Sex Differences In Vascular Structure And Function In Individuals With Multiple Sclerosis And Healthy Controls

Thessa Hilgenkamp[1], Garett Griffith[1], Robert W. Motl[2], Tracy Baynard[1], Bo Fernhall[1]

[1]Integrative Physiology Laboratory, University of Illinois at Chicago, Chicago, IL, United States; [2]Exercise Neuroscience Research Laboratory, University of Illinois at Urbana-Champaign, Champaign, IL, United States

Objectives: Cardiovascular disease is a leading cause of death in multiple sclerosis (MS), and recent data showed that subclinical markers of atherosclerosis are higher in MS as well. Prevalence of MS in men is much lower than in women, but their prognosis is much worse. Men with MS also have higher rates of hypertension and diabetes than women with MS. Whether vascular function and structure differs in men than in women with MS, and whether potential sex differences are similar to those in healthy controls, is unknown. **Aim:** To compare vascular function and structure between men and women in a group with MS and in healthy controls. **Methods:** After a 10 minute rest in the supine position, resting heart rate (HR) and brachial blood pressure (BP) were collected. Augmentation index (AIX), HR normalized AIX (AIX@HR75) and pulse wave velocity were measured with applanation tonometry. Carotid intima-media thickness (IMT) and beta-stiffness were measured with carotid ultrasound, and Forearm Blood Flow (Baseline, Peak and Area Under the Curve) was measured with strain gauge plethysmography. Data were analyzed with a two-way independent ANOVA for factors group, sex and group*sex. **Results:** In both groups, men were taller and heavier than the women, had higher SBP, lower AIX and AIX@HR75, larger IMT and higher baseline and peak FBF. Different patterns were observed in the sex differences for AIX and AIX@HR75 (in women similar in MS and controls, in men higher in MS than in controls). **Conclusions**: People with MS demonstrate a vascular profile consistent with a higher cardiovascular risk compared to controls. Sex differences were similar in subjects with and without MS, except for the significantly higher AIX and AIX@HR75 in men with MS vs male controls, suggesting males with MS may be particularly at risk for cardiovascular disease.

	Control		MS		p-values factors [#]		
	Female (n=21)	Male (n=18)	Female (n=52)	Male (n=18)	Group	Sex	Interaction
Age	49 ± 10	41 ± 9	48 ± 12	48 ± 13	0.228	0.126	0.109
Height (cm)	164 ± 6	177 ± 5	163 ± 7	179 ± 6	0.867	**<0.001****	0.264
Weight (kg)	69 ± 10	89 ± 13	73 ± 14	88 ± 17	0.679	**<0.001****	0.431
BMI	26 ± 4	28 ± 5	28 ± 6	28 ± 6	0.579	0.218	0.243
HR rest	59 ± 9	60 ± 12	65 ± 8	66 ± 12	**0.004****	0.582	0.739
SBP rest	120 ± 12	128 ± 8	119 ± 16	125 ± 12	0.440	**0.015***	0.672
DBP rest	76 ± 9	76 ± 11	72 ± 10	77 ± 8	0.429	0.269	0.341
MAP rest	91 ± 10	94 ± 10	88 ± 11	93 ± 9	0.410	0.081	0.688
AIX	31 ± 10	10 ± 15	27 ± 12	17 ± 12	0.510	**<0.001****	**0.038***
AIX@HR75	23 ± 8	3 ± 16	22 ± 11	13 ± 9	0.074	**<0.001****	**0.018***
PWVc	6 ± 1	7 ± 1	7 ± 2	7 ± 2	0.058	0.695	0.675
PWVc/MAP	0.07 ± 0.01	0.07 ± 0.01	0.08 ± 0.02	0.08 ± 0.02	**0.013***	0.525	0.445
IMT	0.45 ± 0.08	0.51 ± 0.11	0.53 ± 0.12	0.6 ± 0.13	**0.001****	**0.010***	0.985
Beta	7.04 ± 2.21	6.64 ± 2.04	7.25 ± 2.03	8.07 ± 3.57	0.104	0.675	0.227
FBF Baseline	3.1 ± 1.3	3.7 ± 1	1.9 ± 0.9	2 ± 0.9	**<0.001****	0.099	0.203
FBF Peak	20.6 ± 7.1	27.2 ± 7	15.6 ± 5.8	20.5 ± 6.6	**<0.001****	**<0.001****	0.533
FBF AUC	70 ± 23.3	94 ± 27.7	58 ± 22.2	68 ± 26.6	**<0.001****	**0.001****	0.160

[#] two-way independent ANOVA with Group, Sex and Group*Sex as factors

* $p<0.05$

**$p<0.01$