

Energy expenditure and physical activity of ambulatory children with cerebral palsy and of typically developing children.

Bell, K. L. & Davies, P. S. W (2010). Energy expenditure and physical activity of ambulatory children with cerebral palsy and of typically developing children. *American Journal of Clinical Nutrition*, 92, 313–319.

The nutritional needs and energy requirements of children with cerebral palsy (CP) are not well understood. On the one hand, reports indicate that children with CP are shorter and weigh less, with poor nutrition compared to typically developing children of the same age. Meanwhile, there is evidence of overweight and obesity in ambulatory children with CP. However, several authors have found that ambulatory children with CP expend a much greater amount of energy while walking than children without CP.

In order to develop appropriate nutrition and physical activity programs for youth with CP, an understanding of their daily energy requirements is needed. Bell and Davies (2010) conducted a study to examine the energy expenditure of ambulatory children with CP compared to typically developing youth. As part of their study, the researchers assessed whether or not the greater amount of energy expended during walking in with CP has an effect on their level of physical activity and total energy expenditure.

Included in the study were 16 ambulatory children with CP, ages 5 to 12 years old. The participants had either hemiplegia or diplegia and did not use an assistive device for mobility (i.e., wheelchair, walker). The comparison group of 16 consisted of similarly aged, typically developing children.

As components of total energy expenditure (TEE), study variables included resting energy expenditure (REE), activity-related energy expenditure (AEE), and physical activity level. REE represents the amount of calories required for a 24-hour period by the body during a non-active period. To determine AEE, REE was subtracted from 90% of TEE. The reduction of TEE by 10% was to account for heat production by the body (thermogenesis). TEE was measured by a technique called “doubly labeled water.” The ratio of TEE to REE was then calculated to be the physical activity level.

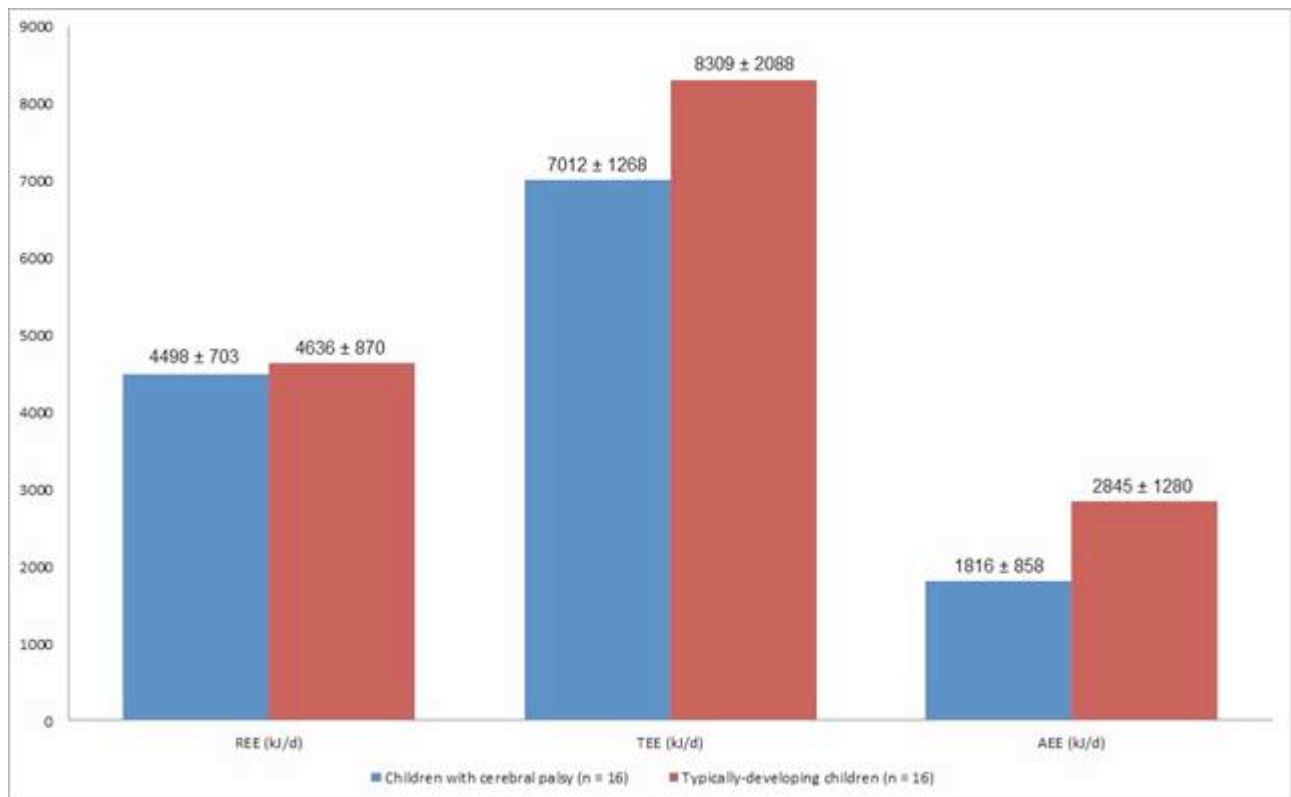
Analysis of the data indicated no statistically significant differences in absolute REE or in REE relative to fat-free mass between the groups. However, the strength of the relationship between body weight and REE was stronger for the control group, with body weight accounting for 79% of the variability in REE compared to 64% in the children with CP. Furthermore, fat-free mass accounted for only 41% of the variability in REE in children with CP, whereas it accounted for 75% in the control group.

