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Abstract

Instrumented Treadmill with an Accelerometry System: A Valid and Reliable Tool for Running Analysis †

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Abstract: Concurrent biofeedback has been demonstrated to be an effective strategy to reduce running-related injuries (RRI) [1,2,3]. The majority of these RRI are overuse injuries related to impact accelerations [4,5]. However, information regarding impact accelerations is not accessible to the entire population since it requires an accelerometry system. The objective of this study was to investigate the validity and reliability of a new accelerometry system placed directly into the treadmill (AccTrea), and compare it to the traditional system placed directly on the athlete's body (AccAthl). Thirty recreational athletes with no history of lower body injuries performed two running tests on different days. They ran for 5 min at 10 km/h and 0% slope and acceleration impacts and spatio-temporal parameters were collected in two sets of 10 s during the las minute taken in each measurement session. The first session intended to assess the validity of an AccTrea versus an AccAthl, and the second session intended to test the reliability. The results showed that AccTrea is a valid and reliable tool for measuring spatio-temporal parameters like step length (validity intraclass correlation coefficient (ICC) = 0.94; reliability ICC = 0.92), step time (validity ICC = 0.95; reliability ICC = 0.96), and step frequency (validity ICC = 0.95; reliability ICC = 0.96) during running. Peak acceleration impact variables manifested a high reliability for both left (reliability ICC = 0.88) and right legs (reliability ICC = 0.85), and peak impact asymmetry demonstrated a modest validity (ICC = 0.55). The valid and reliable results, make the AccTrea system an appropriate tool to inform athletes about their running mechanics, bringing the laboratory data closer to the running community.

Keywords: keyword 1; keyword 2; keyword 3 (List three to ten pertinent keywords specific to the article yet reasonably common within the subject discipline.)

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1. Patents

European patent application with reference EP3735900A1 and entitled "Treadmill for sport training" in May 2019.

U.S. patent application with reference US20200353309A1 and entitled "Ergometric treadmill for sport training" in May 2019.

Chinese patent application with reference CN111905333A and entitled "Force measuring running machine for sports training" in May 2019.

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References

1. Crowell, H.P.; Davis, I.S. Gait retraining to reduce lower extremity loading in runners. *Clin. Biomech.* **2011**, *26*, 78–83.
2. Eriksson, M.; Halvorsen, K.A.; Gullstrand, L. Immediate effect of visual and auditory feedback to control the running mechanics of well-trained athletes. *J. Sports Sci.* **2011**, *29*, 253–262.
3. Wood, C.M.; Kipp, K. Use of audio biofeedback to reduce tibial impact accelerations during running. *J. Biomech.* **2014**, *47*, 1739–1741.
4. Derrick, T.R.; Dereu, D.; McLean, S.P. Impacts and kinematic adjustments during an exhaustive run. *Med. Sci. Sports Exerc.* **2002**, *34*, 998–1002.
5. Mizrahi, J.; Verbitsky, O.; Isakov, E.; Daily, D. Effect of fatigue on leg kinematics and impact acceleration in long distance running. *Hum. Mov. Sci.* **2000**, *19*, 139–151.