Number of Trials for the Reliable Golf Swing Ground Reaction Force Data Collection and Its Characteristics

Park, Young-Hoon (Pusan National University); Youm, Chang-Hong (Pusan National University);
Seo, Kuk-Woong (Pusan National University); Seo, Kook-Eun (Pusan National University)
박영훈 (부산대학교); 염창홍 (부산대학교); 서국웅 (부산대학교); 서국은 (부산대학교)

Published: 2007.12.31

https://doi.org/10.5103/KJSB.2007.17.4.115

Abstract

Ground Reaction force (GRF) is important in human movements and GRF measurements are one of the most frequently used tools in biomechanical studies. In the studies of the golf swing motion, people refer to GRF as weight transfer. A successful golf swing motion requires many segments activation sequences which are controlled by the nerve system. Due to the inter- and intra-individual variability of the human movement and the movement strategies, reliability of the measurements are important in human movement studies. Previous golf researches were based on group studies and certain events’ values were analyzed. The purposes of this study were to determine the number of trials for the reliable golf swing GRF data collection, to reveal the variability level of the meaningful components of the golf swing GRF, and to classify the types of the golf swing GRF patterns. Twenty three male professional golfers (26.4 ± 6.6 years, 174.3 ± 5.2 cm, 71.3 ± 6.5 kg) signed an informed consent form prior to participation in this study. GRFs of driver swings were collected with Kistler 9285 force platform and 9865A amplifier, and calculated by the KwonGRF program (Visol, Korea). Sampling frequency was 1080 Hz. GRF data were trimmed from 1.5 s prior to the impact to 0.5 s after the impact. The number of trials for the reliable GRF collection was determined when the change in floating mean over the 25 % of the standard deviation of that variable. Variabilities of the variables were determined by the coefficient of variation (CV) of 10 %. The types of GRF patterns were determined by visual inspection of the peak GRF shapes. The minimum number of trials for the reliable golf swing GRF data collection was five. Ten-trial seems more conservative. The value of the peak GRF was more reliable than the value of the impact GRF. The CV of the peak GRF and impact GRF were 7.4 %, 15.2 %, respectively. Because of the +/- sigh of the peak GRF appearance time, it was impossible to calculate CV of the peak GRF appearance time. Golf swing GRF patterns were classified as sing peak type, double peak type, and plateau peak type. This classification suggests the presence of the different golf swing weight transfer strategies.
References


---

Cited by

2. Golfers or golf instructors who wish to view a golf swing sequence in the field can simply record a constrained video of a single golf swing on a mobile device, ensuring that the subject is centered in the frame. This eliminates the need for spatio-temporal localization. 3. A video sample containing a single golf swing instance will consist of a specific number of events occurring in a specific order. This information can be leveraged to improve detection performance.

Golf Swing Events. A collection of 580 YouTube videos containing real-time and slow-motion golf swings was manually compiled. For the task of golf swing sequencing, it is important that the shaft remains visible at all times. To alleviate obscurities caused by motion blur, only high quality videos were considered. During the golf swing, the reaction forces applied at the feet control translation and rotation of the body-club system. In this study, we hypothesized that skilled players using a 6-iron would regulate shot distance by scaling the magnitude of the resultant horizontal reaction force applied to each foot with minimal modifications in force direction. Skilled players (n = 12) hit golf balls using a 6-iron. During each swing, reaction forces were measured using dual force plates (1200 Hz) and three-dimensional kinematics were simultaneously captured (110 Hz). The swing is a key movement for golf. Its in-field performance could be estimated by embedded technologies, but often only vertical ground reaction forces (VGRF) are estimated. A number of papers have investigated the function of the shoulder muscles during the golf swing. 7–9 Research at the Kerlan Jobe Orthopaedic Clinic, Los Angeles, California collected data from different golfer groups. 7–9 Male professional golfers were the subjects in one study. The data were then reported again on sequential occasions after the addition of subjects/groups (women, amateurs) to the data set and after advances in technology. The final paper by Pink et al 7 reports on the combined data, which are used in this review. Studies performed by Kao et al 5 and Jobe et al 10 analysed...