PHYSIOLOGICAL, KINEMATIC, & ELECTROMYOGRAPHIC RESPONSES TO PATELLA TAPING IN ELITE CYCLISTS

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INTRODUCTION

The use of Kinesiology-Type Tape (KTT) has become increasingly popular in sports for injury prevention, injury management, and performance enhancement.
Many cyclists use patella KTT; however, the benefits of such interventions remain unclear, especially in uninjured elite cyclists.
We aimed to determine the acute physiological, kinematic, and electromyographic (EMG) responses to applying patella KTT in elite cyclists.

METHODS

Twelve elite male cyclists performed 4-min submaximal cycling trials at 100 and 200 W on a Lode ergometer once with and without patella KTT (randomized). Measures were taken over the last minute of trials.

Cycling economy, energy cost, oxygen cost, and heart rate measures were monitored using the K5 metabolic system (COSMED, Rome, Italy) and Polar® heart rate monitor (Polar Electro, Kempele, Finland). Kinematics and EMG signals were collected using an infrared camera system (Qualisys AB, Gothenburg, Sweden) and wireless EMG sensors (Noraxon USA Inc., Scottsdale, AZ). Following all trials, cyclists rated their perceived comfort levels and change in knee stability and cycling performance with KTT.

Table 1. Changes in mean range of motion with patella KTT associated with small effects

Power	Joint	(Plane) motion	No tape (°)	KTT (°)	Effect size	p-value
100 W	Ankle*	(Y) inversion-eversion	4.3 ± 1.8	5.0 ± 1.7	0.34 ± 0.65	0.097
		(Z) rotation	5.5 ± 0.7	5.2 ± 1.0	-0.36 ± 1.29	0.350
	Knee*	(X) flexion-extension	78.8 ± 2.3	78.2 ± 2.2	-0.23 ± 0.73	0.304
200 W	Knee*	(X) flexion-extension	80.1 ± 2.3	80.9 ± 2.5	0.31 ± 0.84	0.224
	Pelvis	(Z) rotation	4.0 ± 1.8	3.6 ± 1.1	-0.26 ± 1.14	0.447
	Trunk	(X) anterior-posterior	9.5 ± 4.2	8.6 ± 2.7	-0.24 ± 0.93	0.391
		(Z) rotation	8.6 ± 3.8	7.8 ± 2.6	-0.25 ± 1.06	0.430

*Stronger (or dominant) cycling side

RESULTS & DISCUSSION

Patella KTT had non-significant trivial effects on all collected physiological parameters. The effects of KTT on ankle, knee, hip, pelvis, and trunk range of motion were non-significant and mostly trivial; except for a subset of small non-significant effects observed at the ankle and knee at 100 W, and at the knee, pelvis, and trunk at 200 W (**Table 1**).

Patella KTT significantly and meaningfully increased peak, mean, and integrated EMG signals from *vastus medialis*, and altered the *vastus medialis* to *vastus lateralis* activation ratio (**Table 2**). Peak, mean, and integrated EMG signals from *biceps femoris* and *rectus femoris* also generally decreased; with changes indicating small non-significant increases in *biceps femoris* to *rectus femoris* ratio. Changes in EMG signals with KTT were more pronounced at the lower power.

Most cyclists perceived KTT as comfortable (n = 7, 58%), providing additional knee stability (n = 10, 83%), and improving cycling performance (n = 11, 92%). Perceptions were not consistently well matched with individual responses.

Table 2. Changes in EMG with patella KTT associated with significant effects (p < 0.05)

Power	Muscle	Measure	No tape (%)	KTT (%)	Effect size	p-value
100 W	VM*	Peak	30.4 ± 9.2	37.5 ± 7.6	0.72 ± 0.84	**0.035**
		iEMG	39.0 ± 11.6	50.9 ± 13.3	1.03 ± 0.96	**0.012**
		Mean	7.2 ± 1.0	6.5 ± 0.6	- 0.52 ± 0.38	**0.021**
	RF*	Mean	7.7 ± 2.0	10.1 ± 2.4	0.80 ± 0.78	**0.015**
	BF*	Peak	39.5 ± 6.4	38.7 ± 9.6	- 0.44 ± 0.37	**0.033**
		Mean	7.6 ± 1.3	7.0 ± 1.3	- 0.30 ± 0.15	**0.004**
	VM:VL*	iEMG	87.2 ± 17.7	112.9 ± 26.9	1.45 ± 1.50	**0.020**
		Mean	91.4 ± 18.4	120.8 ± 16.8	1.06 ± 0.94	**0.010**

*Stronger (or dominant) cycling side

BF, biceps femoris. RF, rectus femoris. VL, vastus lateralis. VM, vastus medialis.

CONCLUSIONS

- Most cyclists perceived an increased performance and knee stability with KTT.
- Patella KTT had no meaningful impact on the physiological parameters, with small non-significant effects on knee kinematic measures investigated.
- KTT altered the neuromuscular recruitment patterns of elite cyclists, which could have implications for injury prevention.
- The range of responses to KTT showed the presence of positive responders, negative responders, and non-responders; however, perceptions were not able to clearly delineate cyclists into these subgroups.
- The ability of patella KTT to directly enhance elite cycling performance is most likely trivial.

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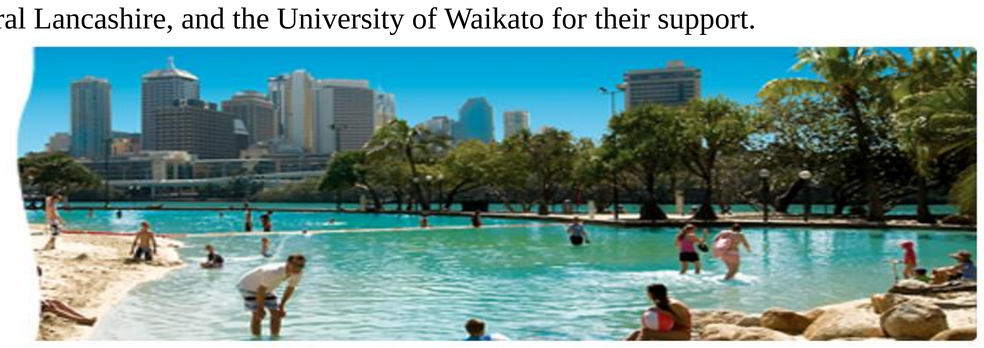

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