



Blood Lactate Clearance During Passive Recovery with Kinesiology Tape Following Maximal Exercise

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Abstract

INTRODUCTION: Kinesiology tape is an elastic cotton blend fabric strip with an adhesive backing. Many different manufacturers claim that their product reduces muscle fatigue and increases blood flow by lifting the skin up off of the underlying fascia and capillaries. This lifting creates a low-pressure area beneath the skin, referred to as the decompressed skin. Skin that is not decompressed (skin around tape) is said to have a higher pressure, causing the fluids to move from the areas of higher pressure to areas of lower pressure. This fluid dynamic is the basis for the claims that the tape increases blood flow. **PURPOSE:** The purpose of this study was to determine if kinesiology tape increases blood flow. Blood lactate clearance was studied as a measure of blood flow. **METHODS:** Six female club soccer players (age 19.5 ± 1.38 years) participated in this study. Subjects arrived at the cardiovascular lab during their scheduled time. After reading and signing a consent form, the principal investigator fitted the subject with a Polar heart rate monitor and 6 pieces of RockTape per leg (Tape was placed on the front and back of the upper leg and the back of the lower leg. Taping was randomized.). Resting heart rate, resting blood pressure, weight, height, bioelectrical impedance, thigh skin fold measurements, and resting blood lactate were taken and recorded for each subject. Subjects completed this process twice, on two separate occasions spaced 48 hours apart. Subjects were then fitted with a mouthpiece and began a maximal graded exercise test (Bruce protocol) until volitional fatigue. Heart rate was recorded every minute; blood pressure was taken during each stage of the test along with a rating of perceived exertion. Once the test was terminated, the subject was allowed to walk at a predetermined cool-down pace for approximately 1 minute while still wearing the mouthpiece. After 1 minute, the subject was able to select a speed at which to walk for another 3.5 minutes. During this time, the mouthpiece was taken off. At 4.5 minutes post exercise, the subject dismounted the treadmill and sat down in a chair. At 5 minutes post exercise, a blood sample was taken and analyzed, and blood pressure and heart rate were recorded. This was repeated again at 10, 20, and 30-minutes post exercise. **RESULTS:** There was a significant difference ($p = 0.045$) in time to fatigue between the taped (10.89 ± 0.85 minutes) and not taped (10.53 ± 0.93 minutes) trials. Minute ventilation was significantly higher during the taped trial with an average of 4.05 ± 4.83 L/min ($p = 0.048$). Blood lactate measured at 5 minutes post exercise was 2.48 ± 2.55 mmol/dl higher during the tape trial, which approached a significant difference ($p = 0.0628$). There was no significant difference in the rate of blood lactate clearance over the 30 minutes of passive recovery between the two conditions. **CONCLUSION:** The results of this preliminary study indicate that while kinesiology tape can reduce muscle fatigue leading to increases in minute ventilation and time to exhaustion, it does not significantly impact the rate of blood lactate clearance after post maximal exercise. With a larger sample size, the post-maximal blood lactate level may approach a higher significance.

