Bipedal In-shoe Kinetics of Skateboarding – The Ollie

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Introduction

- Skateboarding is a globally participated and popular sport with a reported participation of over 11 million in the US alone (4).
- The inherent nature of skateboarding makes it difficult to quantify using standard laboratory methods.
- Published epidemiological studies have stated the significant incidence of musculoskeletal injuries associated with skateboarding (1).
- In-field protocols have been attempted to quantify the metabolic demands of the activity, while only partial segments of a given movement have been quantified from a biomechanics perspective (1-2).

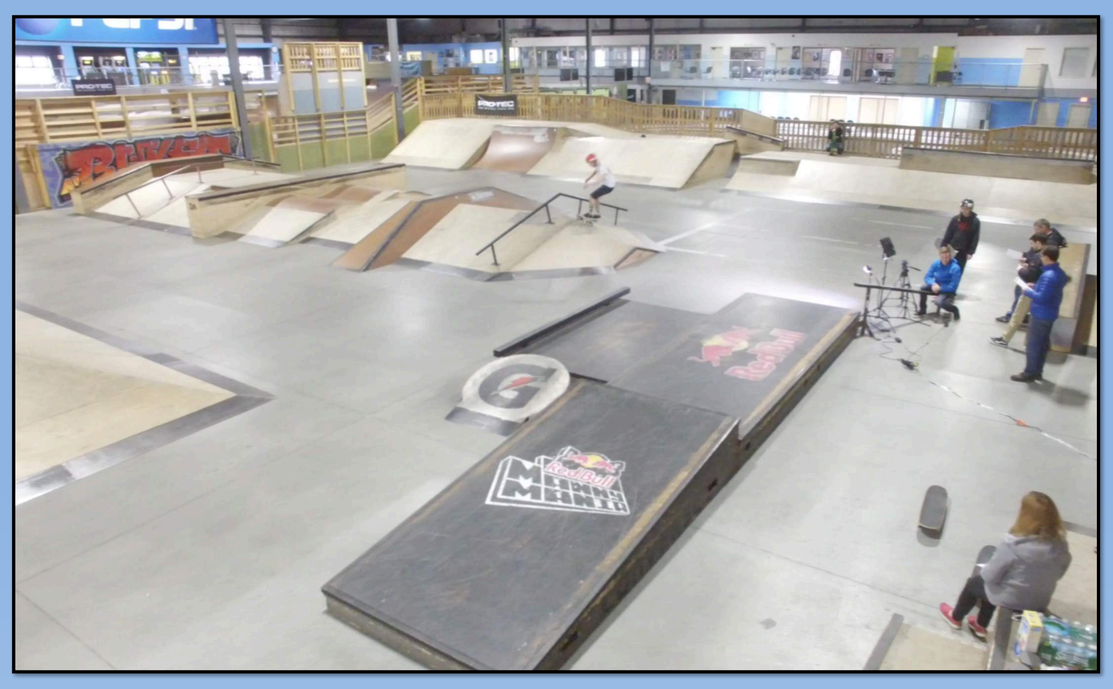


Figure 1. Rye Airfield, an indoor skatepark in Rye, NH which was utilized for the purpose of in-field testing.

Methods

- Four experienced male skateboard participants.
- Identical *Vans Authentic* footwear was worn and sized to each participant, as shown in figure 3.
- Three randomized conditions:
  - (1) Standing Ollie (SO)
  - (2) Rolling Ollie (RO)
  - (3) Ollie Down (OD)
- The OD maneuver was performed utilizing a 36.0 cm platform as show in figure 2.
- OpenGo (Moticon GmbH, Munich, Germany) wireless sensor insoles were utilized to continuously record underfoot forces at 50 Hz.
- Statistical comparisons were made using a single factor ANOVA (alpha = 0.05).

Figure 2. Platform that measures 36.0 cm in height that was utilized during the testing for the Ollie Down condition.

