2018 WORLD SCIENTIFIC CONGRESS OF GOLF | JULY 11-13, 2018 ABBOTSFORD, BRITISH COLUMBIA HOST: UNIVERSITY OF THE FRASER VALLEY

Assessing The Impact of Strength and Conditioning On Golf Swing Biomechanics and Performance

Aaron T. Trunt[1,2], Zadok J. K. Isaacs[2], and Lisa N. MacFadden[1,2]
[1] *Department of Biomedical Engineering, University of South Dakota, Sioux Falls, SD, United States*
[2] *Sanford Sports Science Institute, Sioux Falls, SD, United States*

- Nutrition and Fitness

Purpose: Golf has increasingly gained interest in the scientific world since some of the landmark research performed in the 1970s. Similarly, the role of strength and conditioning and the physiological changes associated with such training has been heavily researched in the past. However, how a strength and conditioning program may affect a person's golf swing has only recently been studied. The purpose of this study was to assess the changes a 14-week strength and conditioning program had on a golfer's club speed, ball speed, and accuracy for two different clubs.

Methods: This study was approved by the Sanford Institutional Review Board. Twelve (3 females and 9 males) middle and high school golfers were completed for the study (age 14-18). Subjects participated in a 14-week golf specific, group strength and conditioning program at the Sanford POWER Golf Academy which met twice a week. Each subject was tested before and after the strength and conditioning program and hit 10 balls with a driver and 10 balls with a 6 iron in the indoors Sanford Biomechanics Lab. Swing data was recorded using two high speed cameras (one positioned down the line and one positioned anterior to the golfer) and a FlightScope Xi launch monitor. Two-tailed paired T-Tests were implemented in MATLAB (Mathworks, Natick MA) to assess if changes in club head speed, ball speed, and accuracy were significant.

Results: Strength gains were evident in all subjects who completed the program with increases in weight of 10 or more pounds for all lifts performed. Accompanying those strength gains, a significant increase in club speed in the driver of 1.788 mph ($p<0.00001$) and in the 6 iron of 0.87 mph ($p=0.0146$). Driver ball speed also significantly increased by 2.04 mph ($p=0.0275$) while 6 iron ball speed also significantly increased by 2.27 mph ($p=0.02$). Furthermore, accuracy for both the driver and 6 iron also significantly increased with an improvement of 9.93 yards for the driver ($p=0.0026$) and 7.36 yards for the 6 iron ($p<0.0002$). Ball distance, however, as quantified by the FlightScope, did not increase despite the positive changes in club head speed and ball speed. These results are summarized in Table 1.

Table 1: Changes observed before and after strength and conditioning program completion.

	Club Speed (mph)		Ball Speed (mph)		Accuracy (yds L/R)	
Club	Driver	6 Iron	Driver	6 Iron	Driver	6 Iron
Before Training	93.53	82.29	133.57	106.49	13.09	7.39
After Training	95.32	83.16	135.61	108.76	3.17	0.02
Difference	+1.79	+0.87	+2.04	+2.27	-9.92	-7.37

Discussion: Overall, these findings support previous research findings for the effects of strength and conditioning on golf swing performance. While this pilot study has a low sample size and may have had limitations due to being indoors (particular for the ball distance and accuracy) these results are consistent with similar studies. Future studies should include a larger subject size and also include a control group to isolate the improvements associated with the strength and conditioning programming.

Practical Application/ Clinical Relevance: Previous research has found that an increase of just 1 mph in ball speed can increase drive distance by 2-3 yards. This means the golfers participating in the Sanford

POWER Golf Academy are getting more distance with their shots using both a driver and an iron, putting them closer to the green than before. Furthermore, an increase in accuracy of the shot is going to play an obvious role as well. With nearly a 10-yard increase in driver accuracy, that could prove to be the difference between a golfer hitting out of the rough or having a much easier shot from the fairway. Similarly, a 7-yard increase in iron accuracy could ultimately be the difference between a putt on the green, or a bunker shot like below. Overall, this study has shown very positive performance changes for golfers adding strength and conditioning training as an element to their golf practice and coaching.

- Please consider for either a podium or poster presentation