). Athletes' aerobic fitness, speed, and muscle strength variables were not found significant differences (p>0.05) between the groups (Table 3).

DISCUSSION

The present study aimed to compare the immediate effect of DT to KT and controls in university football players using the outcomes of aerobic endurance, speed, agility, power (vertical jump, standing long jump, and single leg hop), and muscle strength. To our knowledge, this is the first kind of study to analyse the immediate effect of DT on university football players. This study's hypothesis that the immediate effect would be found in the DT group compared to the KT group and the control group in the outcome variables, was conformed only with agility and power.

Taping is one of the commonly used assistive or external supportive devices in improving sports performance [4]. KT is one of the widely used taping methods to improve sports performance and clinical research. A systematic review and other research articles that evaluated KT's effectiveness in improving sports performance reveal that there is no current evidence to support the use of this method. Thus, we need to examine another tape, such as DT, that improves athletes' performance.

Athletes require exceptional aerobic capacity to achieve the demands of sports and they try to achieve with different types of technique [30]. The aerobic capacity of the muscles can be increased with optimal blood flow and effective muscular contraction. Studies [30, 31] analysed the effect of KT on aerobic fitness and concluded that the application of tape would

not increase aerobic fitness. The present study also attributes the previous studies that the application of DT or KT would not increase aerobic capacity.

Speed in football is a crucial element that can significantly influence a player's performance and team's overall success. Studies examined the effect of KT on athletes' speed performance immediately application of tape and concluded in favour [32-34] and disfavour [17, 35-37] of application. This current study also illustrates that either DT or KT does not improve athletes' speed performance.

Agility plays a crucial role in a player's ability to manoeuvre around opponents while maintaining control of the ball [38]. This study reports a significant improvement in agility after the application of DT to KT and controls. Studies also analysed the effect of KT application on agility and produced mixed results. Studies conducted by Cochrane et al. [32], Mostaghim et al. [24], and Murphy [39] concluded that tape application helps to improve agility. In contrast, studies carried out by Basturt et al. [40] and Constantinou et al. [41] concluded that tape application did not help to improve agility.

Explosiveness and power at the lower limb in football players are vital in execution, as the nature of the sport requires many explosive actions during a match [42] and the jumping ability is considered an expression of power [43]. A meta-analysis [44], systematic review [4], and studies [14, 45, 46] extensively examined the effect of KT in quadriceps on various jumping activities and most of the studies concluded the application of KT does not improve the jumping performances. Only one study in favour of the KT application was reported [24]. Hence, the present study examined the effect of DT and KT in quadriceps on various jumping and found significant improvement in vertical jump, standing long jump, and single leg hop only in the DT group than KT group and control group.

The quadriceps muscle strength plays an important role in football for the sprint, jump, and ball kicking activities and football training specifically increases the strength of the quadriceps and hamstring muscles [47]. Studies analysed the immediate effect of KT application in quadriceps on its strength and concluded with mixed results [14, 39, 48, 49]. The present study also examined the effect of DT and KT application in quadriceps on muscle strength and revealed no significant improvement in post-application of taping compared to controls.

The present study also reports a few limitations. The study assessed the immediate effects of DT and KT application. Therefore, the long-term effects of both tapes on physical fitness parameters remain unknown. Only male football athletes participated in this study due to the country's cultural standards where it took place. The placebo taping group was not included, and the positive effect could be due to the application of taping. Future research should focus on the long-term effects of DT and KT for improvements of physical fitness parameters among university football players and should address these limitations.

CONCLUSION:

Current research showed that the application of DT and KT in the quadriceps does not have a significant effect on aerobic fitness, speed, and muscle strength among university football players compared to controls. However, the athletes experienced significant improvement in agility and power after the application of DT.

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Table 1. Demographic characteristics of the groups*

Variable	DT Group (n=15)	KT Group (n=15)	Control Group (n=15)	*p* value
Age, y	20.80 ± 1.74	20.93 ± 1.67	21.07 ± 1.53	0.907
Weight, kg	67.20 ± 5.43	66.73 ± 5.68	66.47 ± 5.32	0.933
Height, m	1.69 ± 0.06	1.70 ± 0.06	1.69 ± 0.04	0.852
BMI, kg/m^2	23.52 ± 1.23	23.08 ± 1.57	23.20 ± 1.36	0.673
Education, n (%)				0.844
Graduate	13 (87)	13 (87)	12 (80)	
Post-graduate	2 (13)	2 (13)	3 (20)	
Training hours in a day, n (%)				0.844
One hour	13 (87)	12 (80)	13 (87)	
Two hours	2 (13)	3 (20)	2 (13)	
Smoking, n (%)	2 (13)	3 (20)	2 (13.3)	0.844
Experience, y	4.87 ± 0.83	4.87 ± 0.83	4,89 ± 0.80	0.999
Regular exercise, n (%)	15 (100)	15 (100)	15 (100)	1.00

DT = dynamic tape, KT = kinesio tape, BMI = body mass index

*Values are mean ± SD unless otherwise indicated.

