

CHANGES IN TECHNIQUE AND PERFORMANCE WHEN PLAYING GOLF FROM SIDEHILL LIES

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Introduction

The majority of golf biomechanics research has been carried out using flat artificial surfaces. Peters, Smith and Lauder (2015) found that 50% of all tee-to-green shots were performed on a slope of at least 2.25°, which was deemed to be significant enough for golfers to want to adjust (Linde, 2005). Coaching literature (Leadbetter, 1993) and a review of online coaching videos (Nolan, Blenkinsop and Hiley, 2022) show that the advice, specifically when playing from ball above/below feet (sidehill) lies, is that the ball should draw/fade, whilst the swing plane should shallow/steepen as the ball gets higher/lower, and golfers should adjust their aim accordingly. The current study aimed to quantify differences between sidehill and flat shots, and compare this to current coaching advice. It was hypothesized that there would be alterations in golfers' aiming direction, with changes to the impact characteristics and subsequent ball flight.

Methods

Right-handed golfers were recruited for a mid-handicap (10-15) and low-handicap (<5) group. In this ongoing study, analysis on four golfers was completed, with two from each group (mid 1 & 2; age 29 & 60, height 1.85 & 1.9 m, mass 85 & 95 kg and handicap 10.6 & 11.9; low 1 & 2; age 21 & 18, height 1.83 & 1.75 m, mass 73 & 82 kg and handicap +1.9 & 4.1). Eight shots were played in random order on the flat and each slope at 5°, produced by a hydraulic platform. Golfers were instructed to apply their usual adjustments so a full shot would finish on the aiming line. Shot data were collected with a GC2 launch monitor and exported into Microsoft Excel. Club and body kinematic data were collected with 61 retro-reflective markers using 3D motion capture (Vicon), labelled, and exported to MATLAB for further analysis. A swing plane was fitted to the clubhead trajectory from mid-downswing to ball contact to give the direction and steepness of the swing. The line through the heel markers was used to define the direction of aim. An average of the 8 shots per condition was calculated for each variable.

Results and Discussion

Both mid-handicappers faded the ball on the flat (513 & 640 rpm) and both low-handicappers drew the ball (267 & 308 rpm). Although there were noticeable differences in the sidespin between the flat and sloped shots, no pattern was seen. The low-handicappers were more consistent, with lower standard deviation values throughout. As expected, compared to the flat (58.1°), the swing plane became shallower/steeper during ball above (54.5°) and below (60.1°) feet trials. There were no patterns found in the direction angle, however one golfer (low 1) produced a more out-to-in plane during ball above feet shots (4.5° out-to-in) compared to flat (0.9° out-to-in), perhaps contributing to their increased fade, both contrary to coaching information. Average aim angles ranged from 2.3° left to 2.9° right during flat shots for all golfers. Three golfers aimed further right at address on ball above feet shots, following coaching advice. However, the other golfer (low 2) produced the largest aim variance on ball above feet shots ($\pm 2^\circ$) and several of the angles were further right than the flat shots, potentially indicating a lack of strategy. Other than consistency, there were few noticeable differences between the two handicap groups, however a larger sample size may provide clearer results. As expected, there were differences in all variables when playing from sidehill slopes compared to flat, which provides a knowledge base to further investigate the changes and how or why they are produced.

Significance

This work provides new information within an often-overlooked area of golf, that can improve knowledge of a significant part of the game. Although carried out on a small sample size, the results suggest that all players do not follow the traditional pattern of movement and subsequent ball flight characteristics. This can impact coaching practice, whereby an individual approach may be necessary depending on the golfers' natural tendencies when playing from sidehill lies. The work will hopefully encourage golfers, with the help of coaches, to study and develop their own technique and performance, which can impact significantly on their game.

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