

## SUPPLEMENTARY MATERIAL

### Associations between physical activity, left atrial size, and incident atrial fibrillation: The Tromsø Study 1994-2016

**Table S1.** Joint associations of PA and LA size with AF (HR  $\pm$ 95% CI). The Tromsø Study 1994-95.

	N (n=2479)	AF events, % (n)	Person-years (mean $\pm$ SD)	Model 1, HR (95% CI)	Model 1, p-value	Model 2, HR (95% CI)	Model 2, p-value
LA enlarged, active (ref.)	282	15.2 (43)	17.1 (6.2)	1.00 (ref.)		1.00 (ref.)	
LA enlarged, inactive	483	25.5 (123)	14.9 (6.7)	2.03 (1.43-2.87)	<0.001	1.82 (1.28-2.59)	0.001
LA normal, inactive	1019	14.3 (146)	16.4 (6.7)	0.99 (0.70-1.39)	0.948	1.11 (0.79-1.56)	0.555
LA normal, active	695	12.5 (87)	17.9 (6.3)	0.76 (0.53-1.10)	0.148	1.02 (0.70-1.47)	0.938

PA: physical activity, LA: Left atrial, AF: atrial fibrillation, HR: Hazard ratio, CI: confidence interval, ref: reference, SD: standard deviation. Model 1 was unadjusted. Model 2 was adjusted for age, sex, body mass index, and systolic blood pressure.

**Table S2.** Joint associations of PA and LA size with AF, stratified on sex (HR  $\pm$ 95% CI). The Tromsø Study 1994-95.

	N (n=2479)	AF events, % (n)	Person-years (mean $\pm$ SD)	Model 1, HR (95% CI)	Model 1, p-value	Model 2, HR (95% CI)	Model 2, p-value
<b>Female</b>	1298	14.3 (185)	17.2 (6.4)				
LA enlarged, active (ref.)	122	14.8 (18)	18.2 (5.6)	1.00 (ref.)		1.00 (ref.)	
LA enlarged, inactive	341	22.6 (77)	15.6 (6.7)	1.92 (1.15-3.20)	0.013	1.36 (0.81-2.27)	0.244
LA normal, inactive	584	12.3 (72)	17.1 (6.4)	0.91 (0.54-1.52)	0.714	0.86 (0.52-1.45)	0.581
LA normal, active	251	7.2 (18)	19.0 (5.7)	0.45 (0.24-0.87)	0.018	0.62 (0.32-1.21)	0.161
<b>Male</b>	1181	18.1(214)	15.9 (6.8)	1.41 (1.16-1.72) <sup>a</sup>	0.001 <sup>a</sup>	1.79 (1.47-2.19) <sup>a</sup>	<0.001 <sup>a</sup>
LA enlarged, active (ref.)	160	15.6 (25)	16.2 (6.4)	1.00 (ref.)		1.00 (ref.)	
LA enlarged, inactive	142	32.4 (46)	13.3 (6.5)	2.81 (1.72-4.57)	<0.001	2.12 (1.30-3.47)	0.003
LA normal, inactive	435	17.0 (74)	15.4 (6.9)	1.16 (0.74-1.83)	0.519	1.24 (0.78-1.95)	0.362
LA normal, active	444	15.5 (69)	17.2 (6.5)	0.91 (0.58-1.44)	0.682	1.24 (0.78-1.98)	0.354

PA: physical activity, LA: Left atrial, AF: atrial fibrillation, HR: Hazard ratio, CI: confidence interval, ref.: reference, SD: standard deviation. Model 1 was unadjusted. Model 2 was adjusted for age, body mass index, and systolic blood pressure. <sup>a</sup> = Overall difference from female group

**Table S3.** Joint associations of PA and LA size with AF, stratified on age (HR  $\pm$ 95% CI). The Tromsø Study 1994-95.

