

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 (GCIPL), which are measures of anterior visual pathway integrity.
- Research in adult MS patients has indicated that moderate-tovigorous physical activity (MVPA) is positively associated with RNFL.²

OBJECTIVE/HYPOTHESIS

The objective of this study was to investigate the associations between MVPA, RNFL and GCIPL in pediatric MS patients.

It was hypothesized that there would be positive associations between MVPA, RNFL and GCIPL 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 IPMSSG 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 +/-6 diopters 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 GCIPL were measured using a spectral-domain OCT Cirrus scanner (Carl Zeiss Meditec).

Physical Activity Measure:

- Godin Leisure-Time Exercise Questionnaire⁵ >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 This suggests that MVPA is a modifiable lifestyle factor that may help improve anterior associations between MVPA, RNFL and GCIPL, when controlling for visual pathway integrity in pediatric MS patients. the within-subject correlation between eyes, sex, number of ON episodes and disease duration at time of OCT. Bonferroni correction Next steps include an intervention targeting MVPA to improve anterior visual pathway was used to adjust for multiple comparisons. Significance was set at integrity in children with MS. ≤0.05.





Fellow/ON Unaffected ON Affected All Eyes Fellow/ON Unaffected ON Affected All Eyes

Figure 2A. The box plots show the RNF thicknesses, which were measured in µr Median(IQR): Fellow/ON Unaffected 92.0(14) μm, ON Affected 62.5(26) μm eyes 88.5(27) μm.

RNFL and GCIPL were correlated in all eyes(r=0.877; p<0.001), in Fellow/ON Unaffected eyes (r=0.736; p<0.001), and in in ON Affected eyes(r=0.876; p<0.001).



 Fellow/ON Unaffected ON Affected All Eyes

Figure 3B. MVPA was positively associated with GCIPL (B=0.152, p<0.001) in all eyes. They were also associated in the fellow/ON unaffected eyes (B=0.126, p=0.007) and in ON affected eyes (B=0.216, p=0.008).

1. 2. 3. 4. 5.	Yeh et al. <i>Neurology</i> . 2016 Aug 30;87(9 Supplement 2 Sandroff et al. <i>Multiple Sclerosis and Related Disorder</i> Krupp et al. <i>Multiple Sclerosis Journal</i> . 2013 Sep;19(10) Polman et al. <i>Annals of Neurology</i> . 2011 Feb 1;69(2):2 Godin & Shephard. <i>Med Sci Sports Exerc.</i> 1997 Jun;29
	ACKN
This project was funded through grants from the Found program, the Ontario Institute for Regenerative Medicine	

The authors have no conflicts of interest to disclose



L	Figure 2B. The box plots show the GCIPL
lm.	thicknesses, which were measured in μ m.
	Median(IQR): Fellow/ON Unaffected
all	79.0(11) μm, ON Affected 58.5(14) μm all
	eyes 74.5(19) μm.

MVPA (METs/Week)

REFERENCES

2):S53-8. ers. 2014 Jan 31;3(1):117-22. LO):1261-7. 292-302. (6):36-8.

OWLEDGEMENTS

lation of the Consortium of Multiple Sclerosis Centers' MS Workforce of the Future e, and the Multiple Sclerosis Society of Canada.

ISCLOSURES