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Statistical Summary Document

Manuscript Title: The Effect of Lifelong Endurance Exercise on Cardiovascular Structure and Exercise Function in Women

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Animal model used, if applicable: NA

Underlying hypothesis:

We hypothesized that $\dot{V}O_2$max, exercise stroke volume, LV mass and blood volume would be significantly larger and LV chamber compliance more "youthful" in women who had performed lifelong exercise compared to older untrained women and would reflect those observed in the middle-aged untrained women.

Definitions of 'n':

[Define 'n'. If definitions differ, please indicate which definition applies to which experimental question number.]

Statistical summary table:

Experimental question number*	Finding/ conclusion	Experimental location/ variable e.g. cortex vs cerebellum or genotype	Mean value (or other summary statistic)	SD	n (value)	P**	Units	Data comparisons e.g. WT vs KO	Statistical test	Any other variable e.g. subjects' age or sex	Figure/table in which data are presented	Comments e.g. observation
Cardiac output (L/min) at maximal exercise is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Maximal cardiac output (L/min) is significantly larger in OT women compared to older OU and MA	Maximal cardiac output	Mean MA 11.7 OU 10.0 OT 14.1	SD MA 2.0 OU 1.6 OT 2.7	MA n=22 OU n=35 OT n=13	OT vs. OU **p<0.001** OT vs. MA **p<0.001** MA vs. OU **p<0.001**	L/min	OT vs. OU OT vs. MA MA vs. OU	Repeated measures ANOVA Group main effect **p<0.001** Bonferroni *post hoc* testing	NA	Figure 1A	

Stroke volume at maximal exercise is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Maximal stroke volume was significantly larger in OT compared to OU and MA	Maximal stroke volume	Mean MA 67.0 OU 61.2 OT 84.6	SD MA 13.3 OU 10.0 OT 17.5	MA n=22 OU n=35 OT n=13	OT vs. OU **p<0.001** OT vs. MA **p<0.001** MA vs. OU p=0.282	ml	OT vs. OU OT vs. MA MA vs. OU	Repeated measures ANOVA Group main effect **p<0.001** Bonferroni *post hoc* testing	NA	Not shown	
Stroke index at maximal exercise is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Maximal stroke index was significantly larger in OT compared to OU and MA	Maximal stroke index	Mean MA 39.1 OU 35.2 OT 53.7	SD MA 6.4 OU 5.7 OT 11.7	MA n=22 OU n=35 OT n=13	OT vs. OU **p<0.001** OT vs. MA **p<0.001** MA vs. OU p=0.137	ml/m^2	OT vs. OU OT vs. MA MA vs. OU	Repeated measures ANOVA Group main effect **p<0.001** Bonferroni *post hoc* testing	NA	Figure 1B	
Stroke volume relative to fat-free mass is larger at maximal exercise in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Maximal stroke volume relative to fat free mass was significantly larger in OT compared to OU and MA	Maximal stroke volume relative to fat-free mass	Mean MA 1.62 OU 1.50 OT 2.10	SD MA 0.25 OU 0.28 OT 0.31	MA n=21 OU n=35 OT n=12	OT vs. OU **p<0.001** OT vs. MA **p<0.001** MA vs. OU p=0.250	ml/kgFFM	OT vs. OU OT vs. MA MA vs. OU	Repeated measures ANOVA Group main effect **p<0.001** Bonferroni *post hoc* testing	NA	Figure 1C	
Heart rate at maximal exercise will not be different in older trained (OT) women compared to	Maximal heart rate was not significantly different among groups	Maximal heart rate	Mean MA 175.5 OU 164.7 OT 167.3	SD MA 7.6 OU 10.8	MA n=22 OU n=35 OT n=13		bpm	OT vs. OU OT vs. MA MA vs. OU	Repeated measures ANOVA Group main effect p=0.287	NA	Figure 1D	

