The clinical efficacy of Rocktape in a performance enhancing application

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STUDY DESIGN: Randomized, clinical trial using a repeated measures design.	**METHODS AND MEASURES:** 5 elite cyclists were randomly assigned to ride a 24-mile course with and without tape while their performance was measured.
OBJECTIVE: To determine if Rocktape can improve athletic endurance performance.	**RESULTS:** Athletes who wore Rocktape performed 2-6% better than when they did not wear Rocktape.
BACKGROUND: Tape, braces and supports are used extensively in athletics to correct form and provide support. Kinesiology tape has gained popularity in recent years. While Rocktape has become the leader in athletic enhancement kinesiology taping methods, no evidence exists that supports performance claims.	**CONCLUSION:** Rocktape may be of some assistance to athletes in endurance competitions.
	LEVEL OF EVIDENCE: Low

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Introduction

Overview

The use of artificial tapes, braces and supports in athletics is a very common method to treat musculoskeletal dysfunctions. Many athletes rely on these supports as a way to increase kinesthetic awareness, provide increased stability and provide temporary relief from painful sprains.

Cotton tape or “coaches’ tape” has been available for many years and is a standard tool for treating instability in the athletic community. It is widely available, inexpensive and relatively easy to apply[1,3]. More recently, kinesiology tape has also become popular in the field of rehabilitation and athletics.

The primary difference between these tapes is that white tape is rigid, whereas kinesiology tape is elastic. While the primary benefit of white tape is to provide stability, some believe that in addition to providing stability, kinesiology tape also serves to enhance proprioception, neuromuscular stimulation, reduce pain and improve recovery times.

The method of taping using these products is different as well. White tape applications are based on methods developed by McConnell [3,14], Mulligan and Cook and are well understood and documented. The Kinesio method, developed by Dr. Kase [4], is based on taping along the muscles’ insert-to-origin and origin-to-insert points.

While there is no evidence that shows that the Kinesio method is effective, there is clinical evidence that supports the claims that kinesiology tape can be beneficial in rehabilitation applications[2,4,5,6, 10, 12].

In recent years, the use of Rocktape, which is a style of kinesiology tape, has become increasingly popular. Rocktape is specifically made for the athletic market and claims to be able to withstand extreme conditions better than other kinesiology tapes. Rocktape was designed to mimic the qualities of human skin. It has roughly the same thickness as the epidermis and can be stretched between 60% and 80% of its resting length longitudinally. Additionally, the company claims that its tapes are made with cotton and nylon which are water resistant and therefore can be worn by swimmers, surfers and others engaged in water-based activities. It is latex free and the adhesive is 100% acrylic and heat activated. Rocktape claims that its proprietary adhesive is superior to other brands since it is designed for competition [7].

Rocktape states that its tapes can be used to treat common sports injuries or promote performance. Specifically, Rocktape proposes that its tape can 1) increase athletic performance by providing kinesthetic awareness through cutaneous afferent stimulation, 2) reduce pain by relieving pressure on pain receptors due to the tape’s ability to lift the epidermis, 3) improve fluid dynamics thereby reducing edema and 4) when applied properly, induce improvement in an athlete’s form.

While there appears to be evidence that supports the short-term effect of a therapeutic application on reducing pain and disability in subjects with shoulder pain (clinically diagnosed as rotator cuff tendonitis/impingement) as compared to a

sham application, to our knowledge there are no published randomized clinical trials that evaluate the effects of Rocktape in a performance-enhancement application.

The purpose of this study was to compare the performance differences in cyclists who wore tape and those who did not.

Methods

Over thirty elite cyclists in Northern California were contacted by the company and asked if they'd be interested in participating in a clinical test. Those that expressed an interest were interviewed by the company to determine if they qualified. Cyclists that were below a Category II rating were excluded. All subjects were therefore Category II or above, in race-ready shape and free of illness or injuries. A total of twelve cyclists were enrolled in the study. Seven of these cyclists abandoned the test either prior to testing or during the test. Data from cyclists that did not complete the full 2-ride test were excluded from the results.

