Objectives

- Participation in physical activity is highly recommended for children with cerebral palsy (CP).
- While performing an endurance test significant reactivity of the autonomic nervous system is necessary.
- Very few studies have described the impaired cardiac autonomic system at rest or during a tilt test among children with CP.
- Heart rate recovery (HRR) and heart rate variability (HRV) are common measures for assessing activity of the cardiac autonomic nervous system.

The aim of this study is to describe heart rate (HR) and HRV during rest, during a submaximal treadmill test and during rest post treadmill in children with CP.

Methods

The HR was monitored
- 5 minutes seated in a chair,
- during a submaximal treadmill test,
- after 1, 2 minutes rest post-treadmill.

The main outcome variables were
- HR
- the square root of the mean squared differences of successive differences between adjacent heart beats (RMSSD).

The participants were from the Alyn Hospital CP outpatient clinic in Jerusalem.

Study Design

A cross sectional study.

Study Participants & Setting

20 children with CP
- with GMFCS levels I-III,
- ages 6-11
- Excluded
  - children with cardiovascular and/or respiratory disease.

Results

Heart rate

Significant differences in HR mean values between study stages were noted (F3,54=82.2, p < 0.001).

- During rest before the treadmill test, the mean HR was 94.5 beats per minute (bpm).
- HR increased during the last stage of the treadmill test by a mean of 46.3 bpm (95% Confidence Interval (CI) 35.1-57.3 bpm), and was reduced to 13.0 bpm (95% CI 4.4-22.6 bpm) during the first minute post treadmill test and by 25.0 bpm two minutes posttest.

RMSSD

There was a significant difference in the RMSSD mean values between study stages (F3,54=15.0, p < 0.001).
- During rest prior to the treadmill test the mean RMSSD was 52.4 milliseconds (ms) (95% Confidence Interval 34.3-70.6 ms).

Conclusions

- Our study showed that an autonomic system response is possible in response to cardiopulmonary exercise testing in children with a CP.
- Children with CP respond to a treadmill test by increasing their HR and reducing their HRV parameters.
- The current work provides a unique contribution by demonstrating the hearts’ autonomic system response to a submaximal treadmill test and post-test among children with CP.

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Participants’ Characteristics

<table>
<thead>
<tr>
<th>Gender</th>
<th>N=20</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>12 (60)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>8 (40)</td>
<td></td>
</tr>
</tbody>
</table>

| Age (years) | 8.9±1.7 [6-11] |
| BMI (kg/m²) | 15.6±3.2 [10.2-24.8] |

Diplegia 12 (60)
Hemiplegia 8 (40)

GMFCS

I 4 (20)
II 9 (45)
III 7 (35)

Value in table are number (percentage), mean±SD [min-max], BMI-Body Mass Index, GMFCS- Gross Motor Functional Classification System

Outcomes

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- HR
- the square root of the mean squared differences of successive differences between adjacent heart beats (RMSSD).

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