older untrained (OU) and middle-aged (MA) women.				OT 8.9								
Mean arterial pressure (MAP) at maximal exercise will be higher in older trained (OT) and older untrained (OU) women compared to middle-aged (MA) women.	Maximal MAP was not significantly different among groups	Maximal MAP	Mean MA 120.9 OU 118.8 OT 117.4	SD MA 13.1 OU 14.0 OT 5.3	MA=20 OU=35 OT=13		mmHg	OT vs. OU OT vs. MA MA vs. OU	Repeated measures ANOVA Group main effect p=0.358	NA	Figure 1E	
Effective elastance index at maximal exercise will be lower in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Effective elastance index at maximal exercise was significantly lower in OT women compared to OU women.	Effective elastance index at maximal exercise	Mean MA 4.3 OU 4.7 OT 3.1	SD MA 1.0 OU 0.9 OT 0.7	MA=20 OU=35 OT=13	OT vs. OU **p<0.001** OT vs. MA **p=0.012** MA vs. OU p=0.186	mmHg/ml/m^2	OT vs. OU OT vs. MA MA vs. OU	Repeated measures ANOVA Group main effect **p<0.001** Bonferroni *post hoc* testing	NA	Figure 1F	
Systemic arterial compliance at maximal exercise will be higher in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Systemic arterial compliance at maximal exercise was not significantly different in OT women compared to OU and MA women.	Systemic arterial compliance at maximal exercise	Mean MA 0.47 OU 0.43 OT 0.57	SD MA 0.16 OU 0.16 OT 0.14	MA=20 OU=35 OT=13	OT vs. OU p=0.450 OT vs. MA p=1.000 MA vs. OU p=1.000	ml/mmHg/m^2	OT vs. OU OT vs. MA MA vs. OU	Repeated measures ANOVA Group main effect **p=0.006** Bonferroni *post hoc* testing	NA	Figure 1G	

Systemic vascular resistance at maximal exercise will be lower in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Systemic arterial compliance at maximal exercise was significantly lower in OT women compared to OU but not different compared to MA women.	Systemic vascular resistance at maximal exercise	Mean MA 858.4 OU 974.8 OT 673.7	SD MA 220.3 OU 194.5 OT 171.2	MA=20 OU=35 OT=12	OT vs. OU **p=0.023** OT vs. MA p=0.704 MA vs. OU p=0.308	dyne/s/cm^{-5}	OT vs. OU OT vs. MA MA vs. OU	Repeated measures ANOVA Group main effect **p=0.035** Bonferroni *post hoc* testing	NA	Figure 1H	
The Starling (stroke volume-filling pressure) relationship will not be significantly different between older untrained (OU) and middle-aged (MA) women	The Starling relationship was not significantly different among groups.	Slope of the relationship between stroke volume-filling pressure.	Median (25-75%) MA 8.0 (3.9 - 9.0) OU 6.0 (5.2 - 7.1) OT 5.6 (4.5 - 6.7)		MA=22 OU=35 OT=13		ml.m^2 x mmHg	OT vs. OU OT vs. MA MA vs. OU	Kruskal-Wallis ANOVA on ranks. ANOVA p=0.228	NA	Figure 2A	
Preload-recruitable stroke work would not be significantly different among older trained (OT), older untrained (OU) and middle-aged (MA) women	The slope of preload-recruitable stroke work was significantly steeper in OU compared to OT and MA	The slope of preload-recruitable stroke work	Median (25-75%) MA 103.8 (93.4 – 113.2) OU 177.8 (143.5 - 264.3) OT 116.5 (98.4.- 139.4)		MA n=22 OU n=35 OT n=13	OT vs. OU **p<0.001** OT vs. MA p=0.924 MA vs. OU **p<0.001**	ml x mmHg	OT vs. OU OT vs. MA MA vs. OU	Kruskal-Wallis ANOVA on ranks. ANOVA **p<0.001**	NA	Figure 2B	
Left ventricular chamber compliance is	Left ventricular chamber	Left ventricular stiffness constant	Median (25-75%)		MA n=22 OU n=34 OT n=13	OT vs. OU **p<0.001**	Compliance units	OT vs. OU	Kruskal-Wallis	NA	Figure 3A and Table 4	