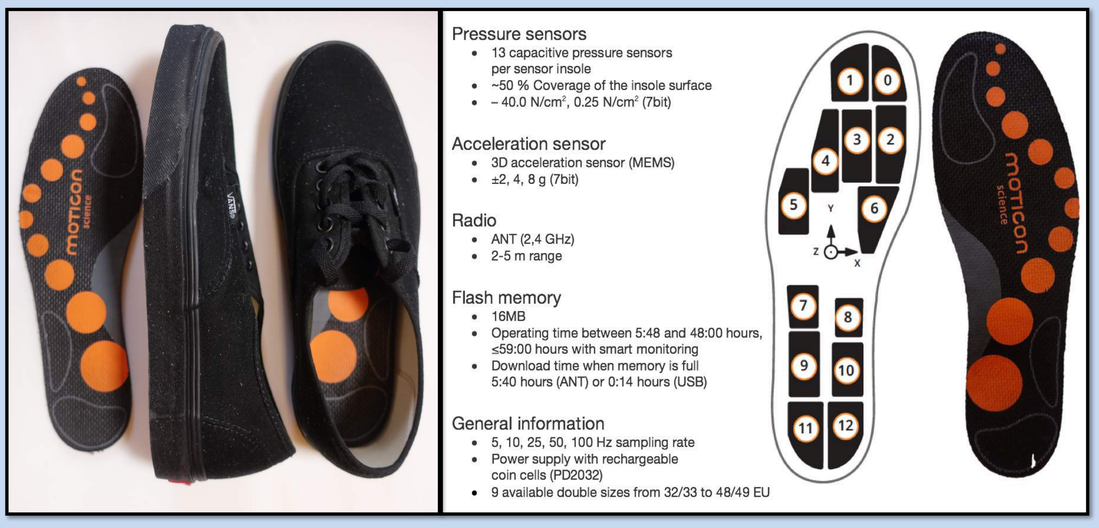
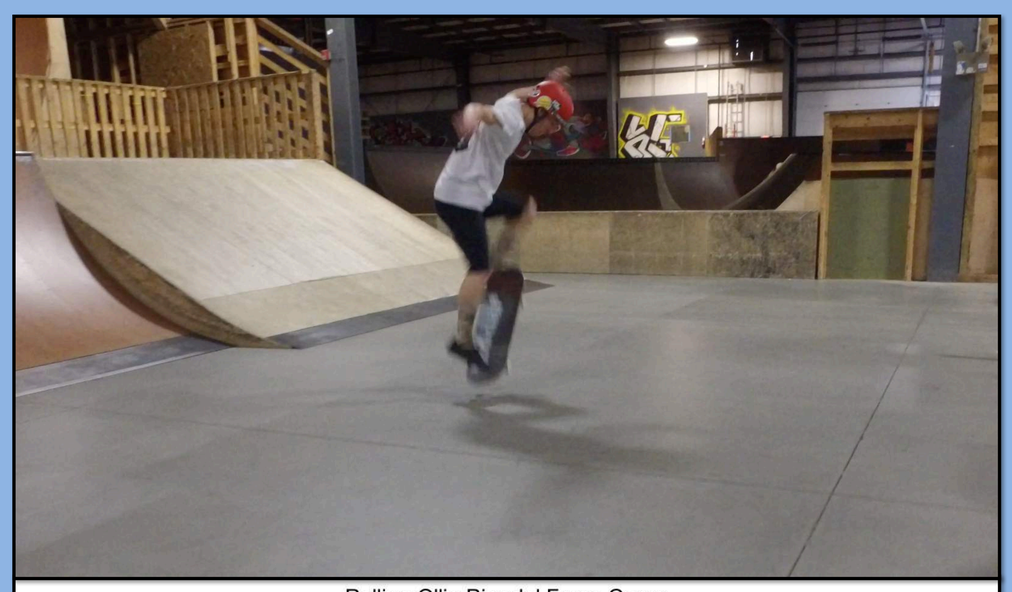


Figure 3. Vans Authentic footwear that utilized the OpenGo wireless pressure sensing insoles with the hardware specifications and a diagram of sensor placement.

Purpose

- The purpose of this pilot study was to quantify the basic skateboarding maneuver of the Ollie using novel methods and technology in the athlete's own environment.