Purpose

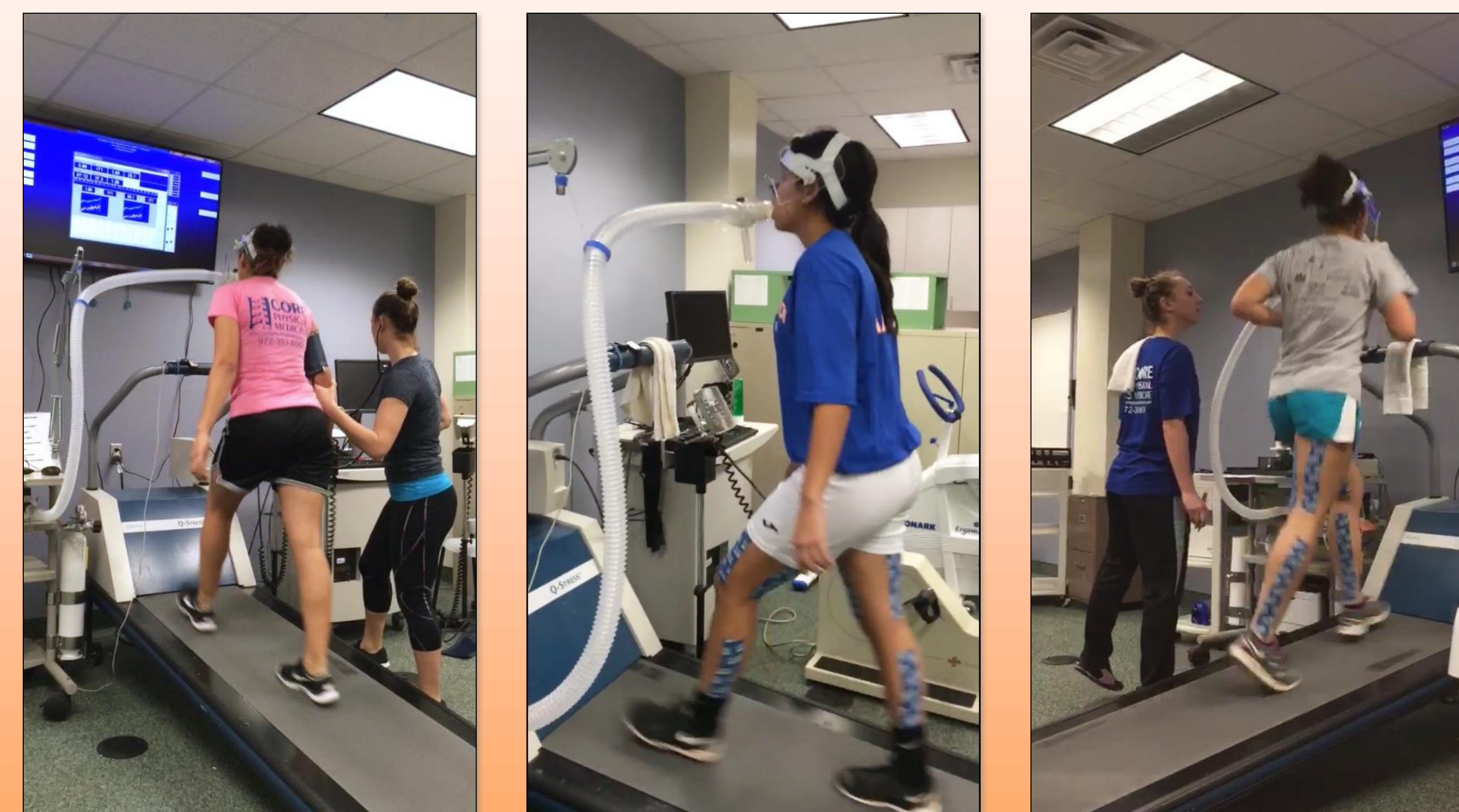
The purpose of this study was to determine if kinesiology tape increases blood flow, as manufacturing companies claim. Blood lactate clearance was studied as a measure of blood flow.

Introduction

Kinesiology tape (KT) is an elastic cotton blend fabric strip with an adhesive backing on one side. Many different manufacturers claim that their product reduces muscle fatigue and increases blood flow by lifting the skin up off of the underlying fascia and capillaries. The varying areas of decompressed skin create a fluid pressure gradient. This fluid dynamic (FD) is the basis for the claims that KT increases blood flow. Lactic Acid (LA) is a by-product of metabolism resulting from exercise. It can be used as a fuel source by the body's tissues until a certain point during exercise when the rate of lactate production exceeds the rate of disappearance ($R_a > R_d$). This point at which the body can no longer use lactate as a fuel source is said to be the anaerobic threshold (AT), or lactate threshold (LT). This is characteristic of a maximal exercise session and can be estimated by oxygen consumption (VO_2). LA is produced in the muscles and enters the blood stream for removal via chemical gradients and the muscle pump. Samples of blood can be taken and analyzed to determine blood lactate (BLA) levels. The literature states that active recovery (AR) at a self-selected pace is the most efficient method of LA removal primarily due to the muscle pump. Passive recovery (PR) eliminates the muscle pump action, forcing the body to rely on other means of LA removal.

