WEIGHT TRANSFER IN DIFFERENT GOLF SWING STYLES BASED ON SWING PLANE: A NONLINEAR DYNAMICS APPROACH

Sunghoon Shin, Pilwon Hur[1], Jeffrey B. Casebolt[2], and Young-Hoo Kwon[2]

Dept of Kinesiology and Community Health, and [1]Dept of Mechanical Science and Engineering, University of Illinois, Urbana-Champaign, USA
[2]Biomechanics Laboratory, Texas Woman's University, Denton, USA

KEY WORDS: swing styles, weight transfer, center of pressure, approximate entropy.

INTRODUCTION: Weight transfer has been considered as one of the most important aspects of golf swing in golf coaching theories. Previous studies present conflicting and restricted findings on weight transfer. The purpose of this study was to determine if swing style influences weight transfer pattern by analyzing select center-of-pressure parameters using the approximate entropy method.

METHOD: Ten professional golfers (handicap 1 or lower) participated in the study: four subjects classified as the one-plane group (mass: 177.8 ± 7.4 cm; height: 81.0 ± 14.9 kg; age: 28.3 ± 7.4 years) and six as the multi-plane group (177.5 ± 4.9 cm; 79.7 ± 6.5 kg; 42.0 ± 17.4 years) based on the trajectory of the club head (backswing top to end of follow-through). The combined center of pressure from two AMTI force platforms was collected at 100 Hz and select center of pressure parameters were compared among three different clubs (pitching wedge, 5 Iron, and driver) and between the swing styles.

RESULTS: The center of pressure parameters for the each groups are presented in Table 1.

Table 1 Summary of the Center of Pressure Parameters

	One-Plane Group (n = 4)			Multi-Plane Group (n = 6)		
	PW	5 Iron	Driver	PW	5 Iron	Driver
ML sway (mm)	303.9 (40.2)	314.5 (42.7)	326.2 (56.7)	491.6§ (49.3)	471.6§ (52.3)	450.7 (69.4)
AP sway (mm)	85.9 (13.3)	121.2† (12.6)	104.5 (11.5)	114.3 (16.3)	129.9 (15.37)	139.9 (14.1)
Sway Path Length (mm)	704.6 (77.7)	703.3 (78.5)	641.6 (91.2)	993.0 (95.1)	912.7§ (96.1)	859.2 (111.7)
Average COP Velocity (mm/s)	222.2 (36.5)	219.9 (39.4)	210.1 (38.8)	430.0§ (44.73)	403.4§ (48.3)	352.9§ (47.5)
Apen of ML COP	0.15 (0.02)	0.13 (0.03)	0.13 (0.03)	0.05 (0.02)	0.04§ (0.03)	0.08 (0.03)
Apen of AP COP	0.20 (0.03)	0.24 (0.03)	0.22 (0.02)	0.14§ (0.03)	0.12 (0.04)	0.08§ (0.02)

Data presented in mean (SD); § Significantly different from the matching one-plane group condition ($p < .05$); † Significantly different from the matching PW condition ($p < .05$); Abbreviations: ML – mediolateral, AP – anteroposterior, COP – center-of-pressure, PW – pitching wedge Apen – approximate entropy

DISCUSSION: Significant inter-group (swing style factor) differences (9 out of 18 conditions) were observed in several center-of-pressure parameters, particularly in the ML parameters, suggesting the influence of swing style on weight transfer during a golf swing. No significant inter-club difference, however, was observed in the centre-of-pressure parameters among the clubs except the AP sway between PW and 5 Iron.

CONCLUSION: This study identified the fact that there are different weight transfer strategies in different swing styles: one-plane swing vs. multi-plane swing.