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127 – A LOW–POWER WIRELESS DATA ACQUISITION SYSTEM TO MONITOR GAIT PATTERNS AMONG TOE–WALKING CHILDREN DURING DAILY ACTIVITIES

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Abstract

Purpose: Clinical gait analysis is considered the "gold standard" for evaluating individual walking patterns. However, in conditions where an individual may exhibit transient voluntary control of gait (such as idiopathic toe walking), their walking pattern in a gait lab may not accurately reflect their gait during daily activities. An accurate assessment of such patients' functional gait is essential in determining appropriate management options and response to treatment. Therefore, a battery-powered, wireless data acquisition system (WDAS) was developed to record daily functional walking patterns. The goal of the present study was to compare the tilt angle and load data obtained from the WDAS with those measured by gait lab equipment in a sample of healthy adult volunteers.

Method: Seven members of the research team participated in our validation study. Following informed consent, the WDAS was attached to the dorsum (laces) of each subject's right shoe. Two thin film load sensors were wired to the device and placed under the sole of the foot, inside the shoe. Three spherical markers were placed on the same foot (head of first metatarsal, head of fifth metatarsal, calcaneous). Data were simultaneously recorded by the WDAS (30 Hz) and gait lab (60 Hz). To calibrate the device, each subject performed three static standing tasks (normal standing, weight bearing on toes, weight bearing on heels). Each subject then performed five normal walking trials and five toe-walking trials over a ten-metre, level course.

Results: From the WDAS and gait lab, the average percentage of time spent on the toes (load values under first toe greater than zero) during the stance phase of normal gait was 50.2% and 67.4%, respectively. During toe walking, this increased to 98.9% and 99.8%, respectively. This indicates that the WDAS and gait lab are similar in their ability to discern between normal and toe-walking gait. For the inclination angle, within-subject correlation values of $r = 0.76$ and $r = 0.92$ were observed during normal walking and toe walking, respectively. This indicates acceptable levels of agreement between the inclination measures of the WDAS and gait lab.

Conclusion: The validity of angle data from the WDAS was confirmed, when compared to data retrieved from a formal, gait analysis lab. Furthermore, the WDAS was able to clearly differentiate between a normal and a toe walking pattern. The WDAS may assist clinicians in the diagnosis and treatment of gait abnormalities, based on information retrieved during daily activities.

Footnotes

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