Docket #: S11-252

Golfing with Science: A Wearable Device for Measuring Golf Swing Biomechanics

Stanford scientists in the LPCH Motion & Gait Lab, Department of Orthopedic Surgery, and Ladd Lab have developed a biomechanical analysis of the golf swing using a lightweight, wearable, and wireless device that monitors a player's golf swing on the course to give real-time, lab-validated insights for improved performance and reduced injury. The device consists of a pair of coin-sized IMUs (inertial measurement units) placed on the skin at the upper and lower spine that allow the user to measure and analyze rotational biomechanical parameters like the S-factor (shoulder obliquity), O-factor (pelvic obliquity), and X-factor (relative hip-shoulder rotation), which research indicates are strong determinants of clubhead speed at impact (CSI) and driving distance. By collecting rich kinematic data that can be communicated to a mobile device or tablet, this technology allows real-time golf swing feedback and monitoring and comparison to pro benchmarks to enhance the player's performance over time. While the technology is validated for golfing, it could be extended to a variety of sports like martial arts, baseball, tennis, and more.

type="video/webm">

type="video/mp4">

Video Description: A demonstration of the technology in action in the lab and on the course. (Video provided by inventors with permission of all participants. Music and stock footage used with permission from Canva, Inc..)

Stage of Development
Prototype device validated on the course and in the lab with professional and amateur golfers

Technologies Included:

11-252 + 22-146

Inventors for 22-146

Innovators & Portfolio

- Jessica Rose
- Kornel Schadl

Inventors for 11-252

Innovators & Portfolio

- Amy Ladd
- David Meister
- Jessica Rose
- Katherine Steele

Applications

- Wearable device for on-course monitoring of golf swing for improved performance and reduced injury

Advantages

- Pair of lightweight IMU devices each the size of a quarter brings laboratory biomechanical insights to the golf course
- Provides real-time and accurate feedback for faster performance improvement
- Tracks improvement over time upon integration with a mobile app

- Benchmarks user swing against data from pro-golfers
- Provides rich insights validated with laboratory kinematic studies

Publications

- Steele, Katherine M., et al. "Golf swing rotational velocity: The essential follow-through." Annals of Rehabilitation Medicine 42.5 (2018): 713.
- Meister, David W., et al. "Rotational biomechanics of the elite golf swing: Benchmarks for amateurs." Journal of applied biomechanics 27.3 (2011): 242-251.

Patents

- Published Application: 20130029791
- Published Application: 20140257538
- Issued: 8,696,450 (USA)
- Issued: 9,656,121 (USA)

Innovators

- Jessica Rose
- David Meister
- Amy Ladd
- Katherine Steele

Licensing Contact

David Mallin

Licensing Manager, Physical Sciences

Email