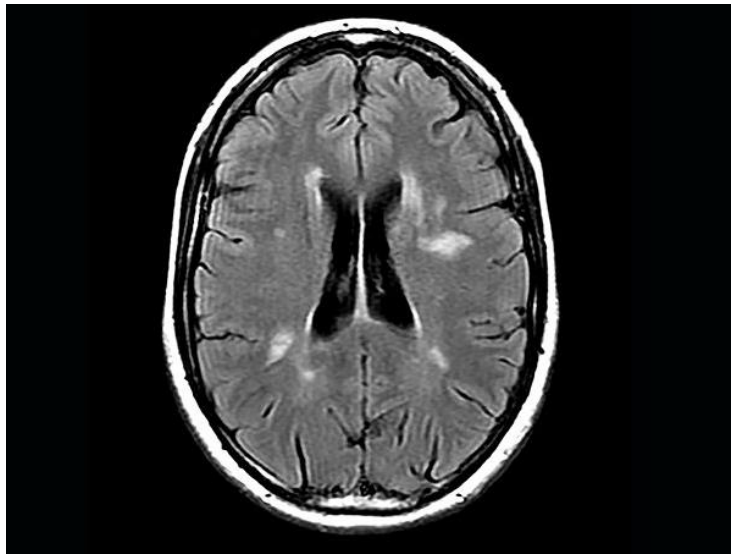
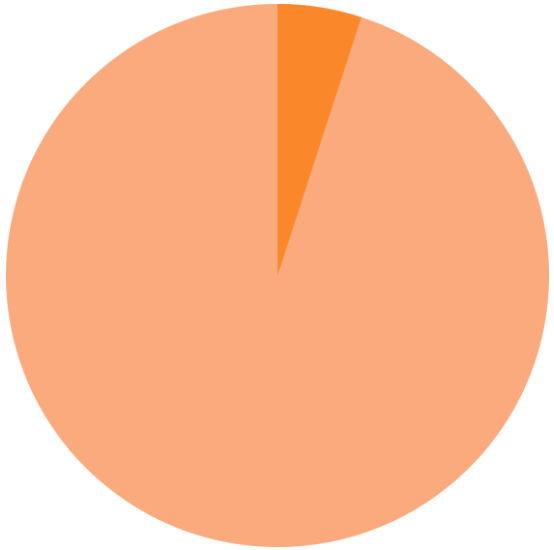
Low sun exposure is a risk factor for paediatric-onset multiple sclerosis

Prince Sebastian

Paediatric multiple sclerosis

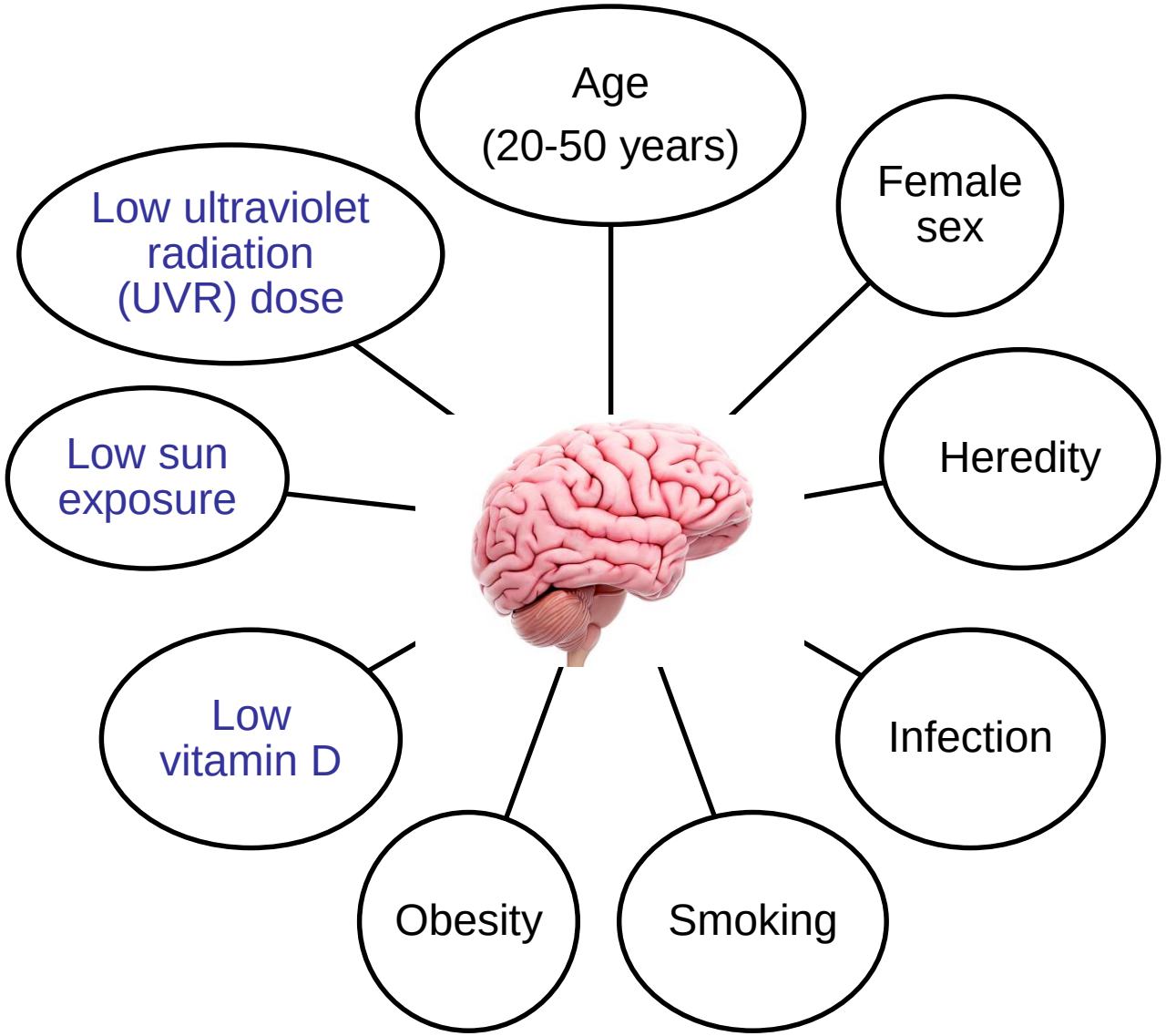




Multiple sclerosis (MS) is an immune-mediated demyelinating disease of the central nervous system.