	N (n=2479)	AF events, % (n)	Person-years (mean $\pm$ SD)	Model 1, HR (95% CI)	Model 1, p-value	Model 2, HR (95% CI)	Model 2, p-value
<b>&lt;65 years</b>	1697	12.7 (215)	17.9 (6.3)				
LA enlarged, active (ref.)	240	21.7 (52)	16.6 (6.6)	1.00 (ref.)		1.00 (ref.)	
LA enlarged, inactive	184	12.0 (22)	18.5 (5.8)	2.11 (1.28-3.48)	0.003	2.28 (1.37-3.80)	0.001
LA normal, inactive	690	11.7 (81)	17.6 (6.5)	1.04 (0.65-1.67)	0.858	1.12 (0.69-1.81)	0.642
LA normal, active	583	10.3 (60)	18.4 (6.1)	0.86 (0.53-1.40)	0.545	0.87 (0.53-1.42)	0.578
<b><math>\geq</math>65 years</b>	782	23.5 (184)	13.9 (6.4)	2.78 (2.28-3.40) <sup>a</sup>	<0.001 <sup>a</sup>	2.59 (2.09-3.20) <sup>a</sup>	<0.001 <sup>a</sup>
LA enlarged, active (ref.)	98	21.4 (21)	14.4 (6.0)	1.00 (ref.)		1.00 (ref.)	
LA enlarged, inactive	243	29.2 (71)	13.2 (6.4)	1.55 (0.95-2.51)	0.080	1.76 (1.07-2.90)	0.025
LA normal, inactive	329	19.8 (65)	13.8 (6.3)	0.98 (0.60-1.61)	0.946	1.07 (0.65-1.75)	0.802
LA normal, active	112	24.1 (27)	15.0 (6.5)	1.05 (0.59-1.86)	0.868	1.01 (0.57-1.79)	0.968

PA: physical activity, LA: Left atrial, AF: atrial fibrillation, HR: Hazard ratio, CI: confidence interval, SD: standard deviation, ref.: reference. Model 1 was unadjusted. Model 2 was adjusted for sex, body mass index, and systolic blood pressure. <sup>a</sup> = Overall difference from age group <65 years

**Table S4.** Joint associations of PA, LA size and age with AF, stratified on sex. LA enlarged, inactive  $\geq 65$  years as reference. (HR  $\pm 95\%$  CI). The Tromsø Study 1994-95

	N (n=2479)	AF events, % (n)	Person-years (mean $\pm$ SD)	Model 1, HR (95% CI)	Model 1, p-value	Model 2, HR (95% CI)	Model 2, p-value
<b>Female</b>	1298						
LA enlarged, inactive $\geq 65$ years (ref.)	178	29.2 (52)	13.9 (6.6)	1.00 (ref.)		1.00 (ref.)	
LA enlarged, active $\geq 65$ years	44	22.7 (10)	15.8 (6.0)	0.64 (0.33-1.27)	0.201	0.68 (0.34-1.33)	0.258
LA normal, active $\geq 65$ years	40	17.5 (7)	17.2 (6.1)	0.42 (0.19-0.93)	0.033	0.53 (0.24-1.19)	0.123
LA normal, inactive $\geq 65$ years	196	15.8 (31)	15.0 (6.1)	0.49 (0.31-0.76)	0.002	0.52 (0.33-0.80)	0.003
LA enlarged, inactive $< 65$ years	163	15.3 (25)	17.5 (6.4)	0.36 (0.22-0.58)	$< 0.001$	0.42 (0.26-0.67)	$< 0.001$
LA normal, inactive $< 65$ years	388	10.6 (41)	18.2 (6.3)	0.23 (0.15-0.35)	$< 0.001$	0.31 (0.20-0.47)	$< 0.001$
LA enlarged, active $< 65$ years	78	10.3 (8)	19.6 (4.9)	0.20 (0.10-0.43)	$< 0.001$	0.30 (0.14-0.63)	0.002
LA normal, active $< 65$ years	211	5.2 (11)	19.3 (5.6)	0.11 (0.06-0.20)	$< 0.001$	0.15 (0.08-0.29)	$< 0.001$
<b>Male</b>	1181						
LA enlarged, inactive $\geq 65$ years (ref.)	65	29.2 (19)	11.3 (5.7)	1.00 (ref.)		1.00 (ref.)	
LA normal, inactive $\geq 65$ years	133	25.6 (34)	11.9 (6.2)	0.78 (0.45-1.37)	0.391	0.80 (0.46-1.40)	0.434
LA enlarged, inactive $< 65$ years	77	35.1 (27)	14.9 (6.7)	0.75 (0.42-1.35)	0.335	0.73 (0.41-1.33)	0.306

