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Conference Abstract

The effect of symmetry monitoring system on lower limb muscle activation asymmetry in bike field test

Tse-Fu Shao [1], Pei-Chen Tsai [1], Zi-Jun Lin [1], Tzyy-Yuang Shiang [2], Chia-Hsiang Chen [3*]

[1] Graduate Institute of Recreational Sport & Health Promotion, National Pingtung University of Science and Technology, Pingtung, Taiwan
[2] Department of Athletic Performance, National Taiwan Normal University, Taipei, Taiwan
[3] Office of Physical Education, National Pingtung University of Science and Technology, Pingtung, Taiwan

* Correspondence: (TS) doof75125l@gmail.com

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1. Introduction

Most of the cycling related studies assume that cyclists are riding in a symmetry condition. Nevertheless, a study has pointed out a 5~15% of power output difference by bilateral legs among injury-free athletes and recreational cyclists (Carpes, Mota, & Faria, 2010), besides, the dominate leg usually generate higher power. Bilateral asymmetry of the body is one of the key factors which affect performance and injury(Fousekis, Tsepis, & Vagenas, 2012). Due to the experimental setup limitation, studies investigated biking asymmetry were usually in laboratory and restricted in functional tests. The aim of this study was to access the effect of lower limb asymmetry in field test when symmetry measurement system intervenes.

2. Materials and Methods

This study recruited 14 participants (height: 172.1±3.9 cm, weight: 64.2±5.3kg, age: 21.9±1.6 year-old). The wireless EMG was applied to observe the bilateral muscle activation in lower limb (rectus femoris, bicep femoris, tibialis anterior, gastrocnemius) with and without symmetry monitoring system in outdoor cycling (Figure 1 and 2). The saddle position was measured when participants flexed knee at 30-degree at bottom dead point, and trunk flexed at 45-degree. The asymmetry index (AI) was calculated by the percentage difference between right (R) and left (L) sides (Equation 1).

$$\mathrm{AI}(\%) = \frac{[R-L]}{\frac{(R+L)}{2}} x100$$

Equation 1

The repeated measurement ANOVA was carried out to analyze the difference between with and without the intervention of symmetry monitoring system to lower limb muscle activation at 5, 10, 15 and 20 km distance. The significance level was set as α=.05.

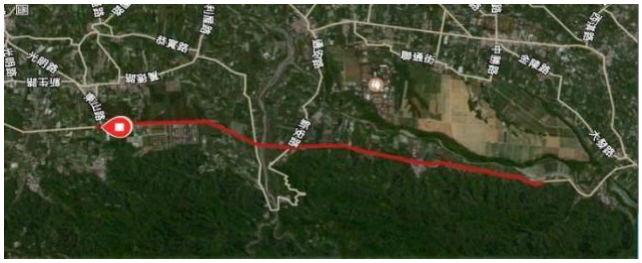

Figure 1. Route of field test.

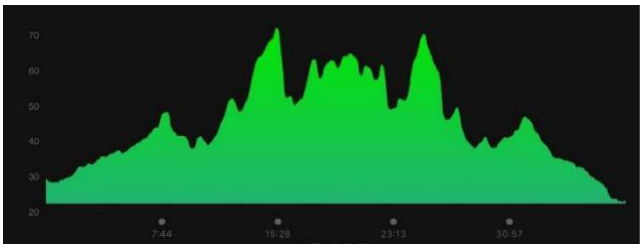

Figure 2. The altitude graph of the route.

3. Results

The aim of this study was to access the effect of lower limb asymmetry in field test when symmetry measurement system intervenes.

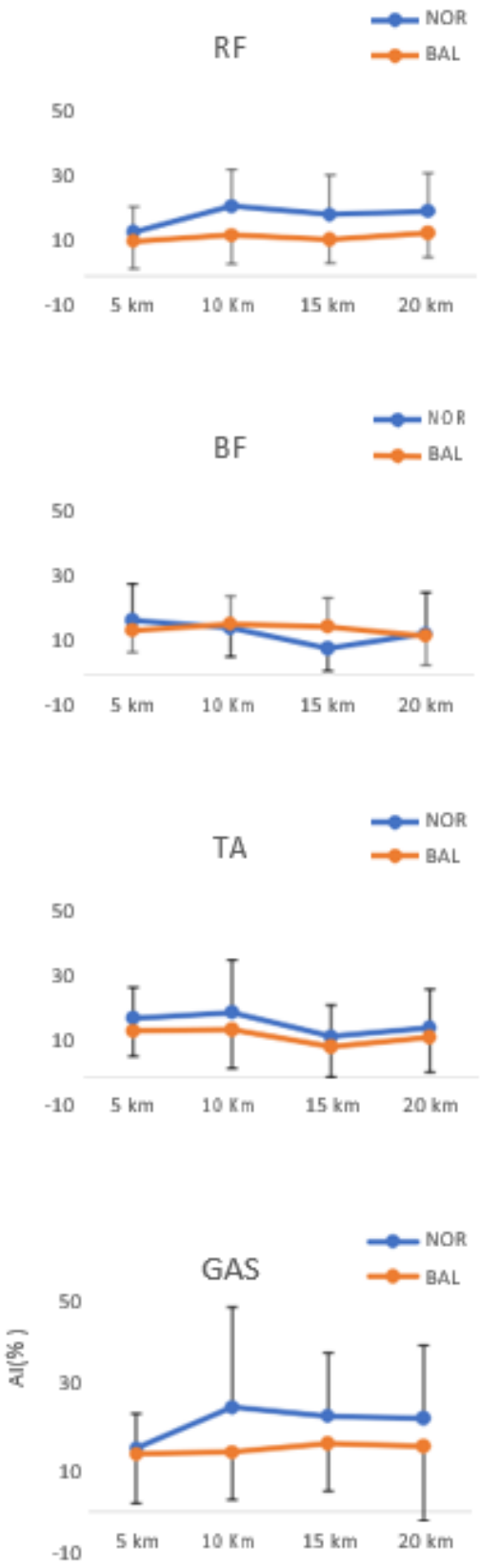

Figure 3. The effect of symmetry monitoring system intervention on bilateral muscle activation asymmetry in lower limb at different distance. NOR represents without symmetry monitoringsystem. BAL represents with symmetry monitoring system. RF represents rectus femoris muscle. BF represents bicep femoris muscle, TA represents tibialis anterior muscle, GAS represents gastrocnemius muscle.

4. Discussion

This study indicated that without the support of symmetry monitoring system, the pedaling asymmetry would be 15% higher. According to previous studies, athletes also displayed bilateral asymmetry in pedaling force, torque and power output. As the distance getting longer, muscle fatigue will lead to unstable power output and thus, increasing the asymmetry index and dampening performance.

5. Conclusions

The intervention of simetry monitoring system could improve the asymmetry phenomenon in lower limb, possibly postpone the onset of fatigue and reducer injury rate.

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