THE CLUBHEAD SWING PLANE IN GOLF DRAW AND FADE SHOTS

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INTRODUCTION

It has become popular to characterise a golf shot in terms of a 'swing plane'. However Coleman and Anderson (2007) showed that the motion of the whole club in the downswing could not be represented by a single plane in all players. Shin et al. (2008) found that the clubhead motion was consistently planar between the club being horizontal in the downswing and follow-through. Coleman and Anderson (2007) also suggested that the club plane might differ between draw and fade shots. The purpose of this study was to compare draw and fade shots, with a focus on the clubhead motion in the late downswing.

METHODS

15 right handed category one (handicap: 2.3 ± 2.1) male golfers hit 5 draw and 5 fade shots using a 5-iron in an indoors laboratory. Ball trajectory was determined using a launch monitor (Foresight Sports, San Diego, CA) and nFlight software (PING Inc, Phoenix, AZ). Successful shots must have finished within 10 yards of the target line, and moved 10-25 yards right to left in the air for a draw or 10-25 yards left to right in the air for a fade. Trials were captured using 8 Raptor-E cameras (Motion Analysis Corporation, Santa Rose, CA) recording at 460Hz. Three tracking markers on the clubhead were used to reconstruct a virtual marker on the centre of the clubface, which was used to represent the clubhead motion. Further markers were used to determine the orientation of the shoulders and feet at address. The raw coordinates were smoothed (cutoff 80Hz for the club and 20Hz for the body) and then interpolated to 2000Hz to help identify key events during the swing. A plane was fitted to the clubhead motion from downswing horizontal to the end of the downswing, using orthogonal least-squares regression (Willmott & Dapena, 2012). The orientation of each plane was determined relative to horizontal and to the target line. Data were compared using dependent T-tests.

RESULTS

Table 1 shows the plane orientations for the two types of shot in absolute terms and relative to the shoulder and feet alignment at address. There was a significant difference between the directions of the planes relative to the target line for the two shots. Small differences in direction remained when corrections were made for the address alignment of both the shoulders and feet. There was also a small, but significant, change in the steepness of the draw and fade planes.

	Draw	Fade	p-values
Clubhead Plane Angle to Target Line (˚)	-3.7 (1.6)	10.1 (2.9)	<0.001
Clubhead Plane Angle to Horizontal (˚)	59.4 (2.6)	60.8 (2.5)	0.001
Clubhead Plane Direction Relative to Shoulder Alignment (˚)	-1.9 (5.7)	1.6 (6.0)	0.001
Clubhead Plane Direction Relative to Feet Alignment (˚)	0.4 (3.7)	3.6 (3.5)	<0.001

Table 1: Clubhead kinematics in draw and fade shots. Positive and negative angles denote directions pointing to the left and right, respectively, of the stated reference line.

DISCUSSION

This study has been the first to investigate differences in the clubhead motion between draw and fade shots. Changes in address alignment accounted for most, but not all, of the differences in the direction of the late downswing clubhead plane. Future studies should further examine how skilled players change the clubhead motion relative to their bodies, and how this affects the shape of the shot.

CONCLUSION

The late downswing clubhead plane differs between a draw and a fade shot, even when differences in address angles are accounted for.

REFERENCES

Coleman, S., Anderson, D. (2007). An examination of the planar nature of golf club motion in the swings of experienced players. *Journal of Sports Sciences*, 25(7), 739-748.

Shin, S., Casebolt, J., Lambert, C, Kim, J., Kwon, Y. (2008). A 3-D determination and analysis of the swing plane in golf. *Proceedings of 26th International Conference on Biomechanics in Sport.*

Willmott, A., Dapena, J. (2012). The planarity of the stickface motion in the field hockey hit. *Journal of Sports Sciences*, 30(4), 369-377.