

Kinematic Differences Between High and Low Handicap Golfers.

Derek Byrne and Ian Kenny

Physical Education and Sport Sciences Department, University of Limerick,
Ireland.

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INTRODUCTION: The widespread growth of golf is mainly due to its accessibility to people of all ages, socio-economic backgrounds and skill levels (Hume *et al.*, 2005). To correspond with this increased participation, research in the area has also increased. The majority of research to date has focused on both professional and elite level golfers. However, with only 7% of male golfers falling into the category 1 group (handicap <5.5) and 53% falling into categories 3&4 (handicap 13- 24) the research does not reflect today's average golfer (USGA, 2007). The aim of this study is to carry out a kinematic analysis of the golf swing for a category 1 and category 3&4 golfer. From this data it is possible to compare variables such as head movement, timing and delayed release of the wrist angle.

METHOD: Eight healthy male golfers were divided into two groups, dependant on skill level. This was determined by each volunteers Golfing Union of Ireland (GUI) handicap. The groups consisted of four Category 1 (mean handicap 4.5 ± 0.5) and four Category 3&4 (mean handicap 17.8 ± 1.3). Following approval from the University of Limerick Ethics Committee each volunteer carried out 10 trials (golf swings) using their own driver into an indoor driving facility. Kinematic data was collected from 29 reflective markers placed on the body and the golf club using a 6-camera system (Motion Analysis Corp., Santa Rosa, California) operating at 200Hz.

RESULTS: Based on the position of the club head and wrist marker the swing was divided into three events. Address (Add) was prior to any movement of the club head, top of backswing (TB) was defined as the maximal height of the wrist marker and Ball Impact (Imp) was defined as the moment when the club head returns to Add position.

Table 1. Mean Head Movement in X- axis (mm)

Event	Category 1	Category 3&4
Address	0	0
Top of Backswing	54.66 (± 29.56)	123.68 (± 17.22)
Impact	-31.18 (± 8.89)	52.33 (5.71)

DISCUSSION: Table 1 above clearly shows the increased head movement at TB and Imp for Category 3&4 when compared to the Cat 1 group. This increased head movement during the golf swing was also greater for the less skilled performer when y-axis movement was analysed, with Cat 1 recording a mean movement of $19.66 (\pm 21.01)$ mm when compared to $117.8 (\pm 37.59)$ mm for Cat 3&4.

CONCLUSION: While anecdotal evidence suggests that lateral head movement is encouraged during the backswing to allow weight transfer the optimal amount is yet to be discovered. Further data will be presented comparing the differences in delayed release of wrist angle on the downswing and timing during the golf swing.

REFERENCES:

Hume, P. A., Keogh, J. & Reid, D. (2005) The role of biomechanics in maximising distance and accuracy of golf shots. *Sports Medicine*, 35, 429-449