

# **Auditory feedback cues for gait improvement in children with gait disorders due to cerebral palsy**

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**Background:** Movement disorders in children with cerebral palsy (CP) are associated with central nervous system disorders that affect their gait and posture control, in addition to bone, joint and muscle problems. Closed-loop auditory feedback cues have been shown to improve gait and balance in patients with movement disorders, such as Parkinson's disease and multiple sclerosis. The effects of such cues on the walking abilities of children with CP does not appear to have been studied before.

**Objectives:** To study the effects of gait training with auditory feedback cues on the walking abilities of children with gait disorders due to CP.

**Methods:** An accelerometry-driven wearable device was used to create a clicking sounds adapted to the patient's steps through earphones. Ten randomly selected group of children of average age  $11.1 \pm 6.57$  with gait disorder due to CP participated in the study. Baseline performance (walking speed and stride length along a 10m straight track) was measured before device use. Following 20min training with the device and 10min rest, performance without the device was measured again and compared to the baseline performance.

**Results:** The average improvement in walking speed was  $25.43\% \pm 28.65\%$ . For participants with baseline walking speed below the median improvement was  $42.79\% \pm 32.23\%$  and for participants with baseline walking speed above the median improvement was  $8.08\% \pm 7.39\%$ . Average improvement in stride length was  $13.58\% \pm 13.1\%$ . For participants with baseline stride length below the median improvement was  $12.66\% \pm 6.63\%$  and for participants with baseline stride length above the median improvement was  $14.50\% \pm 18.44\%$ . For participants with age below the median improvement in walking speed was  $22.83\% \pm 18.86\%$  while for participants with age above median improvement was  $28.04\% \pm 38.09\%$ . For participants with age below the median improvement in stride length was  $11.95\% \pm 6.94\%$  while for participants with age above median improvement was  $15.21\% \pm 18.20\%$ .

**Conclusion:** Auditory feedback cues can improve gait parameters in children with gait disorders due to CP. Baseline walking speed is a very good predictor of improvement, with a markedly higher improvement associated with lower baseline performance. The stride length improvement was similar in participants with baseline performance below and above the median. Age is a good predictor of improvement in walking speed and in stride length, with higher improvement in participants of older age.