Methods

Six female college club soccer players (age 19.5 ± 1.38 years) participated in this study. Subjects arrived at the cardiovascular lab during their scheduled time. After reading and signing a consent form, the principal investigator fitted the subject with a Polar heart rate monitor and 6 pieces of RockTape per leg (Tape was placed on the front and back of the upper leg and the back of the lower leg. Taping was randomized.). Resting heart rate, resting blood pressure, weight, height, bioelectrical impedance, thigh skin fold measurements, and resting blood lactate were taken and recorded for each subject. Subjects completed this process twice, on two separate occasions spaced 48 hours apart. Subjects were then fitted with a mouthpiece and began a maximal graded exercise test (Bruce protocol) until volitional fatigue. Heart rate (HR) was recorded every minute; blood pressure was taken during each stage of the test along with a rating of perceived exertion to confirm a normal response to graded exercise. Once the test was terminated, the subject was allowed to walk at a predetermined cool-down pace for approximately 1 minute while still wearing the mouthpiece. After 1 minute, the subject was able to select a speed at which to walk for another 3.5 minutes. During this time, the mouthpiece was taken off. At 4.5 minutes post exercise, the subject dismounted the treadmill and sat down in a chair. At 5 minutes post exercise, a blood sample was taken and analyzed, and blood pressure and heart rate were recorded. This was repeated again at 10, 20, and 30-minutes post exercise.

