

Research in Review of INWA Scientific Committee:

Arm swing training and trunk rotation had a positive effect on stroke patients' gait ability

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Journal Article Review:

Jun-Ho Shin, Chang-Beom Kim, Jong-Duk Choi (2015) **Effects of trunk rotation induced treadmill gait training on gait of stroke patients: a randomized controlled trial** J. Phys. Ther. Sci. 27: 1215-1217

Purpose of the Study:

The purpose of the study was aimed at proving the clinical effect of treadmill gait training with active arm swings, which can induce trunk rotation in the opposite direction to pelvic rotation.

Study Participants:

This study enrolled 20 hemiplegic patients (15 men and 5 women) attending W Hospital in Daejeon, Republic of Korea.

Procedure or Methods:

The subjects were randomly assigned to a control group of 10 (CG - 8 men and 2 women, age 55.2 ± 9.5 years, stroke onset 18.7 ± 6.9 months) subjects who performed treadmill gait training with their arms fixed, and an experimental group of 10 subjects (EG - 7 men and 3 women, age 51.5 ± 11.9 years, stroke onset 17.3 ± 14.5 months) who performed treadmill gait training with arm swings. Therapists induced arm swing of affected side of EG subjects using Nordic Walking poles, while subjects in CG had the affected arm restricted to prevent arm swing. Training was performed for 30 minutes, 3 times a week for 4 weeks.

The subjects in EG held Nordic Walking poles in both hands during treadmill gait training, while the experimenter also held Nordic Walking poles behind the subject and walked together with the subject, counting out loud to help the subject swing the upper limbs. The gait velocity was increased gradually in accordance with the individual gait abilities of the study subjects, and without interfering with gait independence or stability. The Nordic Walking pole was fixed with a bandage if a subject could not hold the grip of the pole using the hand on the affected side.

The control group performed arm-fixed treadmill gait training in the same way as the experimental group, but with their hands holding the treadmill grip (or fixed with a bandage to the grip if a subject could not hold it).

The average speeds of the EG and CG were (mean±SD) 2.8±0.4 and 2.1±0.7 km/h, respectively, and there was no significant difference between them.

The timed up and go test (TUG) for evaluation functional mobility and balance, the dynamic gait index (DGI) for evaluation gait control abilities in response to task changes and the 6-minute walk test (6MWT) for evaluation functional capacity and gait endurance were assessed before and after 4 week of training.

Results:

The TUG values were not significantly different between before and after the training in the two groups. However, the improvement in the arm-swing treadmill gait training group after the intervention had a p-values of 0.06, which was close to the significance level, whereas that of the arm-fixed treadmill gait training group was 0.10.

The DGI values were significantly different ($p<0.05$) after the training in the arm-swing treadmill gait training group, but not in the arm-fixed treadmill gait-training group.

The 6MWT values were significantly different ($p<0.05$) after the training in the arm-swing treadmill gait-training group, but not in the arm-fixed treadmill gait training group.

Discussion:

The arm-swing treadmill gait training group showed a significant improvement in gait control abilities in response to task changes (DGI) compared to the arm-fixed treadmill gait training group after the intervention program. Arm-swing helps hemiplegic patients to recognize their arms as a feedback mechanism, which is good for postural adaptation and balance maintenance (Faghri PD et al, 1994; Yavuzer G et al, 2002). The authors of this study concluded that arm- swing treadmill gait training can be considered a method that improves the overall gait and dynamic balance abilities of hemiplegic patients.

The experimental group with arm-swing treadmill gait training showed a significant improvement in 6MWT from 239.6±98.8 to 278.5±99.3 m, which was significantly better than that of the arm-fixed treadmill gait

training group. Thus it was shown by the authors of this study the improvements in functional capacity and gait endurance for the group of patient trained with arm-swing movements.

According to the study of Stephenson et al. (2010), the simultaneous harmonic movements of the upper limbs during the gaits of hemiplegic patients induce trunk rotation and increase the range of movement of the ankle joints, thereby increasing stride length. The arm-swing treadmill gait training for hemiplegic patients induces trunk rotation leading to increases in stride length, muscle power, coordination, and gait endurance (Stephenson et al., 2010).

Take away for INWA's Continuing Professional Development (CPD):

This study supports the importance of arm swing and the trunk rotation induced by it for gait and dynamic balance during walking for hemiplegic stroke patients. The INWA Nordic walking technique deals especially with and pays additional attention to arm- swing movements and trunk rotation during Nordic walking gait. As NW specialists we are using drills as "Gorilla" and "Train" to encourage arm swing from the shoulder joint (See part 12 of INWA Nordic Walking Instructor Course Manual, 2nd Ed.). So, we can be proud that these skills could be transferred to real life as an improvement to gait control for people who practice INWA's Nordic walking.