

# Alternative Methods for Chipping in Golf

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### BACKGROUND

- Chips are golf shots from just outside the green that require low impact forces but high accuracy. Golfers who have physiological tremors (e.g., focal dystonia) may experience jerky hand motions that can ruin a chip.
- We are exploring alternative chipping methods that may reduce the detrimental effects of tremors:
  - using a less-lofted "hybrid" club with the golfer's preferred grip
  - using a hybrid club with a novel "arm-lock" grip



Wedge with Standard Grip    Hybrid with Standard Grip    Hybrid with Arm-lock Grip

### HYPOTHESES

- Golfers, both affected and not by tremors, who commonly use a wedge with a standard grip may exhibit better chipping performance if they
- use a hybrid with a standard grip
  - use a hybrid with the arm-lock grip

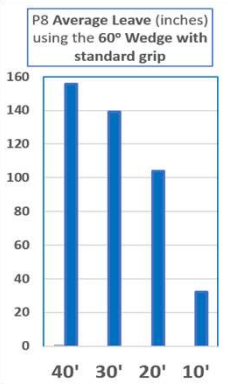
### METHODS

- Will collect performance, video (Osmo), and biomechanical data (Blast Motion) from 64 experienced golfers, 32 with tremors and 32 without
- 40 chips to 4 targets using each of the three club/grip combinations
- Will evaluate accuracy by measuring final ball positions and compare within each participant and across groups
- Will process video images using markerless motion capture algorithms

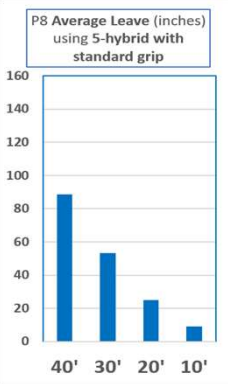
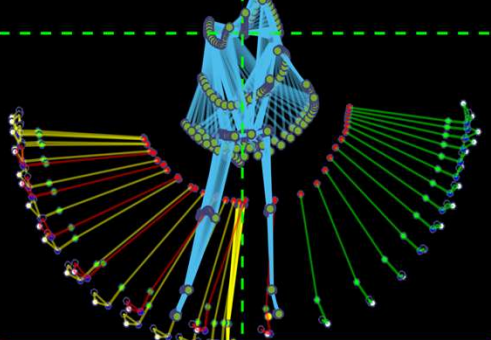
### PRELIMINARY RESULTS

- 23 participants (9 with focal dystonia) to date demonstrate **26-30% average improvement** in chipping performance using the hybrid club
  - With both grip methods
  - Independent of presence or absence of tremor

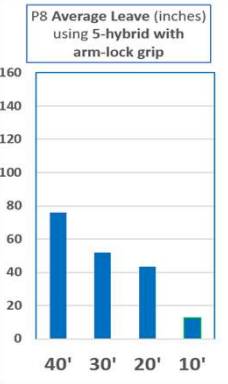
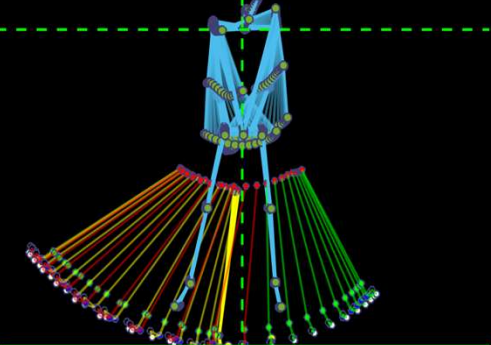
To their surprise, most participants (19/23) chipped better with their hybrid club than with their own preferred wedge.



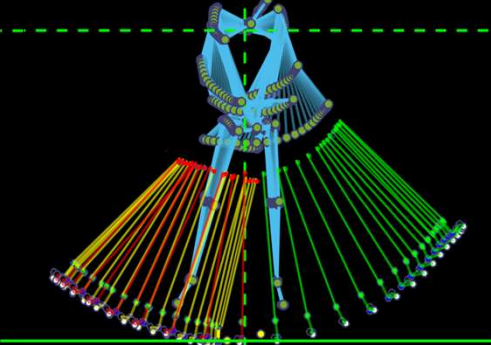
P8 Swing using the 60° Wedge with standard grip (Chip #32)



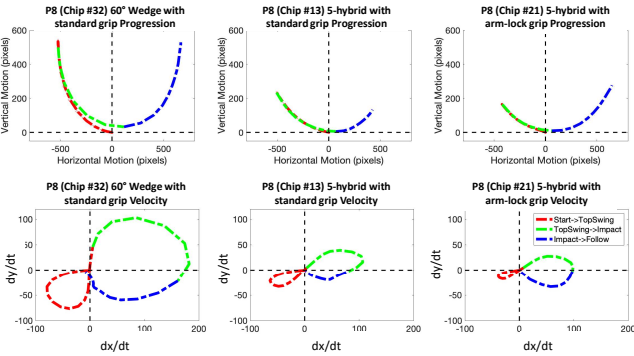
P8 Swing using the 5-hybrid with standard grip (Chip #13)



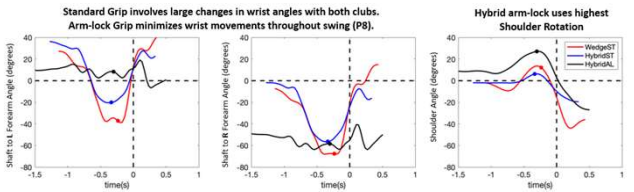
P8 Swing using the 5-hybrid with arm-lock grip (Chip #21)



Data for Participant #8 (P8; male, age 27, no tremors) using the wedge (top diagrams), hybrid with standard grip (middle diagrams), and hybrid with arm-lock grip (bottom diagrams)  
**Left:** Average distances between ball and each of 4 targets (60 chips total)  
**Right:** Motion tracking during backswing (yellow), downswing (red), and follow-through (green)



For chips of similar lengths (43-45 ft in the examples above), golfers must generate a longer and faster swing using a wedge (left graph) vs. a hybrid with standard grip (center graph) or with arm-lock grip (right graph).



For chips of similar lengths, using a hybrid with arm-lock grip (black trace) minimizes wrist movements (left and middle graphs) and requires more shoulder rotation to execute the shot (right graph) vs. a wedge (red trace) or a hybrid with standard grip (blue trace).

### IMPLICATIONS

- Preliminary results support the notion that chipping with a hybrid club using either grip reduces the negative effects of physiological tremors.
- The improvements in performance when chipping with a hybrid club also extend to golfers who are not affected by tremors.
- For movement analysis studies such as the present one, OpenPose and DeepLabCut prove to be powerful tools that we believe will reveal additional features about the biomechanical basis of our observations.

### REFERENCES

Boesch, G. (2021, September 20). *A guide to openpose in 2021*. viso.ai. Retrieved December 31, 2021, from <https://viso.ai/deeplearning/openpose/>

Mathis, A., Mamidanna, P., Cury, K. M., Abe, T., Murthy, V. N., Mathis, M. W., & Bethge, M. (2018). Deeplabcut: Markerless pose estimation of user-defined body parts with deep learning. *Nature Neuroscience*, 21(9), 1281-1289. <https://doi.org/10.1038/s41593-018-0209-y>

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