

Introduction

- Kinesio® Tape is a rehabilitative tape resembling the elasticity of human muscle
 - Currently used in practice to treat pathologic conditions of the musculoskeletal, circulatory, and neuromuscular systems
 - Also used in athletics on healthy tissue, but supported by little research
- Few studies have analyzed quadriceps force production while using Kinesio® Tape.
 - There are no current studies that have isolated rectus femoris in peak force production testing.
 - The studies that have analyzed muscular force production of the quadriceps after Kinesio® Tape reached different conclusions.
- No current literature has been identified reporting on force production when Kinesio® Tape is applied to the tibialis anterior.

Objective & Hypothesis

Objective

- To determine if Kinesio® Tape affects the concentric force production of the rectus femoris and tibialis anterior in healthy, non-injured individuals

Hypothesis:

- Kinesio® Tape will have a positive effect on the peak torque of both the rectus femoris and tibialis anterior muscles, therefore, increasing concentric muscle force production in healthy, non-injured individuals

Methods

- Randomized Clinical Trial conducted at Florida Gulf Coast University.

Participants

- 51 participants: 33 males, 18 females (mean±SD age, 24.4 ± 3.73 yrs.)
- No knee or ankle injury/surgery in the past 6 months, no rehabilitation in the last 6 months, no use of Kinesio® Tape around the knee or ankle within the past month, medically cleared PAR-Q and Health History Questionnaire

Interventions

- Kinesio® Tex Tape Gold in black with a “Y” cut for muscle facilitation technique for the rectus femoris and an “I” cut for muscle facilitation of the tibialis anterior.

Outcome Measures

- Muscle peak torque, average peak torque, and time to peak torque measured at 60 deg/sec and 240 deg/sec for the rectus femoris and 30 deg/sec and 120 deg/sec for the tibialis anterior on the Biodex System 4 Pro Isokinetic Dynamometer.

Data Analysis

- Analyzed by IBM SPSS version 20 with Paired t-Test for dependent samples with Bonferroni correction (p < 0.0056)
- Variables: peak torque, time to peak torque, angle of peak torque, maximum work repetition, total work, average power, acceleration time, deceleration time, and average peak torque for each testing condition.

Results

- No statistically significant mean differences were found when comparing peak torque and average peak torque with and without the Kinesio® Tape (TABLES 1 & 2).
- Statistically significant differences were noted in time to peak torque for the rectus femoris muscle only when tested at 60 degrees/second with the Kinesio® Tape application (TABLE 1 & 2). The mean difference decrease in time to peak torque was 41.96 msec (p = 0.003).

Male vs. Female

- n=33: males, n=18 females
- Averages for peak torque, average peak torque, and average power all favored the males.
- Female group that completed rectus femoris testing at 60 deg/sec was the only group to have statistically significant data (TABLE 3).
- The females in this specific group experienced a statistically significant decrease in time to peak torque utilizing the tape whereas the males displayed a decrease in time to peak torque that was not statistically significant.

Condition Order

- Results were analyzed based on the mean differences between the first and second trials when participants started with tape vs. no tape.
- Statistically significant differences were seen in several of the variables on the second trial regardless of condition including:
 - Peak torque, average peak torque, and average power (TABLE 4)
 - Most of the significant differences were seen in the testing for rectus femoris

Measure	Velocity	Mean	Mean Difference	95% C.I.	p-Value
Peak Torque	60	192.65	3.08	-3.00 to 9.16	0.314
	60*	189.57			
	240	111.69			
	240*	110.88			
Avg Peak Torque	60	177.17	1.62	-4.67 to 7.91	.607
	60*	175.55			
	240	96.79			
	240*	95.033			
Time to Peak Torque	60	426.86	41.96	14.94 to 68.97	.003†
	60*	384.9			
	240	149.01			
	240*	150.4			

TABLE 1. Rectus Femoris Paired Sample Statistics
* indicates values with Kinesio® Tape
† indicates statistically significant data



FIGURE 1. Biodex set up for testing of rectus femoris muscle

Measure	Velocity	Mean	Mean Difference	95% C.I.	p-Value
Peak Torque	30	21.57	-1.7	-3.98 to .59	0.142
	30*	23.27			
	120	12.02			
	120*	13.17			
Avg Peak Torque	30	19.76	-0.51	-1.38 to .36	0.247
	30*	20.27			
	120	10.94			
	120*	10.69			
Time to Peak Torque	30	465.29	-28.63	-79.60 to 22.34	0.265
	30*	493.92			
	120	162.15			
	120*	175.29			