Table 2. Baseline characteristics of the groups (Mean ± SD)

Variable	DT Group (n=15)	KT Group (n=15)	Control Group (n=15)	*p* value
Aerobic fitness (m)	1208 ± 94.66	1202.67 ± 76.30	1210.67 ± 83.45	0.966
Speed (sec)	4.89 ± 0.21	4.88 ± 0.20	4.87 ± 0.20	0.962
Agility (sec)	8.29 ± 0.32	8.27 ± 0.33	8.25 ± 0.30	0.921
Power				
Vertical jump (cm)	47.93 ± 2.40	47.60 ± 1.92	47.67 ± 1.99	0.901
Standing long jump (cm)	195.20 ± 5.65	194.13 ± 4.64	193.80 ± 4.43	0.721
Single leg hop (cm)	178.87 ± 3.70	177.67 ± 3.31	177.93 ± 3.33	0.610
Strength (kg)	47.13 ± 2.85	46.80 ± 2.57	46.93 ± 2.55	0.942

DT = dynamic tape, KT = kinesio tape

Table 3. Summary of outcome measures preintervention and postintervention for the

Variables	Groups	Mean ± SD			Between-Group difference in change score		
		Preintervention	Postintervention	Within-Group change score	DT vs KT Group	DT vs C Group	KT vs C Group
Aerobic fitness (m)	DT	1208 ± 94.66	1240 ± 81.42	32.00 ± 28.35 (-40.24, -12.09)	34.67 (4.60, 99.73)	40.67 (20.60, 105.73)	16.0 (-54.06, 86.06)
	KT	1202.67 ± 76.30	1224 ± 61.97	21.33 ± 25.60 (-35.51, -7.16)			
	C	1210.67 ± 83.45	1208 ± 85.79	2.67 ± 10.33 (-3.05, 8.39)			
Speed (sec)	DT	4.89 ± 0.21	4.81 ± 0.21	0. 08 ± 0.11 (0.18, 0.31)	-0.13 (-0.26, -0.08)	-0.11 (-0.19, -0.05)	-0.03 (-0.19, 0.14)
	KT	4.88 ± 0.20	4.84 ± 0.19	0.04 ± 0.06 (0.00, 0.08)			
	C	4.87 ± 0.20	4.87 ± 0.20	0.00 ± 0.08 (-0.04, 0.05)			
Agility (sec)	DT	8.29 ± 0.32	7.83 ± 0.27	0.47 ± 0.13 (0.39, 0.54) *	-0.26* (-0.51, -0.01)	-0.29* (-0.54, -0.04)	-0.03 (-0.28, 0.22)
	KT	8.27 ± 0.33	8.09 ± 0.28	0.19 ± 0.21 (0.07, 0.30)			
	C	8.25 ± 0.29	8.12 ± 0.30	0.13 ± 0.16 (0.04, 0.21)			
Power-Vertical jump (cm)	DT	47.93 ± 2.40	51.73 ± 2.63	3.80 ± 0.56 (-4.11, -3.49) *	2.80* (0.42, 5.18)	2.87* (0.49, 5.24)	0.07 (-2.31, 2.44)
	KT	47.60 ± 1.92	48.93 ± 2.55	1.33 ± 1.18 (-1.98, -0.68)			
	C	47.67 ± 1.99	48.87 ± 2.85	1.20 ± 0.45 (-2.16, -0.24)			
Power-Standing long jump (cm)	DT	195.20 ± 5.65	200.60 ± 4.53	5.40 ± 2.47 (-6.77, -4.03) *	4.40* (0.58, 8.22)	5.53* (1.72, 9.35)	1.13 (-2.68, 4.95)
	KT	194.13± 4.64	196.20 ± 4.38	2.07 ± 1.71 (-3.01, -1.12)			
	C	193.80 ± 4.43	195.07 ± 3.97	1.27 ± 0.96 (-1.80, -0.73)			
Power-Single leg hop (cm)	DT	178.87 ± 3.70	184.13 ± 3.85	5.27 ± 2.31 (-6.55, -3.99) *	4.27* (1.25, 7.28)	5.67* (2.65, 8.69)	1.40 (-1.62, 4.42)
	KT	177.67± 3.31	179.87 ± 2.88	2.20 ± 1.66 (-3.12, -1.28)			
	C	177.93 ± 3.33	178.47 ± 3.40	0.53 ± 0.84 (-0.99, -0.07)			
Strength (kg)	DT	47.13 ± 2.85	47.07 ± 2.73	0.07 ± 0.59 (-0.26, 0.40)	0.13 (-2.14, 2.41)	0.53 (-1.74, 2.81)	0.40 (-1.87, 2.67)
	KT	46.80 ± 2.57	46.93 ± 2.58	0.13 ± 0.99 (-0.68, 0.42)			
	C	46.93 ± 2.55	46.53 ± 2.36	0.40 ± 0.83 (-0.06, 0.89)			

DT, KT, and Control groups (Mean ± SD).

DT = dynamic tape, KT = kinesio tape, C = control

* Significant difference: $p < 0.05$

Figure 1: Dynamic tape application

Figure 2: Kinesio tape application