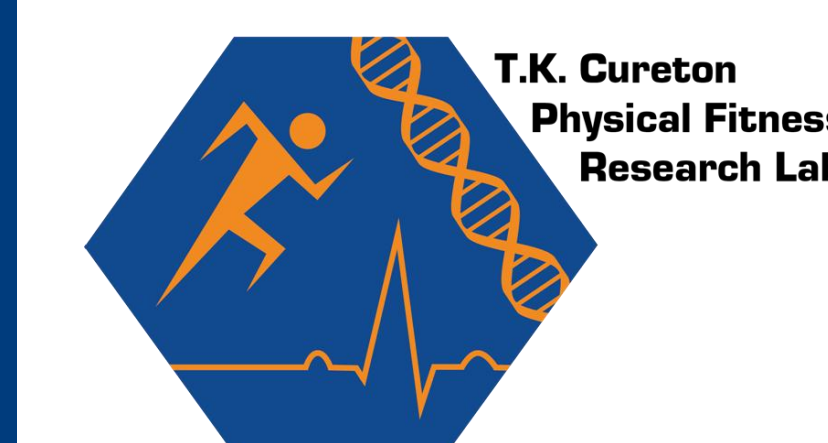




Oxygen Uptake Efficiency Slope Across the Disability Spectrum in Multiple Sclerosis



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Introduction

- Exercise training is an effective method for improving physical and mental health for people with multiple sclerosis (MS).
- One important benefit of exercise training is improved cardiorespiratory fitness (CRF), an important indicator of health status across populations.
- Persons with MS have lower CRF levels compared to healthy matched controls, presumably because of deconditioning.
- The gold standard for evaluating CRF is the cardiopulmonary exercise test (CPET) performed to volitional fatigue/exhaustion, and peak oxygen consumption (VO_{2peak}).
- Maximal exercise may not be viable due to limitations associated with MS.
- Alternatively, an objective and effort-independent measure of CRF may be the oxygen uptake efficiency slope (OUES).

