

THE EFFECT OF 12-WEEK STRENGTH TRAINING ON GAIT CHARACTERISTICS IN ADOLESCENT WITH DOWN SYNDROME: A SINGLE CASE STUDY

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INTRODUCTION: It has been reported that approximately 80% of individuals with Down syndrome (DS) exhibit abnormal gait characteristics. They are exhibited by flat-footed contact with no heel-strike, excessive abduction of the leg in the swing phase, and abnormal knee and hip flexion throughout the gait cycle (Matteo, 2002). The purpose of this study was to examine the influence of a 12-week strength training program on the gait characteristics during walking by an adolescent with DS.

METHOD: A male adolescent with DS (age: 17 yrs; height: 159.5 cm; mass: 75.1 kg) with no history of cardiorespiratory problems participated in this study. In both pre- and post-tests, the peak torque, work, and the average power of the ankle and knee flexors and extensors were measured using a Biodex System 3 isokinetic dynamometer at 60 deg/s and 180 deg/s. Three-dimensional motion analyses were performed to obtain specific gait characteristics before and after the training. Seven trials were analyzed, with the gait velocity between 1.1 - 1.3 m/s. The strength training program involved seven leg exercises (squat, hip abduction, hip adduction, leg curl, leg extension, toe taps, and toe raise) and two abdominal and back muscle exercises (sit-ups and low back) for three sessions a week, three sets of 10-15 RM per session, for 12 weeks. Resistance was gradually increased to keep within the 10-15 RM range. Sit-ups were repeated until the onset of the fatigue. The order of the exercises was randomized to minimize fatigue in a particular muscle group.

RESULTS: All isokinetic variables (the peak torque, work, and the mean power) showed increases in response to the training. Walking cadence increased following training (118.03 steps/min vs 107.81). Stride length, stride time, stance time, and swing time decreased after training. Hip adduction in the stance phase increased while hip abduction in the swing phase decreased following training. Knee flexion increased following training. Hip flexion increased and extension decreased following training (Figure 1). It showed abnormally immature kinematic patterns at the hip and a large variability of walking patterns due to genetic causes differently modifying the motor phenotype, but also by the presence of muscle hypotonia, ligamentous hyperlaxity, muscle weakness, and orthopedic abnormalities (Matteo, 2002). It was concluded that gait characteristics improved after strength training.

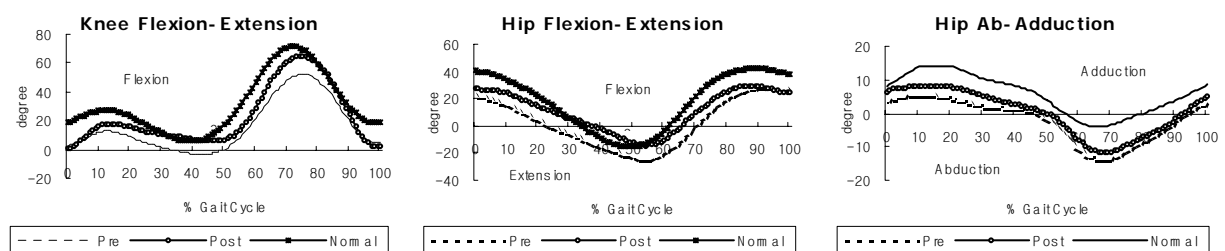


Figure 1. Knee, Hip Flexion-Extension, and Hip Abduction-Adduction Joint angles.

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Matteo, C. (2002). Gait analysis of individuals with Down syndrome. *Physical Medicine and Rehabilitation*. 16, 303-321.