A SINGLE CAMARA PANNING VIDEO METHOD TO OBTAIN THE BASIC CHARACTERISTICS OF SPEED RUNNING IN SPRINT RUNNING

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The purposes of this study were to develop a method to achieve basic kinematics parameters in sprint competition situation suitable for normal coaching usage. 1) A simple method to obtain the basics characteristics of speed running -strides length and strides frequency- over an entire 100m sprint running using only one simple video camera. 2) A procedure to apply in track and field without using any placing mark on the track, but try to use the natural marks placed on tracks (50m and 60m starts, and the 100m 110m and 400m hurdles marks, podiums, anemometers, publicity placards, jump boxes, etc ...). The results revealed similarities between the data obtain from the photo-cells and from one panning video camera, suggesting that this method used by us to calculate the distances is valid. In addition to being used for sprint this technique can also be used to built speed curves in hurdling races, approach running of jumps (long, triple, pole vault) and javelin throwing.

KEY WORDS: panning video, sprint running, speed curve, stride length, stride frequency.

INTRODUTION: The sprinters will require more than just the finish time, to evaluate race proficiency and to prepare properly the competition. Objective information concerning horizontal velocity, stride length and stride frequency variation during a 100m sprint is indispensable to make proper coaching decisions. The velocity curve of 100m run reveals the change of velocity during the entire distance, allowing the division of the event in different phases (start, first acceleration, second acceleration, maximal velocity, deceleration, finish). During training using photocells the coach can easily determinate the velocity in different phases of the 100m run. However to achieve these information in competition the coach need expensive means (high speed videos, or more than one video, or laser measurement devices) of measurement that are not suitable for normal coaching usage.

METHODS: Ten sprinters run on an outdoor synthetic track surface, wearing spike shoes. The time of each ten meters intervals (10m ...100m) of each trial was recorded using photocells. For the Data collection we used one video camera (JVC GR-DVL 9800 digital video camera) that follow the subject's run over the entire 100m, placed on a tripod in the sagittal plane of the running lane. The video camera was placed in middle field at 35m from the center of the track, recording at 50 Hz in interlace way. Using a interlace filter to removes scan line artifacts from interlaced video we can get 100 Hz, having two images side-by-side. In order to calibrate the running track, we used 40 control points placed along the inside and outside the lane, separated by five meters, to determine the positions of the athlete along the track in order to calibrate all the area (figure 1). To compute the real distances of the stride length, we apply the Hay and Koth (1988) method. We used always the instant of touchdown on the same stride cycle phase, to minimize the error during the computation of the stride frequencies.

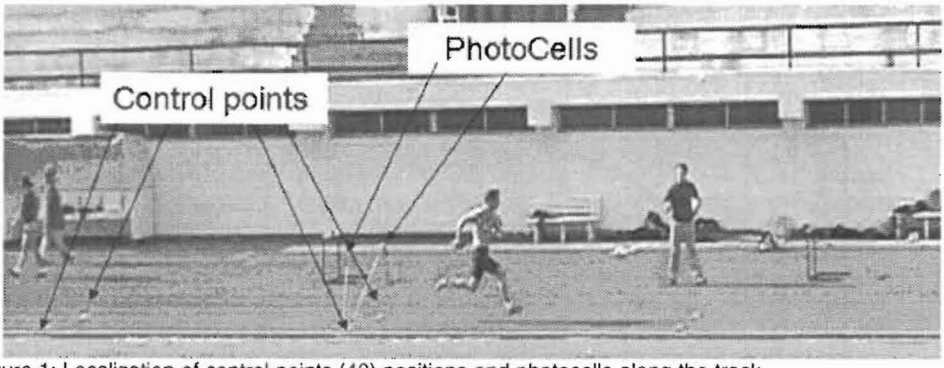

Figure 1: Localization of control points (40) positions and photocells along the track.

Four control points define plane witch the athlete will contact the ground, and those control points with helps to compute the distances form a foot ground contact to the nears strait line off the control points (d1 o d2). (figure 2).

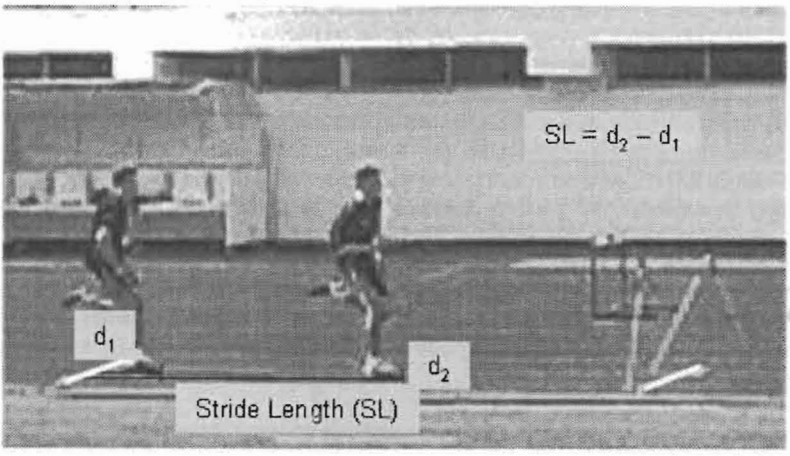

Figure 2: Amplitude of a stride length.

