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Pediatric multiple sclerosis: current perspectives on health behaviors

EXERCISE NEUROSCIENCE RESEARCH LABORATORY

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Purpose

Pediatric onset multiple sclerosis (POMS) accounts for up to 10% of all multiple sclerosis cases, and affects approximately 10,000 children in the United States with an additional 10,000 to 15,000 children demonstrating symptoms indicative of a POMS diagnosis. Children with POMS have higher relapse rates and reach irreversible disease status an average of 10 years earlier than adults with multiple sclerosis. Health behaviors such as physical activity, diet, and sleep may have potential disease modifying effects in this group, as adults with multiple sclerosis have demonstrated similar benefits from interventions targeting health behaviors.

Methods

We identified papers by searching three electronic databases (PubMed, GoogleScholar, and CINAHL). Search terms included: pediatric multiple sclerosis OR pediatric onset multiple sclerosis OR POMS AND health behavior OR physical activity OR sleep OR diet OR nutrition OR obesity. Papers were included in this review if they were published in English, referenced nutrition, diet, obesity, sleep, exercise, or physical activity, and included pediatric-onset multiple sclerosis as a primary population.

Table 1 Papers investigating diet/nutrition/obesity

Reference number	Author, year	Purpose	Results
26	McDonald et al, 2016	Determine if salt intake is associated with POMS risk	No association between salt intake and POMS risk
27	Pakpoor et al, 2017	Determine association between dietary factors and POMS	POMS vs controls: POMS are less likely to have insufficient iron No difference in fat, protein, carbohydrates, sugars, fruits, or vegetables
28	Chitnis et al, 2016	Evaluate contribution of BMI and puberty for risk and age of onset of POMS	POMS had earlier puberty and higher BMI
29	Langer-Gould et al, 2013	Determine whether obesity is a risk factor for development of POMS or CIS	↑ BMI = ↑ risk for demyelination
30	Nourbakhsh et al, 2016	Determine if salt intake is associated with time to relapse in POMS	No association between salt intake and relapse rate
31	Gianfrancesco et al, 2017	Determine association between vitamin D, BMI, and POMS using genetic risk scores	Vitamin D associated with increased odds of POMS Significant association between BMI genetic risk score and POMS
32	Brenton et al, 2014	Evaluate prevalence and factors associated with vitamin D insufficiency and deficiency in childhood vs adult-onset demyelinating disease	No difference in vitamin D deficiency between childhood and adult-onset demyelinating disease
33	Mowry et al, 2010	Determine if vitamin D status is associated with relapses in POMS	Vitamin D levels associated with relapse rates
34	Kyrsko et al, 2016	Determine whether BMI at dx of POMS predicts disease activity, including ARR and MRI lesions	>50% POMS were overweight or obese at time of dx No association between BMI at POMS dx and disease activity
35	Azary et al, 2018	Evaluate effect of diet on relapse rate in POMS	↑ fat intake = ↑ hazard to relapse
36	Graves et al, 2016	Determine association between established risk factors for POMS and relapse rate	HLA-DRB1*15 modified association between vitamin D and relapse rate in POMS

Abbreviations: ARR, annualized relapse rate; BMI, body mass index; CIS, clinically isolated syndrome; dx, diagnosis; POMS, pediatric-onset multiple sclerosis.

Table 2 Papers investigating physical activity

Reference number	Author, year	Purpose	Results
19	Yeh, 2012	Provide overview of diagnosis and management of POMS	Exercise may reduce fatigue
37	Grover et al, 2015	Examine PA, fatigue, depression, relapse rate, and MRI metrics in children with POMS and mono-ADS	↓ PA = ↑ fatigue (and vice versa) ↑ PA = ↓ sleep/rest fatigue symptoms POMS had less PA than mono-ADS ↑ strenuous PA = ↓ T2 lesion volumes, sleep/rest fatigue symptoms, and annualized relapse rate
38	Grover et al, 2016	Evaluate PA with objective and self-report measures with children with POMS, healthy controls, and mono-ADS Assessed correlates of PA, including demographic and clinical characteristics, and theory related determinants	Light and total PA associated with sleep/rest and fatigue Exercise goal setting and self-efficacy linked to PA POMS had less min/day vigorous PA than mono-ADS and controls POMS had less total PA than mono-ADS
39	Sawicki et al, 2015	Assess relationship between self-efficacy, functional disability, and PA in POMS	Self-efficacy and functional disability correlate with self-report and objective measures of PA
40	Grover et al, 2015	Investigate and compare PA levels in youth with POMS, healthy controls, and mono-ADS	POMS report ↓ PA self-efficacy and ↑ perceived functional disability than peers POMS had less vigorous PA than peers
41	Yeh et al, 2015	Describe a research agenda on PA and its consequences and promotion in POMS	Effects of PA and PA maintenance track across lifespan, particularly when developed early in life
42	Rocca et al, 2015	Editorial review on PA to control MS from childhood	Physical activity may influence disease outcome
43	Kinnett-Hopkins et al, 2016	Validate the GLTEQ in POMS patients by using accelerometer in combination with a nomological net	↑ Vigorous PA = ↓ depressive and fatigue symptoms POMS had less strenuous and total PA than mono-ADS

Abbreviations: GLTEQ, Godin leisure-time exercise questionnaire; mono-ADS, monophasic acquired demyelinating syndrome; PA, physical activity; POMS, pediatric-onset multiple sclerosis.

Table 3 Papers investigating sleep

Reference number	Author, year	Purpose	Results
37	Grover et al, 2015	Examine PA, fatigue, depression, relapse rate, and MRI metrics in children with POMS and mono-ADS	Moderate PA associated with fewer sleep/rest fatigue symptoms
38	Grover et al, 2016	Evaluate PA with objective and self-report measures with children with POMS, healthy controls, and mono-ADS Assessed correlates of PA, including demographic and clinical characteristics, and theory related determinants	Moderate PA associated with fewer sleep/rest fatigue symptoms
45	Zafar et al, 2012	Determine whether children with POMS have more sleep disturbances, fatigue, and daytime sleepiness vs healthy controls	POMS more successful in following consistent bedtime routines POMS had comparable fatigue with matched controls

Abbreviations: mono-ADS, monophasic acquired demyelinating syndrome; PA, physical activity; POMS, pediatric-onset multiple sclerosis.

Results

Twenty papers were identified via the literature search that addressed health-promoting behaviors in POMS, and 11, 8, and 3 papers focused on diet, activity, and sleep, respectively. Health-promoting behaviors were associated with markers of disease burden in POMS. Physical activity participation was associated with reduced relapse rate, disease burden, and sleep/rest fatigue symptoms. Nutritional factors, particularly vitamin D intake, may be associated with relapse rate. Obesity has been associated with increased risk of developing POMS. POMS is associated with better sleep hygiene, and this may benefit fatigue and quality of life.

Discussion

Children with POMS benefit from participation in health behaviors, particularly better physical activity, diet, and sleep. Although each of these health behaviors have evidence supporting the influential nature, there are no current interventions targeting promotion of these behaviors. Health behavior promotion in children with POMS represents an appropriate method of managing primary and secondary symptoms. Future interventions targeting health behavior are required to establish evidence-based strategies for treating POMS in rehabilitation settings.