greater in older trained (OT) women compared to older untrained (OU) but not significantly different compared to middle-aged (MA) women.	compliance was significantly greater in OT compared to OU		MA 0.0650 (0.0487 - 0.0799) OU 0.0854 (0.0609 - 0.138) OT 0.0469 (0.0306 - 0.0543)			OT vs. MA p=0.053 MA vs. OU **p=0.018**		OT vs. MA MA vs. OU	ANOVA on ranks. ANOVA **p<0.001** Dunn's *post hoc* testing			
Left ventricular transmural pressure-volume relationship is greater in older trained (OT) women compared to older untrained (OU) but not significantly different compared to middle-aged (MA) women.	Left ventricular transmural pressure-volume relationship significantly greater in OT compared to OU	Pericardial constraint	Median (25-75%) MA 0.0568 (0.0387 - 0.0655) OU 0.0691 (0.0529 - 0.758) OT 0.0336 (0.0185 - 0.0674)		MA n=22 OU n=34 OT n=13	OT vs. OU **p=0.007** OT vs. MA p=0.720 MA vs. OU p=0.106	Compliance units	OT vs. OU OT vs. MA MA vs. OU	Kruskal-Wallis ANOVA on ranks. ANOVA **p=0.005** Dunn's *post hoc* testing	NA	Figure 3B	
VO_2max in absolute levels is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	$\dot{V}O_2$max in absolute levels is larger mass was significantly larger in OT compared to OU and MA	Maximal oxygen uptake ($\dot{V}O_2$max) in absolute levels (L/min)	Mean MA 1.60 OU 1.42 OT 1.81	SD MA 0.29 OU 0.24 OT 0.20	MA n=22 OT n=35 OU n=13	OT vs. OU **p<0.001** OT vs. MA p=0.054 MA vs. OU **p=0.034**	ml/min	OT vs. OU OT vs. MA MA vs. OU	One factor ANOVA ANOVA **p<0.001.** Bonferroni *post hoc* testing	NA	Table 3	
VO_2max relative to total body mass is larger in older trained (OT)	$\dot{V}O_2$max relative to total body mass was	Maximal oxygen uptake ($\dot{V}O_2$max)	Median (25-75%)		MA n=22 OT n=35 OU n=13	OT vs. OU **p<0.001** OT vs. MA	ml/kg/min	OT vs. OU OT vs. MA	Kruskal-Wallis	NA	Table 3	

women compared to older untrained (OU) and middle-aged (MA) women.	significantly larger in OT compared to OU and MA	relative to total body mass	MA 25.9 (21.6 - 27.8) OU 21.5 (18.5 - 24.3) OT 34.0 (29.2 - 38.9)			**p=0.015** MA vs. OU **p=0.013**		MA vs. OU	ANOVA on ranks. ANOVA **p<0.001** Dunn's *post hoc* testing			
VO_2max relative to fat-free mass is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	$\dot{V}O_2$max relative to fat-free mass was significantly larger in OT compared to OU and MA	Maximal oxygen uptake ($\dot{V}O_2$max) relative to fat-free mass	Mean MA 39.1 OU 34.6 OT 46.4	SD MA 4.7 OU 5.4 OT 6.5	MA n=22 OT n=35 OU n=13	OT vs. OU **p<0.001** OT vs. MA **p=0.001** MA vs. OU **p=0.011**	ml/kg/min	OT vs. OU OT vs. MA MA vs. OU	One factor ANOVA ANOVA **p<0.001** Bonferroni *post hoc* testing	NA	Table 3	
Dynamic operating stiffness during LV unloading is greater in older trained (OT) women compared to older untrained (OU) but not significantly different compared to middle-aged (MA) women.	Dynamic cardiac compliance during cardiac unloading was significantly lower in OU women compared to OT women.	Dynamic cardiac compliance	Median (25-75%) MA 0.47 (0.38 - 0.55) OU 0.58 (0.37 - 0.81) OT 0.41 (0.30 - 0.44)		MA n=22 OT n=35 OU n=13	OT vs. OU **p=0.013** OT vs. MA p=0.324 MA vs. OU p=0.538	$\Delta mmHg/\Delta ml/m^2$	OT vs. OU OT vs. MA MA vs. OU	Kruskal-Wallis ANOVA on ranks. ANOVA **p=0.015** Dunn's *post hoc* testing	NA	Table 4	
Dynamic operating stiffness during LV loading is greater in older trained (OT) women compared to	Dynamic cardiac compliance during cardiac unloading was significantly lower in OU women	Dynamic cardiac compliance	Median (25-75%) MA 1.10 (0.79 - 1.55)		MA n=20 OT n=35 OU n=12	OT vs. OU **p=0.006** OT vs. MA p=1.000 MA vs. OU	$\Delta mmHg/\Delta ml/m^2$	OT vs. OU OT vs. MA MA vs. OU	Kruskal-Wallis ANOVA on ranks. ANOVA **p<0.001**	NA	Table 4	