The procedure to compute the distance used was an AVI clip from each trial and the four control points inside the contact point.
The data were computed using the ANAMOVH (Analyze of Human Movement) it's a software developed and easy access to the user, not expensive and friendly use without loosing methodological precision. It generally uses the same procedure of other analysis systems, to validate the calculated velocities we used the data from the photocells
Data analysis: The speed curve (stride lengths and stride frequency) obtained with the panning video were compared with the speed curve (times of each 10m sections) obtained with the photo-cells. The mean, standard deviation and standard error deviation of the partials were computed for the complete sample. The mean difference between the compute velocities and the photo cells velocities are 0.0047 0.17 m.s-1, and a standard error of 0.18 ms-1.

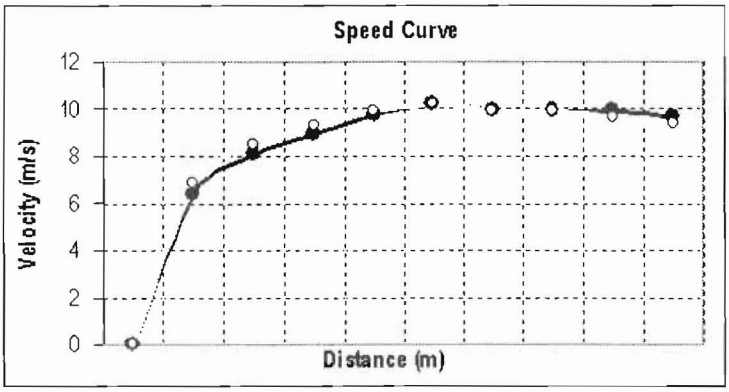

Figure 3: The speed curve obtain 1) from the photo-cells (cells) and 2) from the video camera (AnaMovH).

RESULTS AND DISCUSSION: The results obtain for one single athlete revealed similarities between the data obtain from the photocells and from the video camera (figure 2).

CONCLUSION: The results of the present study suggest that this method used by us to calculate the distances is valid. If the differences between the sums of partial jumps are less then 2%, we can conclude that the partial distances should have the same quantities error. Such errors are considered acceptable for speed, stride and frequency curves obtain in competition situation. When this technique is implemented in competition situation, it is recommended that two panning video cameras be used, each covering 50-60m of the race, because of the size of the image (smaller), and a very careful measured of the competition area (marks placed on track -figure 3,- podiums, anemometers, publicity placards, jump boxes, etc.) to control all the results. In addition to being used for sprint this technique can also be used to built speed curves in hurdling races, approach running of jumps (long, triple, pole vault) and javelin throwing.

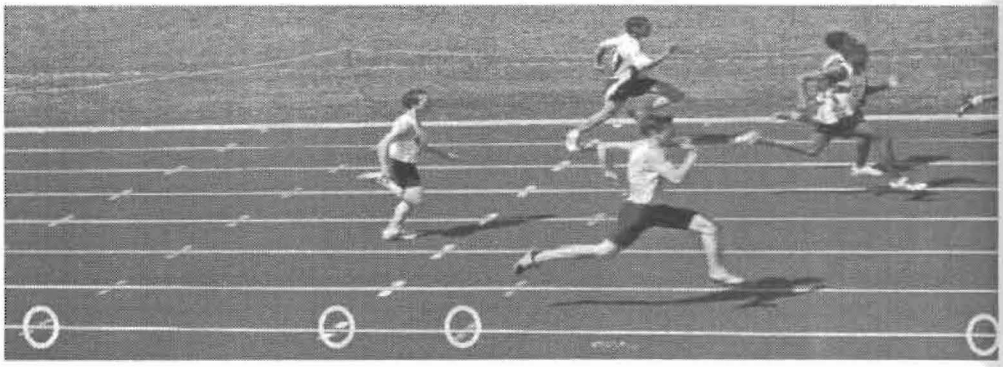

Figure 4: Same of the usual marks placed on tracks (50m and 60m starts, and the 100m 110m and 400m hurdles marks ...).

REFERENCES:

Hay J. & Koh, T. (1988). Evaluating the approach in the horizontal jumps. International Journal of Sport Biomechanics, 4, 372-392.