The difference is in the start: impact of timing and start procedure on sprint running performance

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Introduction

A review of published studies monitoring speed performance reveals considerable variation in timing methods and hardware manufacturers. Because of the role of the Norwegian Olympic training center (NOC) as a national high performance testing facility, in the present study we have quantified the test-retest reliability of our standard procedures. In addition, we have simultaneously compared several popular start and timing procedures to generate correction factors that should facilitate more meaningful comparisons of published sprint performance results.

Methods

The data collection served two purposes: 1) validation of the Brower hand pod and NOC floor plate methods of timer initiation against video based timing and 2) independent comparison of three commonly used starting positions, measured by different timing methods, and their impact on sprint time. Volunteer, trained track and field athletes (n=25) performed two series of three maximal 40m sprints indoors on a dedicated Mondo test track used by the NOC. Rest between sprints was 6 minutes. Pause duration between the two series was 20 min. In each series, sprinters performed three sprints in randomized order under the following conditions: a) start from standard sprinter blocks with gunfire, measured by both Brower Timing with audio speaker sensor and Dartfish video, b) 3-point start with fingers placed on a timer触发pad at the start line, measured by both Brower and Dartfish, and c) standing rocking start leaning back prior to sprinting, measured by both Brower, Dartfish, and a dedicated system used by the NOC employing an imbedded pressure sensor below the track surface. The different timing methods and starting positions compared are presented in Figure 1.

Results and discussion

The coefficient of variation for test-retest timing using different starting positions ranged from 1.2 to 1.7%, with the block method being the most reliable in a group of athletes familiar with this start method. The key finding of the present study is that the starting method and timing system used can combine to generate large absolute differences in "sprint time". Figure 2 shows that 3-point finger pod starts, standing photo cell starts and standing floor plate starts provide 0.17, 0.27 and 0.69 s faster times respectively over 40 m compared to starts from blocks reacting to gunfire.

At the extreme, a 40m sprint time of 4.4 sec. measured from a standing start with triggering via floor sensor below the front foot is a poorer performance than 5.0 sec. measured from starting blocks with time initiated by a starter’s gun. The method of sprint timing used can result in greater differences in sprint time than several years of a conditioning training program. These differences are essentially absolute. Therefore, their impact on interpretation of shorter sprint distance performances would be even greater. Comparison of sprint timing results without consideration of the specific start configuration and timing methods can make for a lot of confusion. For internal comparisons of performance in a training monitoring setting, changing timing methods is unacceptable.

Figure 1. Body position at timer triggering for different start methods compared. A) Block start, B) Three-point start with hand release, C) Standing start with photo cell trigger, D) Standing start with floor sensor trigger below front foot.

Figure 2. Correction factors between starting positions (block starts as reference)