Results

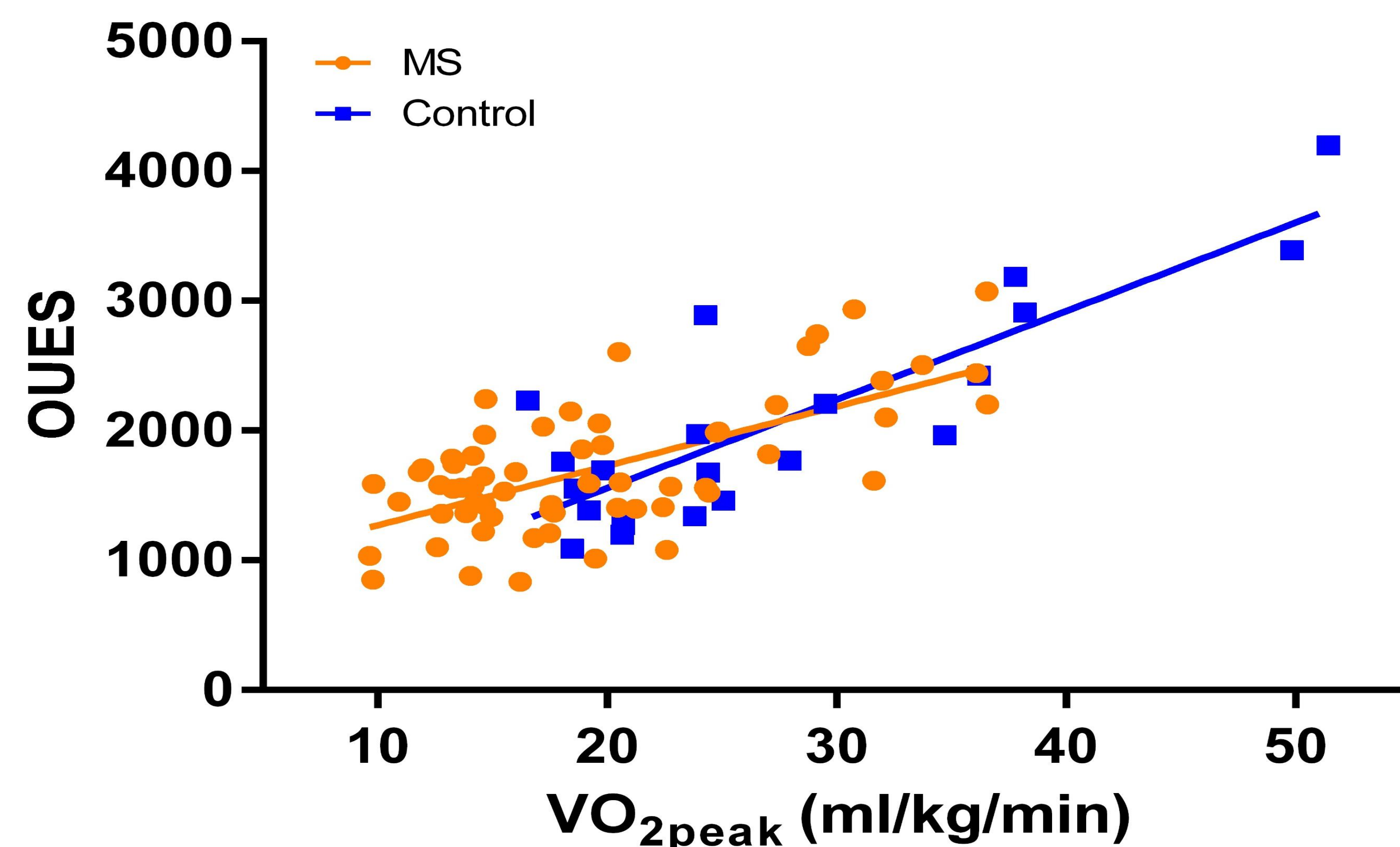


Figure 1: Relationship between the OUES values and VO_{2peak} for the MS and control samples.

