Wii balance board as a device for investigating kayak's biomechanics: pilot study

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Abstract

Background: *The Wii Balance Board (WBB) is validated as an effective device for assessing the postural sway. In this pilot study, we evaluate the use of WBB during kayaking.*
Methods: *The monitoring was carried out on an international male kayaker (Age: 35 y, height 1.82 m, weight 76 kg) performed 3×100 [m sprints on an Olympic K1 kayak with a WBB (100 Hz) modified as seat at 1.01, 1.18 and 1.54 Hz paddling frequency (freq)]. Kayak's velocity was clocked.*
Results: *Kayak's velocity increased (+23% with respect to lowest value) linearly (r=0.99) over freq. Due to COP kinematics over increasing freq, COP (and BCOM) Ws increased linearly (r=0.96) over kayak's velocity as well (+50 and +100%, respectively).*
Conclusion: *The study of COP and BCOM biomechanics could reveal to be helpful for both improving performance and reducing injury in kayaking.*

Keywords: *Wii Balance Boar, postural sway, kayaking*

Introduction

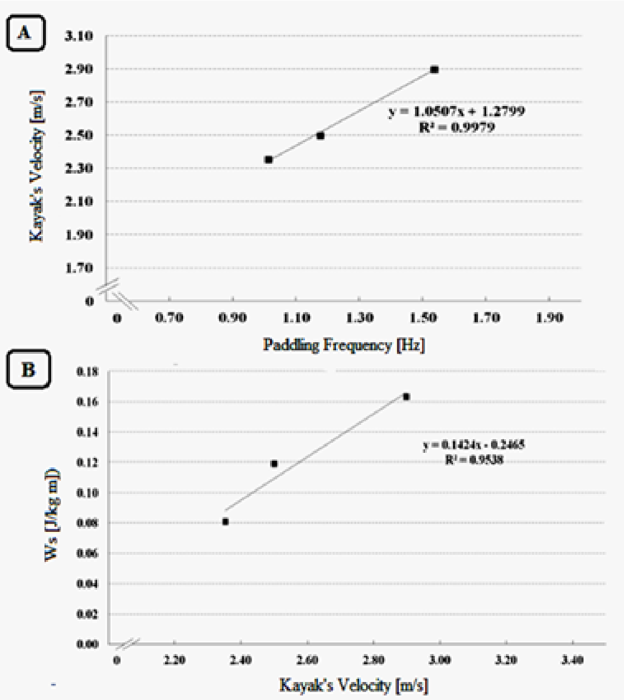
Considering the validated use of the Wii Balance Board (WBB) as an effective device for assessing the postural sway [1], we believe that WBB can be used during kayaking too. This may prompt to a simple way to estimate 2D velocity and mechanical work at seat (Ws). The power developed by the paddler is transferred to the kayak through the application of forces against foot bar and seat [2]. The seat is fixed in the propulsive direction and contributes to the net propulsive force [3].

Materials and Method

One international male kayaker (Age: 35 y, height 1.82 m, weight 76 kg) performed 3×100[m sprints on an Olympic K1 kayak with a WBB (100 Hz) modified (Figure 1) as seat at 1.01, 1.18 and 1.54 Hz paddling frequency (freq). Kayak's velocity was clocked. 2D antero-posterior and medio-lateral COP positions over time were firstly used to calculate its instantaneous velocity (v). Then v was put into the mechanical kinetic energy equation: Ek = $^{1/2}$ mv2, with m as subject's mass. By assuming a) seat force rigidly transferred to kayak, b),

Figure 1. Kayak's seat

most of the weight supported by the seat and c) negligible contribute to subject's kinematics due to the reciprocating upper arms' movement during paddling (positive)ΔEk resembles athlete's centre of pressure(COP)



Ws and – through just a constant displacement offset – his body centre of mass (BCOM) Ws as well.

Results

Kayak's velocity increased (+23% with respect to lowest value) linearly (r=0.99) over freq (Figure 2A). Due to COP kinematics over increasing freq, COP (and BCOM) Ws increased linearly (r=0.96) over kayak'svelocity as well (+50 and +100%, respectively; Figure 2B). Such a specific variables' combined change could prompt to develop new efficiency indexes to support different level kayakers to optimize their paddling technique. Such an ecological approach could be useful for Ws analysis in kayak-ergometer too.

Discussion

The results of this pilot study are promising. Further athletes of different racing level could be investigated by means of the described methodological approach during both training and race. The study of COP and BCOM biomechanics could reveal to be helpful for both improving performance and reducing injury in kayaking.

References

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