



The Effects of a Modified Golf Stance on Transverse Plane Socket Reaction Moments in Unilateral Transtibial Amputees

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INTRODUCTION

The conventional golf stance has been extensively studied for able-bodied golfers; however, it has not been documented for unilateral transtibial amputee golfers. The conventional golf stance can be detrimental to the musculoskeletal system of the golfer (Cole, 2016). Even though these detriments have been studied in intact individuals, it would seem apparent that the stance can be just as detrimental to unilateral transtibial amputees.

The transverse plane is the least studied and least understood plane of the human body (Meister, 2011). There are few reliable methods for measuring moments in this plane of motion. By using advanced technology that can attach directly to the prosthesis, this plane can be further explored. The most important factor of studying the transverse plane in relation to socket reaction moments is trying to understand how those moments affect the human body.

METHODS

Subjects: 3 male subjects, ages (45-68) (K3-K4), with no comorbidities. All subjects used their own prosthesis and their own golf clubs.

Apparatus: Intelligent Prosthetics Endoskeletal Component System (iPecs) to measure magnitude and timing of socket reaction forces and moments in the prosthesis, Trackman Golf System to measure ball distance (DIST).

Procedures: The iPecs was attached to each subject's prosthesis for each set of conditions (stance type). On each of two test days, the subjects were asked to hit 7 – 10 balls using each of the following clubs: a driver (D), a mid-iron (5 or 6 iron) (I), and their typical wedge (W). During the first session, each subject used their own conventional stance (C). One week later, subjects performed the same number of swings using the same clubs a week later using the modified golf stance (M) they learned during the previous week. All testing was done on a standard driving range with ambient conditions monitored and documented. For each trial, the iPecs device measured Fx, Fy, Fz (axial) and Mx, My and Mz (axial) at a sampling rate of 500 Hz. The iPecs was zeroed between trials. The Trackman measured ball speed, club head speed, and ball distance for each trial.

Data Analysis: The means of the distances, axial socket reaction moments (ASRM), and time for peak-to-peak ASRM (TPASRM) for each stance (TYPE) using each club (CLUB) were calculated and compared for all of the subjects

RESULTS

Preliminary results comparing the ASRM and TPASRM for each TYPE indicate that ASRM and TPASRM are reduced with M when compared with C after controlling for ball distance (DIST). Statistical analyses are currently in process.

TYPE	CLUB	DIST	ASRM	TPASRM
C	D	233.9 (5.12)	34.6 (2.53)	0.408 (0.059)
M	D	240.0 (8.6)	22.2 (1.0)	0.292 (0.035)
C	I	149.0 (9.88)	30.3 (2.53)	0.446 (0.058)
M	I	163.4 (11.0)	25.5 (3.6)	0.419 (0.024)
C	W	115.3 (1.58)	30.9 (2.53)	0.444 (0.035)
M	W	115.2 (5.0)	23.6 (2.24)	0.424 (0.015)

Table 1. Mean (SD) Distance (DIST) (yd), Axial Socket Reaction Moment (ASRM) (Nm), and Time to achieve peak-peak torque (TPASRM) (s) for one subject.

DISCUSSION

The results of the study indicate that the modified golf stance reduced ASRM while using each club type when compared with the conventional golf stance. Aside from the average distance of the wedge shots for each stance, the distance slightly increased using the modified stance. The reduction of ASRM suggests smaller shear forces are exerted on the residual limb and its surrounding tissues, areas that are susceptible to injuries and skin breakdown from shear forces (Sanders, 1993). If a reduction in shear on the residual limb decrease the risk of injuries to the residual limb of lower limb amputee golfers, it may encourage them to participate in the activity. More regular participation could lead to improved quality of life (Bragaru et al., 2011).

CONCLUSION

In this pilot study, altering the posture of the body during the golf swing reduced axial socket reaction moments with no detrimental effect on ball distance. Further data analyses are being conducted.

CLINICAL APPLICATIONS

The application of a potentially less detrimental golf stance linked with better performance may improve quality of life of patients by encouraging amputee golfers to participate in their sport more regularly.

REFERENCES

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