脚自転車最大運動時のパフォーマンスに及ぼす走行勾配感覚の影響

県立広島大学　三浦　朗
（共同研究者）　同　遠藤（山岡）雅子

High Intensity Cycling Performance is Influenced by Visual Sensation

by

Akira Miura, Masako Yamaoka Endo
Department of Exercise Science and Physiology,
School of Health Sciences,
Prefectural University of Hiroshima

ABSTRACT

The influence of perceived effort during fatiguing exercise is still not well understood. We therefore evaluated visual sensation of cycling road on performance during high-intensity ergometer exercise. Fourteen young male subjects（aged 20 to 32 years）each performed high-intensity square-wave exercise to exhaustion on an electrically braked cycle ergometer while simultaneously viewing one of three different cycling road animations: control（level）condition, up condition and down condition. The simulated speed was 4 m/s for each visual sensation. Initially, each subject performed a single high-intensity exercise trial（work rate: 100-105 % of peak VO2, pedaling rate: 70 rpm）to exhaustion while viewing a level road cycling animation. Each subject performed two more trials with the same work rate protocol, but after reaching 85 % of their control duration time, the level visual sensation was changed to up or down（randomized）until exhaustion. Pulmonary gas exchange and heart rate（HR）were measured continuously. The duration time in control condition was significantly shorter than up and down conditions（control：175.1 ± 8.7, up：

191.2.±10.9, down：192.2±12.3 s). There was no significant difference between the duration time of the up condition and down condition. Interestingly, some subjects perceived the up condition as easier while others thought it was harder. Therefore, we regrouped our data and compared the duration times of those who perceived the visual sensation as easy versus those who thought it was hard, independent of visual sensation. However, 2 out of 14 subjects who perceived no different visual sensation between up and down conditions, were excluded from the comparison. Duration time of the easy trial was significantly longer than the hard trial (easy trial: 200.8±12.9, hard trial: 186.6±13.6 s, n=12). These results demonstrate that high-intensity cycling performance can be altered by visual sensation input.

要　旨

本研究では，走行路面勾配に関する視覚情報の付加が，パフォーマンスに及ぼす影響を検討した．健康な成人男性14名（20～32歳）が本実験に参加した．被験者は，一定負荷自転車エルゴメータ運動（運動強度：$\dot{V}O_2max$の100～105%，ペダリング回転数70rpm）を，大型スクリーンの道路面走行動画を見ながら疲労困憊まで行った．実験条件は，道路面が終始平坦な動画をみせるcontrol条件，運動の終盤に平坦から走行角度が徐々に上っていくup条件，徐々に下がっていくdown条件の3種類であった．最初にcontrol条件を行い，その後日を改めてup条件とdown条件をランダムに行った．up条件とdown条件では，control条件で測定した運動継続時間の85%の時間経過後，走行面が4 m/秒で上りあるいは下りに変化する映像を提示した．同時に，ガス交換諸変量，心拍数を測定した．結果として，control条件に比較して，up条件とdown条件は，ともに，運動継続時間が有意に延長した．しかしながら，走行勾配感覚提示の違いが最も大きいと想定されたup条件とdown条件を比較したところ，有意な差は認められなかった（control条件：175.1±8.7，up条件：191.2.±10.9，down条件：192.2±12.3秒）．主観的な運動遂行感覚（相対的に楽に感じるか）が，被験者によってup条件とdown条件間で異なったため「楽に感じた試行（E試行）」と「きつく感じた試行（H試行）」に分けて運動継続時間を比較した（ただし，up条件とdown条件の主観的な運動遂行感覚が同じであった2名は除いた）．その結果，E試行はH試行に比べて，運動継続時間が有意に延長していた（E試行：200.8±12.9，H試行：186.6.2±13.6秒，n=12）．これらのことから，視覚による走行勾配感覚入力は，運動継続時間に影響を及ぼすことが示唆された．