The test was conducted at Premiere Spine and Sport in San Jose CA. Ages ranged from 17 to 40 and genders were mixed. The testing was conducted in a way to ensure there were uniform recovery periods for all athletes. Additionally the athletes were physically segmented away from each other to ensure there were no competitive influences ("racing") introduced during the test. The group of cyclists was divided into three pods, with each pod having three riders. Each rider was randomly assigned to a pod. The pods were then scheduled to test as follows.

week 1, pod 1	**Monday**	**Tuesday**	**Wed**
Rider 1	no tape		rocktape
Rider 2	rocktape		no tape
Rider 3	rocktape		no tape
week 2, pod 2	**Monday**	**Tuesday**	**Wed**
Rider 1	no tape		rocktape
Rider 2	rocktape		no tape
Rider 3	no tape		rocktape
week 3, pod 3	**Monday**	**Tuesday**	**Wed**
Rider 1	no tape		rocktape
Rider 2	no tape		rocktape
Rider 3	rocktape		no tape

The primary author is a certified Rocktape practitioner and applied all the taping procedures. Informed written and verbal consents were obtained from all subjects before enrollment, and all rights of the subjects were protected.

Taping Techniques

Subjects were assigned to one of two groups using a coin-toss, and allocation was concealed. The tape group received a standard performance back chain and performance front chain Rocktape application. Standard 2-in (5-cm) Rocktape was used for all applications.

For this study, tape was applied to the subjects with two taping techniques. The taping applications used follow fascial lines or meridians, as coined by Thomas Myers, author of 'Anatomy Trains: Myofascial Meridians for Manual and Movement Therapists [13]. The tape is applied to numerous structures along a kinetic chain that work in concert to provide fluid and efficient movement. The theory is that if we can stimulate mechanoreception (cutaneous) along these lines, we can assist in coordinating efficient movement along that pattern.

Each taping group was equally taped along these fascial planes. The first application was the "Performance Front Chain" that commenced at the talocrural joint line, extending superiorly along the anterior surface of the tibia, lateral to the patella, and ending along the Rectus Femoris to the AIIS (Anterior Inferior Iliac Spine). The second application, the "Performance Back Chain", commenced at the junction of the Achilles tendon and Calcaneus, extending superior/ posterior up the Gastroc Soleus complex. The application skipped the posterior aspect of the knee, in order not to irritate sensitive skin, and resumed in a superior direction up the hamstring group to the Ischial Tuberosity. The taping application resumed again at the PSIS (Posterior Superior Iliac Spine) extending up the Erector Spinae group to the Cervico-Thoracic Junction. Both the Performance Front and Back Chain were applied bilaterally.

Measuring Outcomes

We utilized 3 primary outcome measurements: wattage, time and distance. All of these data were recorded by three CompuTrainers made by RacerMate. CompuTrainers were calibrated before each session to ensure uniformity. In several cases, a rider's personal power system was cross-correlated as a reference to ensure that the CompuTrainers were properly calibrated. CompuTrainer claims a Margin of Error (MoE) of +/- 2%. Independent test showed a +/- 1% MoE. Subjects were questioned about their daily activities to ensure that no one had ridden the same day as the test-day and that they were in good condition.

Intended power (Watts)	SRM (Watts)	PowerTap (Watts)	CompuTrainer (Watts)
100	107	105	101
125	131	128	124
150	147	144	146
175	176	173	175
200	201	199	200
225	226	223	225
250	252	249	250
275	274	271	273
300	301	299	300
325	327	326	325
350	353	351	350

Additionally, the data was recorded on paper by an operator at 5 minute intervals to ensure data integrity should a technical malfunction develop in a CompuTrainer during the test.

Each cyclist was given a schedule that included two sessions, one with and one without tape. A coin-toss determined if they rode taped in their first session. Depending on the outcome of the first session, the opposite condition was applied in the second session. If the coin-toss for the first rider in the pod resulted in a tape application, the second rider in the pod did not receive tape.

Each subject was tested at approximately the same time of day for each session and used the same bike, CompuTrainer, shoes, nutrition products and warm-up techniques to prepare for the test. Each session was separated by an identical one-day rest period. The test was conducted at the beginning of the race season so all the cyclists reported that they were 'race ready', meaning their winter base-training was complete and they were ready to race.

It was further assumed that no performance improvement would be realized due to the increase in training from the previous session ("training effect"). However, it was assumed that all subjects would perform better on the second ride due to course familiarity.

Sample Size

Given the intensity of this test, only 5 riders were able to complete the test in its entirety. We assumed that any number of subjects would provide significant data given the elite status of each rider. No attempts were made to grow the sample size based on a priori analysis regarding standard deviations for this type of test.

Procedure

Each subject was greeted at approximately 5PM and the evening's activity was explained to the subject. The purpose of the test was not mentioned nor was the subject told about the benefits of Rocktape during the test. A coin-toss determined if they rode the first session with or without tape. If they rode the first session with tape, then they rode their second session with no tape. Subjects were taped by the same instructor, with the same tape, in the same room with the same taping application.