TABLE 2. Tibialis Anterior Paired Sample Statistics
* indicates values with Kinesio® Tape

Muscle and Velocity	Gender	Peak Torque	Average Peak Torque	Time to Peak Torque	Average Power	Max Work Repetition
Tibialis Anterior 30 deg/sec	F	15.133	13.47	386.11	4.27	1.78
	M	25.09	23.19	508.48	7.83	1.18
	F*	19.94	14.89	501.11	4.72	1.67
	M*	25.09	23.21	490.00	8.18	1.24
Tibialis Anterior 120 deg/sec	F	8.14	7.17	168.33	5.033	1.28
	M	14.14	13.06	158.79	10.79	1.54
	F*	8.16	7.33	166.11	5.16	1.67
	M*	15.90	12.52	180.30	10.63	1.40
Rectus Femoris 60 deg/sec	F	141.21	129.21	485.56	80.26	3.27
	M	220.70	203.33	394.84	128.69	2.75
	F*	139.87	126.10	422.22†	77.68	2.72
	M*	216.67	202.52	364.54	123.30	2.88
Rectus Femoris 240 deg/sec	F	71.65	56.84	160.56	85.05	4.38
	M	133.53	118.58	142.72	179.75	3.79
	F*	69.43	58.81	158.33	92.25	3.89
	M*	133.49	120.98	146.06	189.76	3.34

TABLE 3. Male vs Female Results
* indicates values with Kinesio® Tape
† indicates statistically significant data

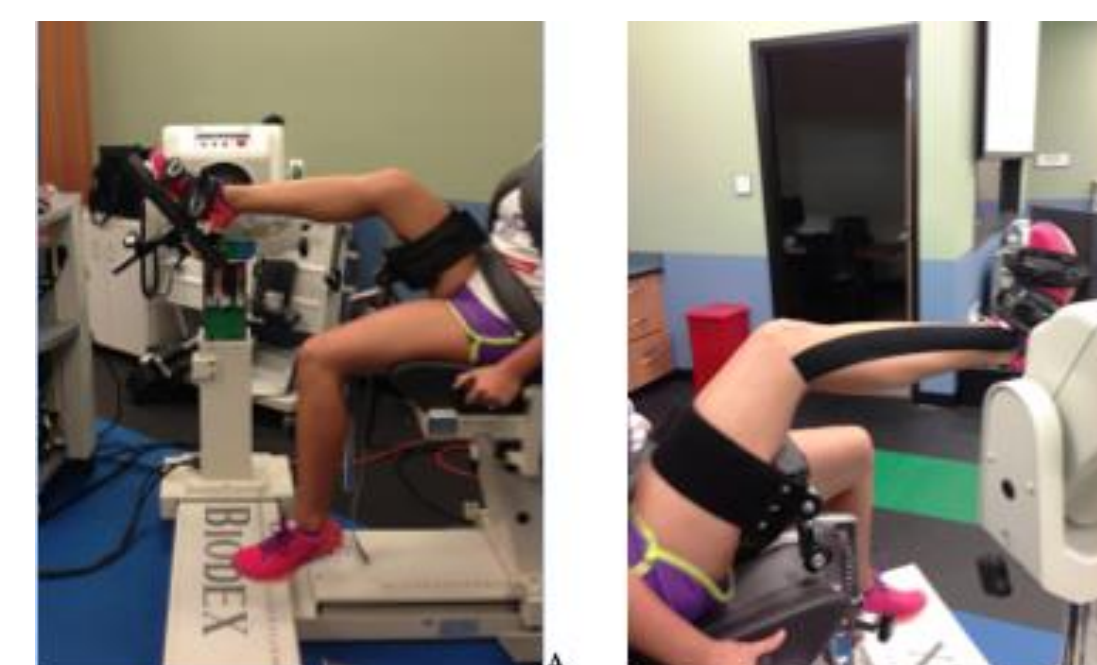


FIGURE 2. A, Biodex set up for testing of tibialis anterior, medial view. B, Biodex set up for testing of tibialis anterior, lateral view.