Typical onset is between 20-50 years, but ~5% of cases begin before 18 years (paediatric MS)

MS aetiology



Paediatric MS

- Low sun exposure, low ultraviolet radiation (UVR) exposure and low vitamin D status have been well-characterised as risk factors for MS in adults.
- What role do they have in paediatric MS?
- Does the earlier onset of paediatric MS reflect a higher load of environmental risk factors?

Aims

1. Determine the association between sun exposure (time spent outdoors) and paediatric MS risk

2. Determine the association between use of sun protection and paediatric MS risk

3. Determine the association between ambient UVR dose and paediatric MS risk

4. Determine the association between vitamin D status and paediatric MS risk

Methods

- Multicentre case-control study
- 16 paediatric MS centres in the USA
- 332 case participants:
  - aged 4-22 years
  - MS onset before 18 years
  - <4 years from symptom onset
  - Median disease duration 7.3 months
- 534 control participants:
  - aged 3-22 years
- Cases and controls matched on sex and age - unfixed case:control ratio (range 1:1 – 1:16)

Environmental and Genetic Risk Factors for Pediatric Multiple Sclerosis Study

US Network of Pediatric Multiple Sclerosis Centers

Methods

Exposures:

- Sun exposure: measured as time spent outdoors daily during summer (self-reported by parent/child)

- Use of sun protection: based on use of sunscreen, sunglasses, hat, and short/long-sleeved clothes, in the most recent summer

- Ambient summer UVR dose: based on participants' locations of residence over their lifetime

- Vitamin D status: measured as serum 25-hydroxyvitamin-D [25(OH)D] concentration (ng/mL) (post-diagnostic, at baseline interview)

Methods

- Multivariable conditional logistic regression to test associations between exposures of interest and case-control status, adjusting for:
  - Sex
  - Age
  - Race (white, black, Asian, other)
  - Season of birth
  - Child's skin colour
  - Mother's education
  - Cigarette smoke exposure in 1st year of life
  - Ever having been overweight
  - EBV seropositivity (anti-VCA [viral capsid antigen] optical density)

Results

Characteristics of children with MS and their age- and sex-matched controls:

- 63% of cases were female
- Median (IQR) age of cases was 15.9 (3.3) years
- Cases were significantly more likely to have been exposed to cigarette smoke

  (controls: 12.7%; cases: 17.8%)
- Cases were significantly more likely to report ever being overweight

  (controls: 14.2%; cases 23.8%)
- Cases had higher median (IQR) anti-VCA levels

  (controls: 2.2 (3.5); cases 3.7 (1.8))

Results

Sun-related data for children with MS and their age- and sex-matched controls:

- Cases were significantly more likely to spend <30 minutes outdoors daily in the present/most recent summer

  (controls: 6.2%; cases 18.7%)

- Median sun protection index (SD) was similar between cases and controls

  (controls: 5.9 (2.5); cases 5.5 (2.5))

- Median ambient UVR dose in the most recent summer (IQR) was similar between cases and controls

(controls: 4.9 kJ/m^2 (1.5 kJ/m^2); cases: 4.8 kJ/m^2 (1.6 kJ/m^2))

- Cases had higher median serum 25(OH)D (IQR) levels

(controls: 23.7 ng/mL (11.9 ng/mL); cases: 27.7 ng/mL (17.5 ng/mL))

Results

Table 3: Multivariable conditional logistic regression analysis (fully adjusted model*)

	Odds ratio (OR)	95% confidence interval (95%CI)	p-value
Time outdoors in the present/most recent summer (weekends)			
• <30 minutes	1.00	-	-
• 30 minutes-1 hour	0.39*	0.17-0.86	0.02
• 1-2 hours	0.13***	0.06-0.31	<0.001
• 2-3 hours	0.21***	0.09-0.46	<0.001
• >3 hours	0.14***	0.06-0.31	<0.001

*Adjusted for: sex, age, race, season of birth, child's skin colour, mother's education, cigarette smoke exposure, overweight, EBV infection

Key findings

- Spending >30 minutes outdoors during summer was associated with significant lower risk for paediatric MS
- Use of sun protection was not associated with risk for paediatric MS
- Higher ambient summer UVR dose was associated with lower risk for paediatric MS
- Higher serum 25(OH)D was associated with higher risk for paediatric MS
  - most likely due to post-diagnosis vitamin D supplementation

Discussion

- First study to investigate the effect of sun exposure in paediatric MS
- Large, diverse, well-matched cohort
- Key findings replicated in multiple sensitivity analyses
- Could not investigate the effect of vitamin D due to lack of data on vitamin D supplementation
- Potential to use regular sun exposure to prevent development and/or progression of MS

Summary

- Spending more time in the sun during summer – even 30 minutes daily – is associated with lower risk for MS in children

- Living in a sunnier location is associated with lower risk for MS in children

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