Moderate-to-Vigorous Physical Activity is Positively Associated with Retinal Nerve Fiber Layer and Ganglion Cell-Inner Plexiform Layer Thickness in Pediatric Multiple Sclerosis

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BACKGROUND

• Over 1/3 of pediatric MS patients experience optic neuritis (ON).¹
• MS patients have reductions in their retinal nerve fiber layer (RNFL) and ganglion cell-inner plexiform layer (GCIPIL), which are measures of anterior visual pathway integrity.
• Research in adult MS patients has indicated that moderate-to-vigorous physical activity (MVPA) is positively associated with RNFL²

OBJECTIVE/HYPOTHESIS

The objective of this study was to investigate the associations between MVPA, RNFL and GCIPIL in pediatric MS patients. It was hypothesized that there would be positive associations between MVPA, RNFL and GCIPIL in pediatric MS patients.

DESIGN/METHODS

Design: This study used a cross-sectional design.
Participants: 27 participants were recruited from the Pediatric MS and Demyelinating Disorders Center at the Hospital for Sick Children.
Inclusion Criteria:
• Diagnosis of MS (according to the IMPSG consensus definitions and the 2010 McDonald criteria for multiple sclerosis)³,⁴
• Age ≥18 years
Exclusion Criteria:
• Neuroinflammatory abnormalities associated with underlying systemic disorders or other neurologic disorders
• Recurrent neuroinflammatory disorders other than MS
• Coexisting ocular pathologies
• VA < 20/40 or worse

Demographic and Clinical Information Collected:
• Age at time of OCT
• Sex
• Disease duration at time of OCT
• History of ON at time of OCT
• Visual acuity as LogMAR score (e.g. 20/20 vision = LogMAR of 0)

Structural Visual Measures:
• Ocular coherence tomography (OCT) >90 days after an ON episode
• RNFL and GCIPIL were measured using a spectral-domain OCT Cirrus scanner (Carl Zeiss Meditec).

Physical Activity Measure:
• Godin Leisure-Time Exercise Questionnaire³ ≥30 days after a relapse.
• The health contribution score from the GLTEQ corresponds to MVPA.

Statistical Analysis: General linear models were used to assess the associations between MVPA, RNFL and GCIPIL, when controlling for the within-subject correlation between eyes, sex, number of ON episodes and disease duration at time of OCT. Bonferroni correction was used to adjust for multiple comparisons. Significance was set at p≤0.05.

RESULTS

Table 1. Demographic and clinical information

| Age at OCT (Years), median(IQR) | 15.75(3.21) |
| Females, % (n) | 74.1% (20) |
| Disease Duration (Years), median(IQR) | 1.99(3.33) |
| Number of days between OCT-PA, median(IQR) | 55.00(188) |
| Visual acuity (LogMAR), median(IQR) | 0.00(0) |

Number of ON episodes at OCT, % (n):

| 0 | 51.9% (14) |
| 1 | 33.3% (9) |
| ≥2 (2-7) | 14.8% (4) |

PHYSICAL ACTIVITY DATA

Figure 1. The box plots show amounts of physical activity, which were measured in metabolic equivalents per week (METs/week). Median(IQR): Moderate 10(20); Vigorous 0(27); MVPA 18(42).

Next steps include an intervention targeting MVPA to improve anterior visual pathway integrity in children with MS.

CONCLUSIONS

• Moderate-to-vigorous physical activity (MVPA) was positively associated with RNFL and GCIPIL thickness in pediatric MS patients.
• This suggests that MVPA is a modifiable lifestyle factor that may help improve anterior visual pathway integrity in pediatric MS patients.

REFERENCES

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DISCLOSURES

The authors have no conflicts of interest to disclose.