KINEMATIC ANALYSIS AND MUSCULAR ACTIVITY OF SKATEBOARD PROPULSION IN EXPERIENCED PARTICIPANTS

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INTRODUCTION: Skateboarding began in the 1950s and coincided with the initial popularization of surfing in southern California. Today, there are approximately 12 million people who use a skateboard in the United States with world-wide participation increasing (National Sporting Goods Assoc., 2005).
No published scholarly investigation has attempted to study the biomechanics of skateboard propulsion. Considering the need for increased physical activity in the general population, it may be beneficial to investigate an activity outside of traditional exercise modalities such as running, cycling, and swimming (Transportation Research Board, 2003).
The purpose of this study is to investigate and describe human motion during the pushing and riding of a skateboard. Specifically, it seeks to determine which joints and muscles are involved in this activity, the angular velocities of these joints, and how stride frequency varies with speed and grade.

METHOD: Experienced skateboarders gave Informed Consent to participate as subjects. To be considered as a subject, each individual must have skated for a minimum of two years.
The skateboarding test was conducted on a large motor-driven treadmill (2.44 m x 3.05 m). All subjects underwent a habituation period of skateboarding on the treadmill before testing. Each subject used their own skateboard with a helmet and a rope and harness system employed to minimize the risk of injury in the case of a fall.
To determine changes in stride frequency, the subjects performed 16 different combinations of speed (8, 10, 12, and 14 km/hr) and grade (1.0, 2.0, 3.0, and 4.0). The number of foot contacts for speed and grade were recorded.

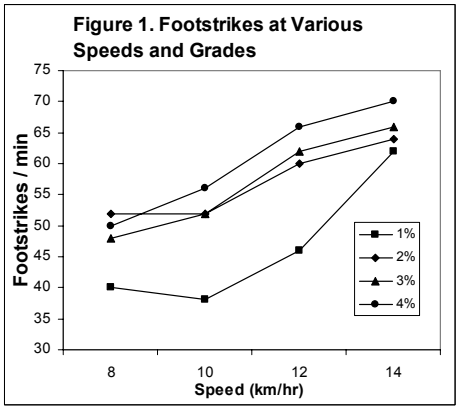

Figure 1. Footstrikes at Various Speeds and Grades

A high speed video camera, positioned for a lateral view, captured video data at 120 Hz. Reflective markers were used to analyze the ankle, knee, hip, shoulder, and elbow joints. Video data were analyzed using a PEAK 3D motion capture system to determine peak angular velocities (Peak Performance Technologies, Centennial, CO). Concurrently, a Biopac MP100A System was used to collect electromyography (EMG) data (Biopac Systems, Goleta, CA). EMG electrodes placed on the gastrocnemius medialis, tibialis anterior, rectus femoris, and semitendinosus were used to determine muscular involvement during skateboarding (Cram, 1997). Mean iEMG activity, expressed as a fraction of Maximum Voluntary Contraction, was determined for each muscle.

DISCUSSION: Data collection will continue through May, 2007. Results will be available for the ISBS Conference in August of 2007. Pilot data indicate increases in stride frequency with increases in speed or grade (Figure 1). EMG data show major involvement of the tibialis anterior and rectus femoris.

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