Wearable system feedback requirements for improving running technique

Citation for published version (APA):

Document status and date:
Published: 13/04/2018

Document Version:
Accepted manuscript including changes made at the peer-review stage

Please check the document version of this publication:
• A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher’s website.
• The final author version and the galley proof are versions of the publication after peer review.
• The final published version features the final layout of the paper including the volume, issue and page numbers.

Link to publication

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

• Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
• You may not further distribute the material or use it for any profit-making activity or commercial gain
• You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the “Taverne” license above, please follow below link for the End User Agreement:
www.tue.nl/taverne

Take down policy
If you believe that this document breaches copyright please contact us at:
openaccess@tue.nl
providing details and we will investigate your claim.

Download date: 30. Apr. 2021
WEARABLE SYSTEM FEEDBACK REQUIREMENTS FOR IMPROVING
RUNNING TECHNIQUE
Jos Goudsmit*a,b, Mark Janssena,b, Simone Luijtena, Steven Vosa,b
aFontys University of Applied Sciences – School of Sport Studies,
Theo Koemenlaan 3, 5644HZ Eindhoven, The Netherlands
bEindhoven University of Technology – Department of Industrial Design, De Zaale, 5612AJ
Eindhoven, The Netherlands
e-mail: j.goudsmit@fontys.nl

ABSTRACT
Within the growing market of sports-related wearable devices, dozens of consumer available products analyze running technique and provide feedback to the user. Feedback is used to direct the users’ focus of attention and influences motor learning and performance [1]. To improve running performance feedback should target key points within running biomechanics [2]. Aim for this study was to define feedback requirements for improving running technique using wearable devices.

First, a screening protocol was developed based on: (i) the OPTIMAL theoretical framework [1], (ii) running biomechanics [2] and, (iii) observations of six running coaches. Second, four wearables were tested according to the protocol (Stryd, HRM-Run™ (Garmin), SHFT and TICKRx (Wahoo)). Third, results were reviewed and four experts identified future requirements in a focus group using MoSCoW method.

Four topics were included in the screening protocol: (i) running biomechanics key points, (ii) feedback, (iii) instruction and motivation, and (iv) individual tailoring. Empirical testing of the wearables showed that cadence, ground contact time and vertical oscillation were measured with all wearables. Each wearable measured additional parameters such as power, impact force, toe-off angle, and smoothness. Feedback provided by the wearables is visual feedback displayed in numbers, additional visualisations were available in TICKRx and Garmin HRM-Run™. Instruction on running technique is provided by SHFT only. Motivation is present in SHFT and Garmin HRM-Run™.

Review of the biomechanical key points by the experts showed that only two less relevant running biomechanics key points were measured and the direction of feedback promotes external focus.

In conclusion, consumer available running wearables promote an external focus of attention but not on the relevant biomechanical key points determining proper running technique. Feedback requirements were identified as measuring more relevant key points and providing feedback without interpretation from the combination of all key points. Tailoring and motor learning are required to be improved by taking earlier sessions as a reference for constructing the individual bandwidth of key points. The identified biomechanical key points within the described study [3] were used in a follow-up study aimed at measuring and relate these key points to the running performance during the half marathon in Eindhoven. Video observations and wearable data were obtained in 18 runners. Results on measured key points in a single runner as found in this study will be included in the presentation.

Acknowledgments: This work is part of the project Nano4Sports, which is financed by Interreg Vlaanderen-Nederland.

Keywords: running technique; wearable; feedback; tailoring

REFERENCES