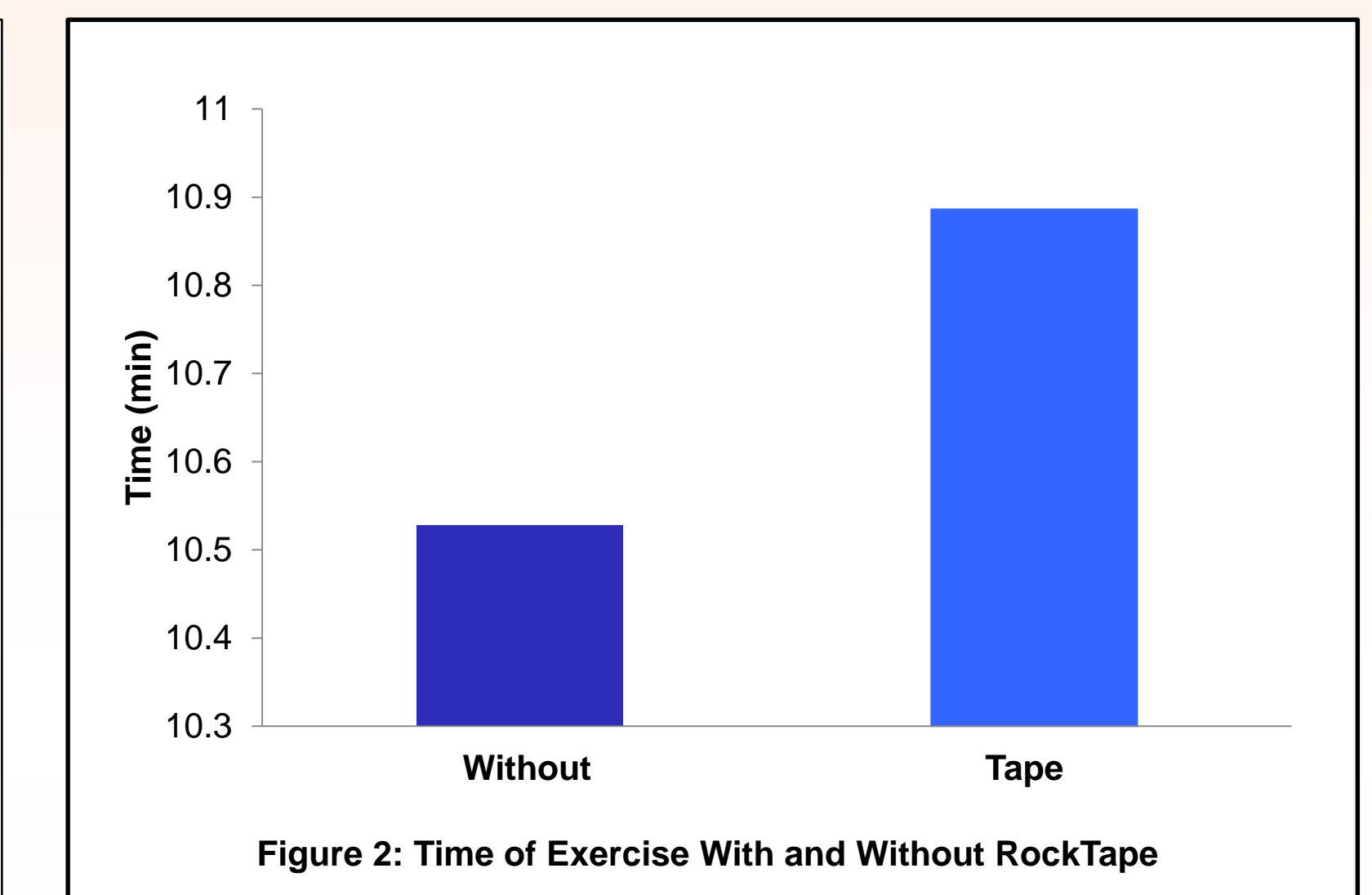
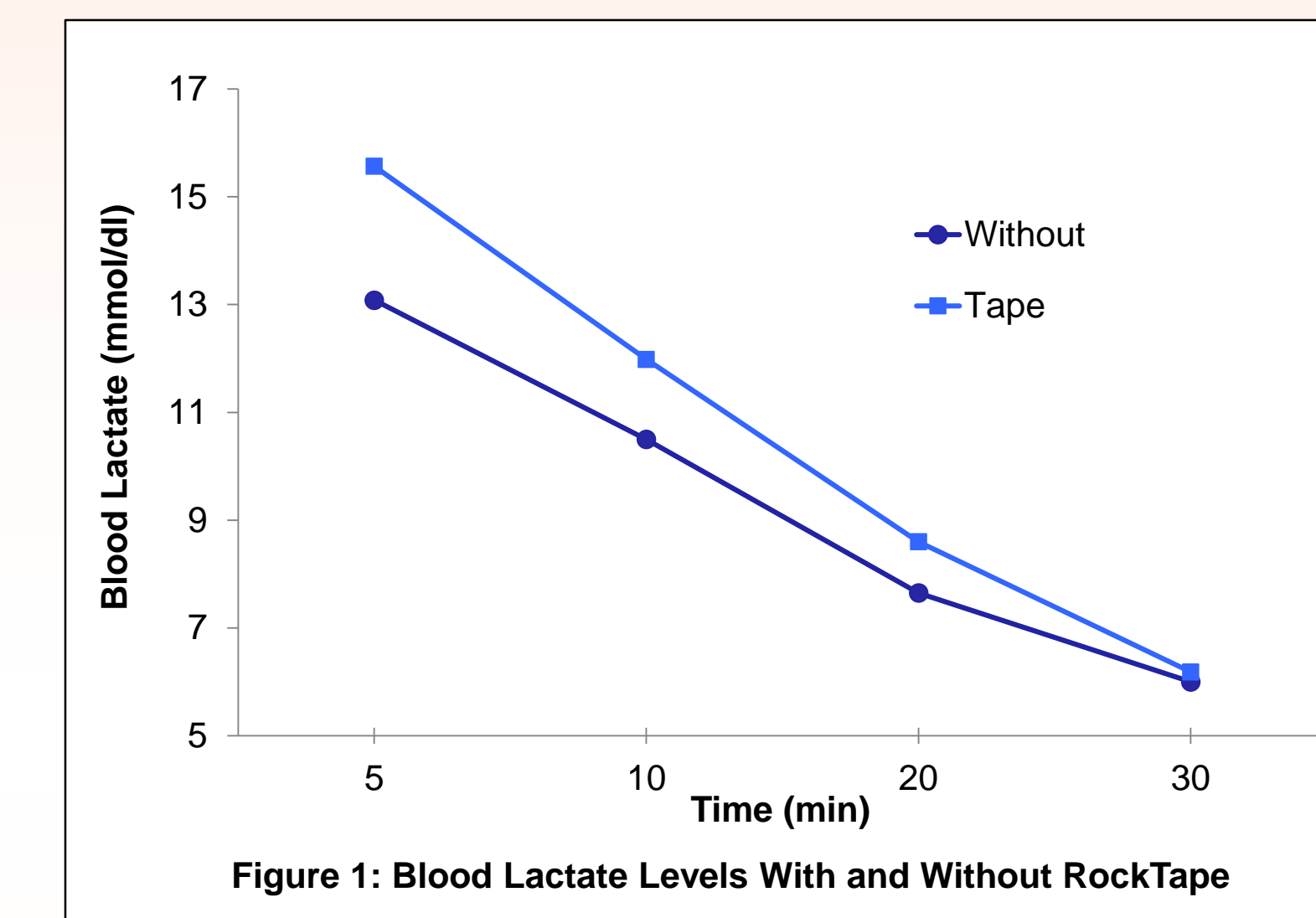