FIGURE 3. A, Taping method for tibialis anterior. B, Taping method for rectus femoris.

Muscle and Velocity	Testing Condition	Peak Torque	Average Peak Torque	Time to Peak Torque	Average Power	Max Work Repetition
Tibialis Anterior 30 deg/sec	Tape first N=19	-.48	.84	-81.05	-1.31	0.00
	Biodex First N=32	-2.42	-1.31	2.50	-.71	0.00
Tibialis Anterior 120 deg/sec	Tape First N=19	-.304	.54	-10.52	.35	0.00
	Biodex First N=32	-.03	.09	-14.68†	-.121	0.00
Rectus Femoris 60 deg/sec	Tape First N=31	8.30†	5.54	20.32	7.51†	-.29
	Biodex First N=20	-5.02	-4.46	75.50†	-.42	.75
Rectus Femoris 240 deg/sec	Tape First N=31	6.94†	3.65	-8.38†	7.67	.71†
	Biodex First N=20	-8.70	-11.37†	9.5	-34.885†	.10

TABLE 4. Paired Statistics of mean differences comparing Tape vs No Tape Starting Conditions
† indicates statistically significant data

Results

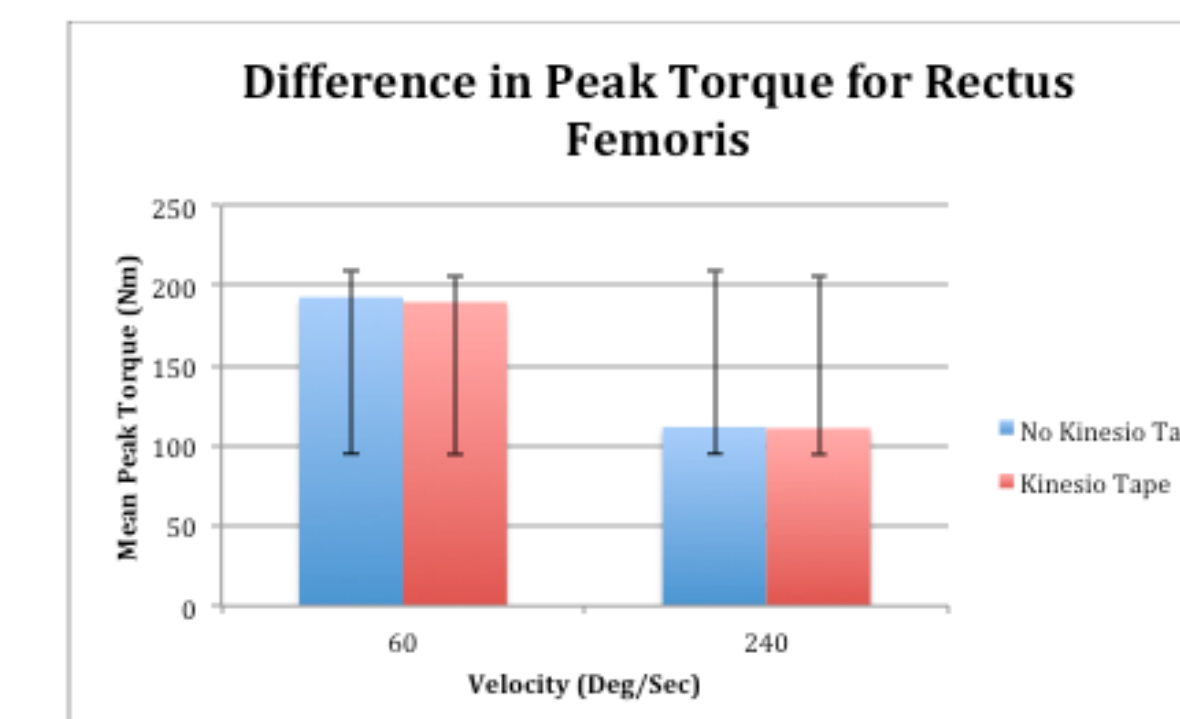


FIGURE 4. Mean Peak Torque for Tape vs. No Tape on Rectus Femoris

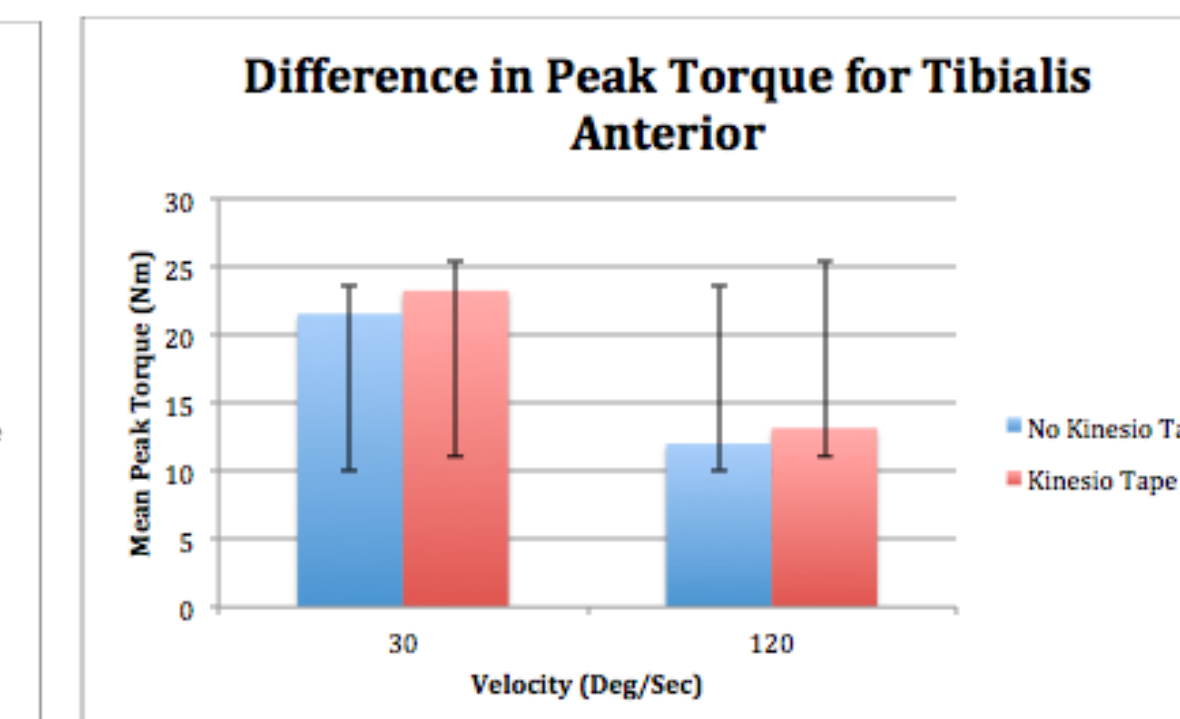


FIGURE 5. Mean Peak Torque for Tape vs. No Tape on Tibialis Anterior

Discussion

- The study provided inconclusive data to support the claim that Kinesio® Tape increases force production when applied to the rectus femoris or tibialis anterior in a healthy population

Clinical Implications

- The findings from this study may help clinicians make evidence-based judgments before applying the tape as a clinical intervention for increased force production.
