2018 WORLD SCIENTIFIC CONGRESS OF GOLF
JULY 11-13, 2018
ABBOTSFORD, BRITISH COLUMBIA
HOST: UNIVERSITY OF THE FRASER VALLEY

Golf As Therapeutic Exercise for Older Adults

Andrea M. Du Bois[1], Nicole A. Marcione[1], Steven C. Castle[2], George J. Salem[1]

[1]*Division of Biokinesiology and Physical Therapy, University of Southern California*
[2] *Division of Geriatric Medicine, University of California, Los Angeles; Geriatric Research Education and Clinical Center, VA Greater Los Angeles Healthcare System*

Biomechanics and Physiology

Purpose: Aging is associated with physiological changes, including reductions in muscular strength, power, and balance, which impair the ability to perform activities of daily living and increase fall risk. Regular physical activity can attenuate these declines and *multimodal* physical activity interventions appear to be most effective in improving balance and reducing falls in older adults. Golf is a popular recreational activity that includes intermittent periods of walking at moderate to vigorous exercise intensity, repeatedly bending over to place/pick up a golf ball, and high velocity golf swings. The golf swing places a high demand on the hip abductor musculature, a muscle group important for mediolateral (ML) postural control. The golf swing also requires a large bidirectional weight shift, directly challenging the *dynamic* ML postural control of the golfer. Thus, the golf swing may be an excellent training stimulus for the hip abductor musculature (strength and power) and ML postural control (balance). The objective of this preliminary study is to evaluate the golf swing as possible therapeutic exercise for older adults.
Methods: Two older, non-golfing males (67 and 74 years old) were enrolled in a comprehensive golf-training program consisting of two 90-minute sessions per week for a total of 12 weeks. Pre-training, the participants completed biomechanical testing to assess hip demands and center of pressure (COP) dynamics during older adult therapeutic exercises including 30-second semi-tandem stance (ST), chair stands (CS), and fast gait (FG). Biomechanical analysis of the golf swing (7 iron) was performed following completion of the training intervention. Lower extremity kinematics were collected at 250 Hz and 60 Hz for the golf swings and therapeutic exercises, respectively, with a 10-camera motion analysis system (Qualisys Inc, Gotëborg, SE). Ground reaction forces were collected (1500 Hz) using two embedded AMTI force platforms (Newton, MA). Kinematics and ground reaction forces were filtered using a using a 6 Hz low pass forth-order zero lag Butterworth filter and COP with a cut-off frequency of 5 Hz. The average internal net hip abductor moment (ABD_MOM), average net hip joint abductor power (ABD_POW), and range of ML COP excursion (COP_R) were calculated. The lead (7L) and trail (7T) limb during the golf swing were individually analyzed. Data was averaged across the limbs for the semi-tandem stance and chair stand. Only the left limb was analyzed during fast gait. Means and standard deviation are reported and Cohen's d effect sizes (ES) are used to indicate the strength of the differences.
Results: The ABD_MOM (Figure 1) during the golf swing was similar to semi-tandem stance (7L ES: 0.47; 7T ES: 0.36) and greater than chair stand (7L ES: 3.74; 7T ES: 2.20). The ABD_MOM during fast gait was similar to the trail limb (ES: 0.54) but greater than the lead limb ABD_MOM (ES: 7.73). The ABD_POW (Figure 2) during the golf swing was greater than chair stand (7L ES: 2.63; 7T ES: 0.84) and semi-tandem stance (7L ES: 2.16; 7T ES: 0.81) but less than fast gait (7L ES: 17.48; 7T ES: 1.22). The COP_R (Figure 3) during the golf swing was equivalent to the COP_R during fast gait (ES: 0.75) and greater than chair stand (ES: 1.42) and semi-tandem stance (ES: 1.61).

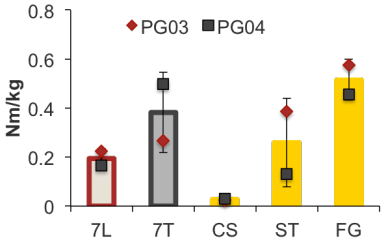

Figure 1. Average internal net hip abductor moment during the golf swing and therapeutic exercises.

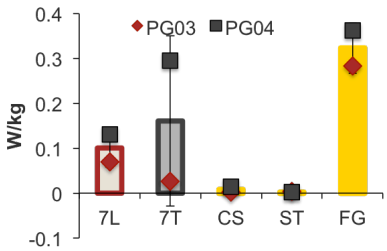

Figure 2. Average net hip joint abductor power during the golf swing and therapeutic exercises.

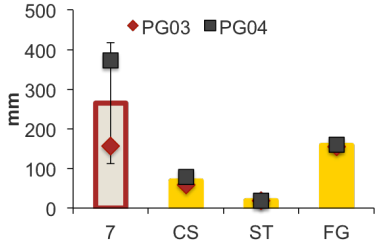

Figure 3. Range of ML COP excursion during the golf swing and therapeutic exercises.

Discussion: Hip abductor demands during the golf swing were similar to or greater than the hip abductor demands during semi-tandem stance and chair stand; thus, the golf swing may be considered as a potential therapeutic hip exercise activity. Although, the fast gait hip abductor moment and power demands were similar to or greater than the demands of the golf swing, COP excursion during the golf swing was greater than during fast gait, semi-tandem stance, and chair stand, supporting the golf swing as a potential balance training activity.
Practical Application: Multimodal interventions that include strengthening, balance, and gait are recommended to reduce fall risk. Golf swing hip demands and COP dynamics are similar to or greater than the demands during commonly utilized therapeutic exercises, making the golf swing a viable therapeutic exercise activity for older adults. Additionally, walking the golf course is equivalent to moderate/vigorous-intensity cardiorespiratory exercise in seniors; thus, golf play may provide a comprehensive stimulus for improving overall fitness and reducing fall risk.