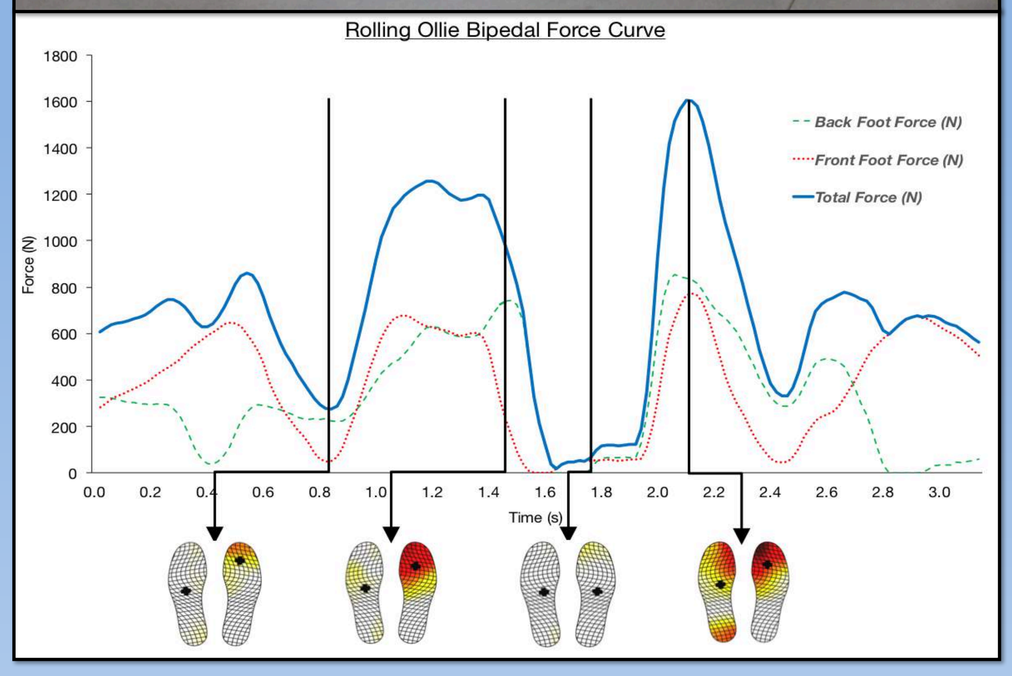


Figure 4. Forces and underfoot pressures from a Rolling Ollie trial and an image representing a captured moment post takeoff during the Rolling Ollie trial.

Results

Table 1. Takeoff and Landing Forces

Condition	Takeoff Force (BWs)	Landing Force (BWs)
SO	2.47 ± 0.38	2.40 ± 0.33
RO	2.55 ± 0.51	2.71 ± 0.23
OD	2.34 ± 0.32	3.15 ± 0.51

- Pressure distribution during takeoff and landing was centered around the medial forefoot in sensors 0, 2, and 3 shown in figure 3 and 4.
- Heel landings indicated a pressure distribution in sensors 11 and 12 as shown in figure 3.
- Landing patterns varied from heel, forefoot and a distribution between both, the heel and forefoot.

Discussion & Conclusion

- Measured takeoff forces were similar to previous studies that evaluated the impact forces from an Ollie movement (1,3).
- The landing forces in our findings were lower when compared to previous literature (3). This may be due to the OpenGo hardware limitations, testing method, or skateboard anatomy variability.
- Previous literature on skateboarding forces utilized force plates to determine the force measurements for the whole system (1,3).
- It is critical to keep in mind that the board, bushings, and wheels of the skateboard, as well as the footwear, may provide for shock attenuation.
- The OpenGo system differentiates itself by providing force measurements underneath each foot without the need for a tethered data logger on either the distal limb or waist of the subject (5).
- The unique methods of data collection in this pilot study allows the subject to perform in his or her given environment without external influence from testing equipment.
- Limitations include the OpenGo hardware, skateboard anatomy variability, and skateboarding maneuver variability.

References

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