older untrained (OU) but not significantly different compared to middle-aged (MA) women.	compared to OT and MU women.		OU 2.39 (1.20 - 3.83) OT 1.08 (0.95 - 1.62)			**p<0.001**			Dunn's *post hoc* testing			
Left ventricular mass is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Left ventricular mass was not significantly different among groups	Left ventricular mass	Median (25-75%) MA 77.6 (69.5 - 91.6) OU 76.2 (69.8 - 87.8) OT 78.8 (74.0 - 85.7)		MA n=19 OU n=35 OT n=12		g	OT vs. OU OT vs. MA MA vs. OU	Kruskal-Wallis ANOVA on ranks. ANOVA p=0.820	NA	Table 5	
Left ventricular mass relative to BSA is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Left ventricular mass relative to BSA was significantly larger in OT compared to OU and MA	Left ventricular mass index	Median (25-75%) MA 46.5 (41.5 - 48.6) OU 44.7 (41.0 - 49.6) OT 51.8 (48.5 - 53.9)		MA n=19 OU n=35 OT n=12	OT vs. OU **p=0.002** OT vs. MA **p=0.020** MA vs. OU p=1.000	g/m^2	OT vs. OU OT vs. MA MA vs. OU	Kruskal-Wallis ANOVA on ranks. ANOVA **p=0.002** Dunn's *post hoc* testing	NA	Table 5	
Left ventricular mass relative to fat-free mass is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Left ventricular mass relative to fat-free mass was not significantly among groups	Left ventricular mass relative to fat-free mass	Median (25-75%) MA 1.9 (1.7 - 2.1) OU 1.9 (1.8 - 2.0) OT 2.0 (1.8 - 2.4)		MA n=18 OU n=35 OT n=12		g/kgFFM	OT vs. OU OT vs. MA MA vs. OU	Kruskal-Wallis ANOVA on ranks. ANOVA p=0.338	NA	Table 5	

Left ventricular end-diastolic volume is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Left ventricular end-diastolic volume was not significantly different among groups	Left ventricular end-diastolic volume	Mean MA 101.2 OU 95.4 OT 98.8	SD MA 17.7 OU 16.7 OT 13.0	MA n=19 OU n=35 OT n=12		ml	OT vs. OU OT vs. MA MA vs. OU	One factor ANOVA ANOVA p=0.454	NA	Table 5	
Left ventricular end-diastolic volume index is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Left ventricular end-diastolic volume index was significantly larger in OT compared to OU	Left ventricular end-diastolic volume index	Mean MA 58.8 OU 54.7 OT 63.7	SD MA 7.6 OU 8.3 OT 8.0	MA n=19 OU n=35 OT n=12	OT vs. OU **p=0.004** OT vs. MA p=0.326 MA vs. OU p=0.236	ml/m^2	OT vs. OU OT vs. MA MA vs. OU	One factor ANOVA ANOVA **p=0.005** Bonferroni *post hoc* testing	NA	Table 5	
Left ventricular end-diastolic volume relative to fat-free mass is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Left ventricular end-diastolic volume was not significantly different among groups	Left ventricular end-diastolic volume	Mean MA 2.5 OU 2.3 OT 2.5	SD MA 0.4 OU 0.4 OT 0.4	MA n=18 OU n=35 OT n=12		ml/kgFFM	OT vs. OU OT vs. MA MA vs. OU	One factor ANOVA ANOVA p=0.218	NA	Table 5	
Left ventricular mass-to-volume ratio is larger in older trained (OT) women compared to older untrained	Left ventricular mass-to-volume ratio was not significantly	Left ventricular mass-to-volume ratio	Median (25-75%) MA 0.77 (0.69 - 0.92)		MA n=19 OU n=35 OT n=12		g/ml	OT vs. OU OT vs. MA MA vs. OU	Kruskal-Wallis ANOVA on ranks. ANOVA p=0.637	NA	Table 5	

