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APPENDIX

Description of Therapeutic Golf Rehabilitation Program

The six components of TGR include general fitness, motor control and muscle strength, flexibility, speed of movement, balance and postural control, and task- (golf) specific training (see Figure 1).

General fitness: Cardiovascular conditioning is recommended as part of golf fitness programs.[23,52] Following stroke, cardiovascular function and exercise tolerance are often reduced and can result in as much disability as hemiparesis[53]; hence, individuals poststroke may require cardiovascular training to improve their exercise tolerance. Warming up is also one of the most important factors in enabling peak performance and preventing injuries associated with golf.[54] TGR includes stretching for muscles of the neck, rotator cuff, shoulders, wrists, fingers, chest, back and trunk, groin, hamstrings, quadriceps, and calves.

Motor control and muscle strength: Golf strengthening recommendations have been proposed for the general public based on the muscular activity required to golf and injury prevention.[22,55-57] A detailed description of the motor control and muscle strength component of TGR has been reported elsewhere.[58]

Flexibility: Ranges of motion needed during the golf swing have been reported.[59,60] If any or all of these movements are limited by soft tissue changes secondary to long-standing hemiparesis, the golf swing will be affected. Subjects were prescribed individual stretching exercises with the goal of increasing their flexibility.

Speed of movement: Not only does the golf swing require coordinated movement of many joint segments through their ranges of motion, but it happens very fast, with a total swing time (defined as time of initial club movement to time that the ball leaves the clubface) of less than 1.3 seconds.[59,61] Persons with high amounts of muscle spasticity in either of their upper extremities may demonstrate difficulty producing the speed and trajectory needed for successful ball flight. Addressing this problem often requires swing modification, such as using a one-armed swing to prevent frustration and encourage success with ball contact in the golf task.

Balance and postural control: Proper positioning and postural alignment in each of the swing phases are essential to healthy and successful golf.[54,60,62] Lindsay and colleagues suggested that decreased balance plays a role in the golf weight transfer in that ineffective or incomplete weight transference may decrease ball distance and lead to biomechanical compensations or injuries.[60] Given that dynamic stability is decreased in persons following stroke,[63] one may expect altered weight transfer patterns during the golf swing in this population. All participants in TGR are trained in each of the following balance tasks: assuming a proper address position, weight shifting bilaterally while in a golf stance, adding trunk rotation to the weight shifts, further adding upper extremity perturbations that mimic the back swing and follow-through golf movements, and maintaining the end of the follow-through position. Balance in golf is further challenged by encouraging increased upper extremity movement speeds, performing the task with eyes closed, and adding swing drills that require coordinated physical strategies in a task-specific manner.

Task- (golf) specific training: Practicing functional tasks is essential to motor learning.[64] Practicing golf is essential to improving one's game.[58,62] Participants in TGR have six standardized golf lessons, once per week for each of the 6 weeks of the program. For weeks 1 to 3, the lessons focussed on driving, woods, and iron shots; week 4 focussed on irons and chipping; and week 5 focussed on chipping and putting; subjects played nine holes at an accessible golf course in week 6. Grip and swing mechanics are modified according to the participants' stage of motor recovery and golf limitations or problems. Some examples of grip modifications include use of a bilateral baseball grip, a flexible wrist splint, or a modified golf glove that maintains the paretic hand on the club.