After taping, each subject's rear tire pressure was checked to ensure that 8 bars were present and then the CompuTrainer was properly calibrated according to the manufacturer's instructions. Riders were allowed a 30-minute period to perform their usual warm up technique. Riders were allowed to start the test no sooner than 10 minutes after concluding the warm-up. In some cases the subject's own personal power system was used to verify the CompuTrainer's calibration. Cyclists used their own bikes and shoes and were allowed to consume their preferred fluids and nutrition while riding. Electric fans provided air flow and were set at the same flow rate for each rider. Music players were not allowed.

CompuTrainers have a standard 23.95 mile time trial course called "Hampton Triathlon" which was used for the test. To ensure conformity, no changes or deviations were allowed. All tests were conducted indoors in a controlled environment. Temperature, humidity and training status were all uniform throughout the test. Upon completion of the test, the subjects were allowed to cool down and remove their tape (if present).

The second session was conducted in the same manner (without tape if the first session included tape and vice versa). Subjects were not allowed to talk with the other riders during the test and external distractions (radio, TV, etc) were not present.

Data Capture and Analysis

All data was successfully recorded by the CompuTrainers and the operator. A PC connected via an RS-232 interface to the CompuTrainer collected and stored the data. The data was transcribed into the following table in the exact order the subject was tested with and without tape.

	Subject	Time	Watts	Distance
Rider 1	With Tape	58:32	311	23.95 miles
	Without Tape	58:07	317	23.95 miles
		:25 faster without tape		
Rider 2	Without Tape	1:03:12	255	23.95 miles
	With Tape	1:01:37	264	23.95 miles
		1:35 faster with tape		
Rider 3	Without Tape	1:01:11	277	23.95 miles
	With Tape	1:00:09	279	23.95 miles
		1:02 faster with tape		
Rider 4	Without Tape	1:05:38	230	23.95 miles
	With Tape	1:01:46	276	23.95 miles
		3:52 faster with tape		
Rider 5	With Tape	1:07:07	217	23.95 miles
	Without Tape	1:06:33	221	23.95 miles
		:34 faster without tape		

Average time improvement with tape on 2nd session	Average time improvement without tape on 2nd session
2:09	:30

As predicted, all subjects tested faster on the 2nd session due to course familiarity, regardless of tape.

Session #	Avg Time	Avg Watts
1	1:03:08	258
2	1:01:38	271

Of note were the performance differences during the 2nd session between subjects who wore tape and those who did not.

Discussion

The purpose of this study was to compare the efficacy of using kinesiology tape to promote performance improvements in cyclists. Our results show that Rocktape can have a positive effect on performance. However, no such test has previously been conducted and until this test method is replicated by others and presented for peer review we would propose these results offer a low level of evidence; however, it points to the need for further investigation.

The physiological mechanisms by which Rocktape is presumed to work remain hypothetical, and we can only speculate what they may be. In this study, significant improvement in Watts and speed were noted for those subjects who wore tape. Under the proprioception theory, the subject may have become more efficient due to an increase in motor units recruited from the rectus abdominis illiocostalis, psoas, and the gluteus medius to perform the activity due to an increased proprioceptive stimulus; thus their pedal stroke may have become more economical which helped mitigate the onset of fatigue.

One plausible explanation for such a change is that this style of taping may have assisted the subject in maintaining better form by supporting the core muscles in the lower back. In this way, the subject was able to better control diaphragm expansion and contraction which may have lead to more efficient respiration and lower lactate levels. Further research is required to better understand the mechanisms at play for the improvement.

One of the weaknesses of this study is the lack of a true independent research team. Rocktape funded and conducted this study, which is an obvious issue. Additionally, the test should have utilized a control group, which would have provided a control for any potential Hawthorne effect. As an aside, we considered using a sham tape application for comparison but it seemed more clinically useful to compare a Rocktape performance application against no tape instead of a sham tape in that a sham tape would have been very limiting and decreased performance in this test.

Another potential limitation of the study was that a strong placebo effect of taping has been well documented in subjects with patellofemoral joint pain [8,9,11] which could have had an effect on our results. Lastly, the subjects may have had prior knowledge of Rocktape and its claims and therefore have been psychologically contaminated. The cycling world is a close-knit community of individuals and it is possible that our subjects were predisposed to perform better.

Conclusion

When applied to elite cyclists engaging in a physically challenging time-trial, Rocktape may improve performance by 2-6%.

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