(OU) and middle-aged (MA) women.	different among groups		OU 0.80 (0.75 - 0.89) OT 0.78 (0.75 - 0.92)									
Total blood volume is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Total blood volume was not significantly different among groups	Total blood volume	Mean MA 4044.1 OU 4053.3 OT 4018.0	SD MA 592.0 OU 475.9 OT 417.0	MA n=22 OU n=35 OT n=7		ml	OT vs. OU OT vs. MA MA vs. OU	One factor ANOVA ANOVA p=0.986	NA	Table 5	
Total blood volume relative to total body mass is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Total blood volume relative to total body mass was significantly larger in OT compared to OU	Total blood volume relative to total body mass	Median (25-75%) MA 62.3 (56.5 - 69.5) OU 60.8 (58.3 - 63.0) OT 67.2 (64.5 – 75.6)		MA n=22 OU n=35 OT n=7	OT vs. OU **p=0.015** OT vs. MA p=0.129 MA vs. OU p=0.873	ml/kg	OT vs. OU OT vs. MA MA vs. OU	Kruskal-Wallis ANOVA on ranks. ANOVA **p=0.018** Dunn's *post hoc* testing	NA	Table 5	
Total blood volume relative to fat-free mass is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Total blood volume relative to fat-free mass was significantly larger in OT compared to OU and MA	Total blood volume relative to fat-free mass	Mean MA 98.5 OU 98.5 OT 109.0	SD MA 9.4 OU 8.2 OT 10.2	MA n=21 OU n=35 OT n=6	OT vs. OU **p=0.028** OT vs. MA **p=0.039** MA vs. OU p=1.00	ml/kgFFM	OT vs. OU OT vs. MA MA vs. OU	One factor ANOVA ANOVA **p=0.028** Bonferroni *post hoc* testing	NA	Table 5	
Plasma volume is larger in older trained (OT)	Plasma volume was not	Plasma volume	Mean MA 2712.9	SD	MA n=22 OU n=35 OT n=7		ml	OT vs. OU OT vs. MA	One factor ANOVA	NA	Table 5	

women compared to older untrained (OU) and middle-aged (MA) women.	significantly different among groups		OU 2664.6 OT 2662.6	MA 394.8 OU 318.6 OT 325.3				MA vs. OU	ANOVA p=0.868			
Plasma volume relative to total body mass is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Plasma volume relative to total body mass was significantly larger in OT compared to OU	Plasma volume relative to total body mass	Median (25-75%) MA 43.2 (37.5 - 46.1) OU 40.0 (37.5 - 41.4) OT 44.9 (40.8 - 49.2)		MA n=22 OU n=35 OT n=7	OT vs. OU **p=0.015** OT vs. MA p=0.351 MA vs. OU p=0.225	ml/kg	OT vs. OU OT vs. MA MA vs. OU	Kruskal-Wallis ANOVA on ranks. ANOVA **p=0.010** Dunn's *post hoc* testing	NA	Table 5	
Plasma volume relative to fat-free mass is larger in older trained (OT) women compared to older untrained (OU) and middle-aged (MA) women.	Plasma volume relative to fat-free mass was significantly larger in OT compared to OU	Plasma volume relative to fat-free mass	Mean MA 66.1 OU 64.8 OT 71.9	SD MA 6.4 OU 6.1 OT 7.0	MA n=21 OU n=35 OT n=6	OT vs. OU **p=0.041** OT vs. MA p=0.158 MA vs. OU p=1.00	ml/kgFFM	OT vs. OU OT vs. MA MA vs. OU	One factor ANOVA ANOVA **p=0.046** Bonferroni *post hoc* testing	NA	Table 5	

*You may use multiple lines for the same question to indicate multiple comparisons

** Authors may wish to make the text bold where p is considered significant against a stated confidence limit