3D ANALYSIS AND DETERMINATION OF STRIDE PARAMETERS FOR DIFFERENT TYPE OF FOOT STRIKE IN RUNNING.

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Introduction

In running, the analysis of the stride has been investigated in different studies. There are a lot of kinematics and kinetics differences between runners (Dicharry, 2010; Larson et al, 2011). The purpose of the study was to compare methods for the calculation of various parameters of the stride for runners with different foot strike patterns. A 3D optoelectronic system usually used in motion laboratories was compared with tools commonly used on the field: an optical based detection system (Optogait) and an accelerometer based system (Myotest).

Methods

Twenty male subjects (33±10 yrs), all practicing athletics, were divided into two groups: the Heel group; attack the ground with the heel (n=12), and the Toe group; attack the ground with the middle or front of the foot (n=8). They performed a 30 seconds trial at speeds of 8 then 16 km/h for 3D analysis, and repeated the trial for the Optogait-Myotest analysis. Six 3D algorithms to determine contact time were compared.

Results

To detect foot strike, the use of the first peak velocity between two different 3D markers provided the best results. For the heel group of runners, the first peak velocity was coming from a marker placed at the center of the heel, while a marker facing the fifth metatarsal head provided the first peak for the Toe group. To detect the toe off, the minimum vertical position of a 3D marker placed in line with the big toe gives the most satisfactory results for both groups. Using these peak velocity and these markers, there were no significant difference with the Optogait values (P>0,05).

Regarding the entire group (n=20), the method taking the first peak velocity between the heel marker and the fifth metatarsal marker to detect foot strike seemed the most convenient. This method is statically equivalent (p>0,05) to the results of the Optogait (eg: contact time=227±16ms for 3D vs 222±14 for Optogait at 16km/h) for the combined group, whatever type of foot strike a runner has.

Discussion

The main objective of this study was to validate a 3D method of calculating the different strides parameters, focusing primarily on the contact time. Once the contact time methods are validated, other strides parameters such as fly time, reactivity, stride length and stride frequency can also be assessed, based on the same detection of event. However, it seems that the most valid method to determine foot strike differs with the type of runner. In conclusion, 3D analysis provides interesting opportunities for calculation of the stride analysis, allowing to give precise numerical feedback on athletes running strides.

References

Dicharry J. (2010). Clin Sports Med. 20 (3), 347-64. Larson P, Higgins E, Kaminski J, Decker T, Preble J, Lyons D, McIntyre K, Normile A (2011). J Sports Sci, 29, (15), 1665-73.

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