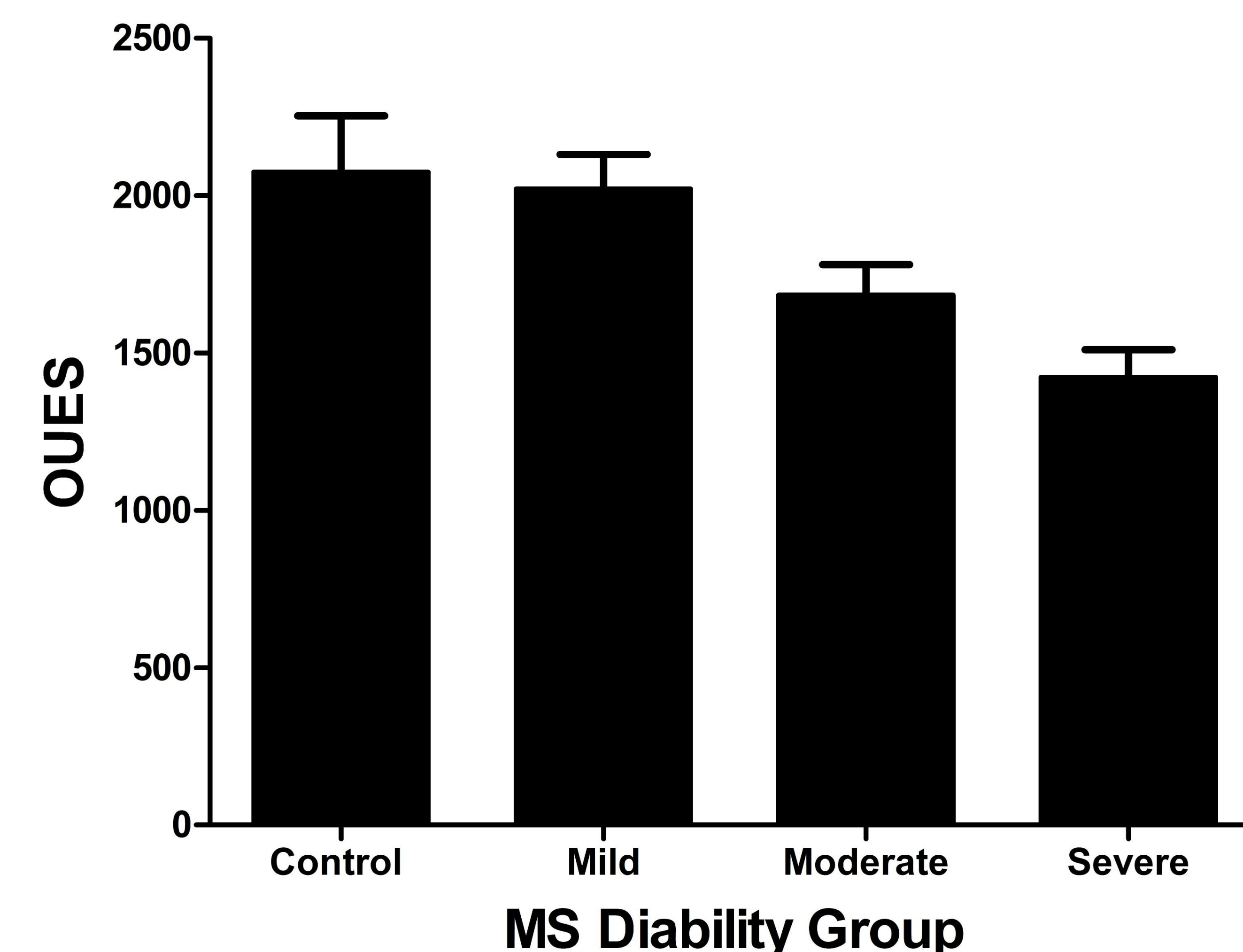


Figure 2: Comparison of the OUES values across the MS disability spectrum and controls.

Purpose

To examine:

- Differences in the OUES between persons with MS and matched controls.
- Differences in the OUES across the MS disability spectrum.
- The relationship between the OUES and other CPET outcomes (VO_{2peak} , WR_{peak} , TTE_{peak} , HR_{peak} and VE_{peak}).

Methods

- 62 participants with MS and 21 non-MS controls matched on age, sex, height and weight completed a symptom-limited CPET using a recumbent stepper and an open-circuit spirometry system.
- Through log-transformation of the VE, a linear relationship between log VE and VO_2 was established:
 - $VO_2 = \alpha \times \log_{10} VE + \beta$
- The slope (α) represents the OUES, a measure of the efficiency of oxygen uptake with increasing VE.
- OUES50 and OUES75 were calculated using 50% and 75% of the CPET data respectively.

Table 1: Bivariate Pearson's correlation coefficients between the OUES (100%, 50%, 75%), and other CPET variables, for the MS sample overall (n=62).

	OUES	OUES50	OUES75	VO_{2peak} (ml/kg/min)	RER_{peak}	WR_{peak} (watts)	TTE_{peak} (seconds)	HR_{peak} (bpm)	VE_{peak} (L/min)	RPE_{peak}
OUES										
OUES50	.86**									
OUES75	.95**	.94**								
VO_{2peak} (ml/kg/min)	.66**	.47**	.57**							
RER_{peak}	-.06	-.15	-.06	.36**						
WR_{peak}	.78**	.61**	.72**	.85**	.20					
TTE_{peak} (seconds)	.74**	.53**	.66**	.75**	.13	.90**				
HR_{peak} (bpm)	.57**	.39**	.52**	.69**	.33**	.65**	.58**			
VE_{peak} (L/min)	.72**	.58**	.69**	.78**	.41**	.81**	.76	.64**		
RPE_{peak}	-.06	-.11	-.10	-.17	-.15	.06	.06	.02	-.02	

*Denotes correlation coefficient is significant at $p < .05$ level; **Denotes correlation coefficient is significant at the $p < .01$.

Conclusions

- It was determined that the OUES is flatter (i.e., lower) in persons with MS compared to healthy controls.
- The OUES decreased as disability increased.
 - These findings are not surprising and are likely related to inactivity induced deconditioning associated with MS.
 - Such deconditioning impacts the cardiovascular, respiratory, and musculoskeletal systems, all of which contribute to the OUES.
- The OUES (in MS) was significantly associated with other CPET variables including VO_{2peak} , WR_{peak} , TTE_{peak} , HR_{peak} and VE_{peak} .
 - These association were also present when comparing submaximal OUES50 and OUES75.
 - Since the OUES can be determined via submaximal exercise it represents a promising alternative as a measure of CRF in clinical populations.
 - This has important implications for the evaluation and monitoring of CRF in persons with MS.

Acknowledgements

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