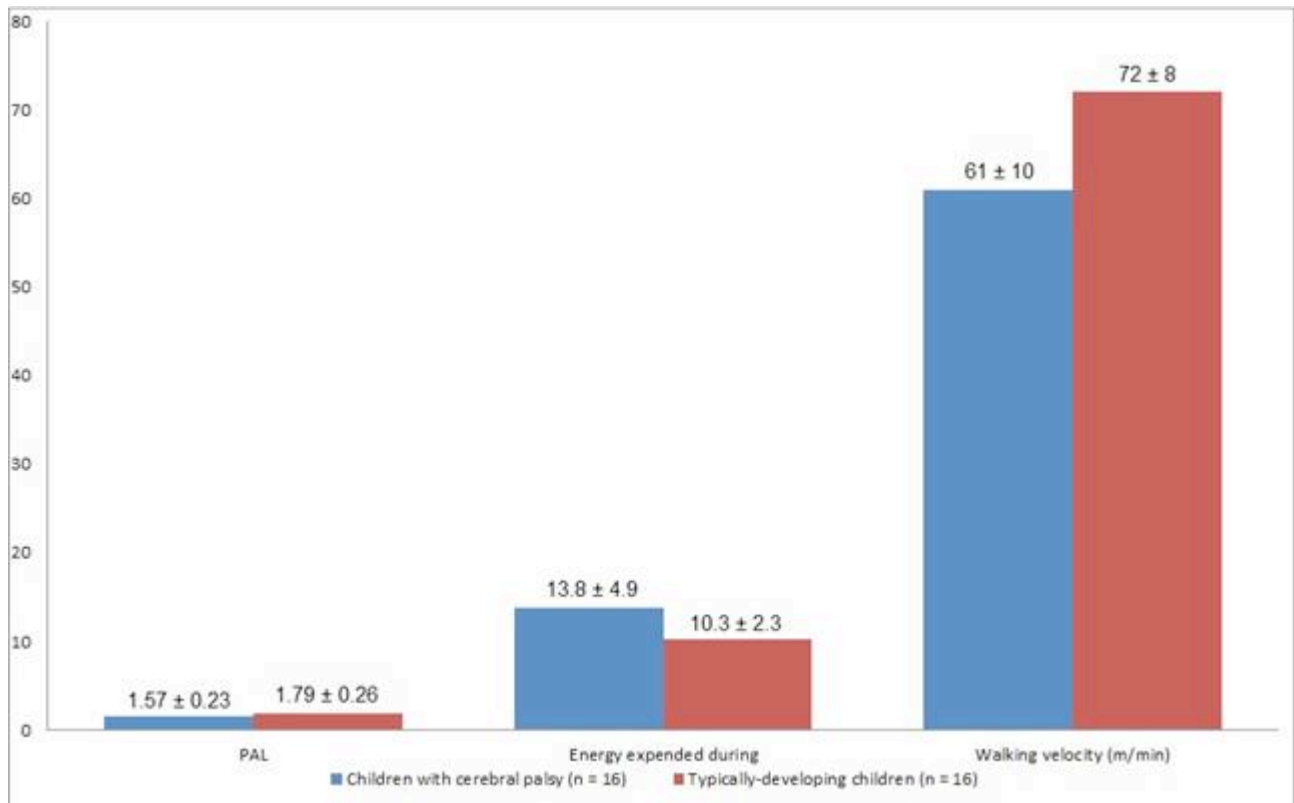
Children with CP had lower AEE and therefore their TEE was significantly less than the controls. For both groups there was a significant correlation between TEE and fat-free mass, while AEE was significantly correlated with fat-free mass only in the control group. This correlation indicated that the children without CP who expend more energy in physical activity

per day had a higher fat-free mass, which was not the case in those with CP. There was no correlation between physical activity level and fat-free mass in either group. The slopes of the regression lines relating AEE to fat-free mass were not significantly different, however the intercepts were, which indicated that AEE was lower relative to fat-free mass in the children with CP.

During walking at a self-selected velocity, the children with CP walked slower but expended significantly more energy than the controls. The children with diplegia expended significantly more energy than those with hemiplegia, although there was no difference in walking velocity.

With fat-free mass constant, children with CP expended more energy during walking compared to the controls, and with greater levels of fat-free mass, more energy was expended. The relationships between physical activity level and energy expenditure during walking, and that between TEE and energy expenditure during walking (relative to body weight), were not significant for either group.





In summary, the results of this study found that children with mild CP had a lower physical activity level and lower energy requirements than typically developing children. However, during walking the children with CP expended significantly more energy. The authors suggest that to fully understand the daily energy requirements for children with CP further study is needed. Physical activity interventions and their effects on physical activity level and TEE need to be examined.

Overall, a healthy balanced diet with portion sizes relative to physical activity level is recommended. Several activity options are available for children with CP of all ages including swimming, boccia, cycling, track and field, and power soccer. A nutritious diet and healthy active lifestyle should be the goal for all.