A repeated measures analysis was run to compare blood lactate concentration levels between the two conditions. A paired t-test was used with an alpha level set at $p \leq 0.05$ to determine if there was a significant difference in time to fatigue (TTF) within subjects per each condition.

Results

Table 1: SUBJECT DEMOGRAPHICS

	AGE	HEIGHT (m)	WEIGHT (kg)	BMI	BIA	THIGH
MEAN	19.5	1.63	62.33	23.16	24.33	21.58
SD	1.38	0.08	8.66	1.72	5.16	2.92
MAX	21	1.71	73	26	33	27
MIN	18	1.5	46.8	21	20	19



There was a significant difference ($p = 0.045$) in TTF between the taped (10.89 ± 0.85 minutes) and not taped (10.53 ± 0.93 minutes) trials. Minute ventilation (V_E) was significantly higher during the taped trial with an average of 4.05 ± 4.83 L/min ($p = 0.048$). Blood lactate measured at 5 minutes post exercise was 2.48 ± 2.55 mmol/dl higher during the tape trial, which approached a significant difference ($p = 0.0628$). There was no significant difference in the rate of BLA clearance over the 30 minutes of passive recovery between the two conditions.

Conclusions

The results of this preliminary study indicate that while KT can reduce muscle fatigue leading to increases in VE and duration of exercise, it does not significantly impact the rate of BLA clearance after post maximal exercise. Therefore, if KT allows for longer TTF, a greater accumulation of BLA will be present. This suggests an explanation for the higher 5-min post exercise BLA trend seen in this study. With a larger sample size, the post-maximal blood lactate level may approach a higher significance. Future studies should consider BLA levels in the maximal-5 minute post exercise window to further understand the effect KT has on BLA. The trend seen in this study suggests that KT may influence BLA clearance during the 5 minutes immediately following maximal exercise, warranting further research.