- The finding that there was a decrease in time to peak torque when Kinesio® Tape was utilized at 60 deg/sec may benefit clinicians training individuals for functional strength movements targeting the rectus femoris. This decrease in time may increase muscle efficiency in concentric contractions of the rectus femoris since peak torque may be reached in a shorter time.

The Learning Effect

- Defined as the participant's ability to improve his or her results in short intervals after a thorough explanation or test run of the specific task at hand.
- In this study, the Biodex protocol was accurately followed using thorough instructions with warm-up and trial repetitions given each time. Despite this, after analyzing the data based on condition sequence subgroups, it was found that there was still a possibility of a learning effect.

Limitations

- This study was completed on healthy, non-injured adults only, excluding the application of this intervention to injured populations.

Future Research

- In order to combat the learning effect, future studies may want to revise the methods to have participants come back the next day to repeat the protocol. Future researchers may also want to include a placebo group utilizing a sham taping technique.

Conclusions

- The results from this study displayed that Kinesio® Tape has no positive or negative effect on concentric force production when applied to the rectus femoris and the tibialis anterior muscles of healthy, un-injured individuals between the ages of 18-40 years.
- However, time to peak torque displayed a statistically significant decrease when Kinesio® Tape was applied to the rectus femoris for the 60 deg/sec testing condition.
- No sources of funding were provided for this study.

Key References