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Abstract

EMG Activities of the Shoulder Muscles during a simulated Downhill compared to dynamic Shoulder Exercises – A Cross-Sectional Study

Svenja Kaczorowski [1,*], Roman P. Kuster [2,3] and Daniel Baumgartner [2]

[1] Institute of Physiotherapy, School of Health Professions, Zurich University of Applied Sciences, Winterthur, Switzerland
[2] Institute of Mechanical Systems, School of Engineering, Zurich University of Applied Sciences, Winterthur, Switzerland
[3] Division of Physiotherapy, Department of Neurobiology, Care Sciences and Society, Karolinska Institutet, Stockholm, Sweden

* Correspondence: (SK) Svenja Kaczorowski, svenja.kaczorowski@gmx.net

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Abstract: Mountain biking is associated with a high injury risk for the upper extremities. Neither a definition of when a return to biking after injury is safe nor a rehabilitation guideline for mountain bikers exists. Moreover, muscular activities of the shoulder muscles during mountain biking are not well investigated. The aim of this cross-sectional study was to evaluate whether electromyographic (EMG) activity of the pectoralis major and the single segment of the deltoid is similar during the dynamic shoulder exercises "Bear Hug" and "Wall Push" to the EMG activity during a simulated downhill ride on a bike simulator. Moreover, it was investigated if there is an association between the anteversion angle of the shoulder and the average EMG amplitude of the examined muscles during the simulated downhill. Normalized surface EMG has been obtained from deltoid and pectoralis major during a simulated downhill and the shoulder exercises from 12 healthy participants. Average shoulder anteversion angle has been measured with an inertial motion capture system. Two one-sided t-test (TOST) evaluated similarity between average and peak EMG amplitudes. Correlation coefficients revealed associations between shoulder angle and EMG amplitude. Average and peak EMG activities of the pectoralis major during the Wall Push were similar to the simulated downhill (average: mean difference=-0.01%MVIC, p=.009; peak: MD=-4.22%MVIC, p=.032). The Bear Hug with 2 and 3kg showed similar average EMG activities compared with the downhill (2kg: MD=1.02%MVIC, p=.017; 3kg: MD=0.85%MVIC, p=.021). No correlation between anteversion angle and EMG activity on the bike was found. Bear Hug and Wall Push can be used in rehabilitation to prepare the ventral and lateral shoulder muscles for the return to biking, taking into account that the results refer to a laboratory investigation. Joint loading and the influence of the rotator cuff muscles have to be investigated further.

Keywords: mountain biking, return to sport, shoulder injury.