LA normal, active ≥65 years	72	27.8 (20)	13.7 (6.4)	0.68 (0.36-1.28)	0.235	0.70 (0.37-1.31)	0.263
LA enlarged, active ≥65 years	54	20.4 (11)	13.3 (5.7)	0.54 (0.26-1.13)	0.103	0.57 (0.27-1.20)	0.140
LA normal, inactive <65 years	302	13.2 (40)	17.0 (6.6)	0.23 (0.13-0.40)	<0.001	0.23 (0.13-0.41)	<0.001
LA normal, active <65 years	372	13.2 (49)	17.9 (6.3)	0.21 (0.12-0.36)	<0.001	0.23 (0.13-0.40)	<0.001
LA enlarged, active <65 years	106	13.2 (14)	17.7 (6.3)	0.22 (0.11-0.43)	<0.001	0.22 (0.11-0.45)	<0.001

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PA: physical activity, LA: Left atrial, AF: atrial fibrillation, HR: Hazard ratio, CI: confidence interval, SD: standard deviation, ref.: reference. Model 1 was unadjusted. Model 2 was adjusted for body mass index and systolic blood pressure

**Table S5.** Joint associations of PA, LA size and age with AF, stratified on sex. LA enlarged, active <65 years as reference. (HR  $\pm$ 95% CI). The Tromsø Study 1994-95.

	N= (2479)	AF events, % (n)	Person-years (mean $\pm$ SD)	Model 2, HR (95% CI)	Model 2, p-value
<b>Female</b>	1298				
LA enlarged, active <65 years (ref.)	78	10.3 (8)	19.6 (4.9)	1.00 (ref.)	
LA enlarged, inactive $\geq$ 65 years (1)	178	29.2 (52)	13.9 (6.6)	3.39 (1.59-7.25)	0.002
LA enlarged, inactive <65 years (2)	163	15.3 (25)	17.5 (6.4)	1.41 (0.63-3.14)	0.402
LA enlarged, active $\geq$ 65 years (3)	44	22.7 (10)	15.8 (6.0)	2.29 (0.90-5.86)	0.083
LA normal, inactive $\geq$ 65 years (4)	196	15.8 (31)	15.0 (6.1)	1.74 (0.79-3.83)	0.166
LA normal, inactive <65 years (5)	388	10.6 (41)	18.2 (6.3)	1.04 (0.49-2.22)	0.919
LA normal, active $\geq$ 65 years (6)	40	17.5 (7)	17.2 (6.1)	1.80 (0.65-4.98)	0.255
LA normal, active <65 years (7)	211	5.2 (11)	19.3 (5.6)	0.50 (0.20-1.25)	0.137
<b>Male</b>	1181				
LA enlarged, active <65 years (ref.)	106	13.2 (14)	17.7 (6.3)	1.00 (ref.)	
LA enlarged, inactive $\geq$ 65 years (1)	65	29.2 (19)	11.3 (5.7)	4.46 (2.23-8.94)	<0.001
LA enlarged, inactive <65 years (2)	77	35.1 (27)	14.9 (6.7)	3.27 (1.71-6.26)	<0.001
LA enlarged, active $\geq$ 65 years (3)	54	20.4 (11)	13.3 (5.7)	2.55 (1.16-5.63)	0.021
LA normal, inactive $\geq$ 65 years (4)	133	25.6 (34)	11.9 (6.2)	3.56 (1.91-6.66)	<0.001
LA normal, inactive <65 years (5)	302	13.2 (40)	17.0 (6.6)	1.04 (0.56-1.93)	0.900
LA normal, active $\geq$ 65 years (6)	72	27.8 (20)	13.7 (6.4)	3.11 (1.57-6.18)	0.001
LA normal, active <65 years (7)	372	13.2 (49)	17.9 (6.3)	1.02 (0.56-1.86)	0.943

PA: physical activity, LA: Left atrial, AF: atrial fibrillation, HR: Hazard ratio, CI: confidence interval, SD: standard deviation, ref.: reference. Model 1 was unadjusted. Model 2 was adjusted for body mass index and systolic blood pressure

**Table S6.** Association between PA with five categories and AF (HR  $\pm$ 95% CI). The Tromsø Study 1994-95.

	N (n=2472)	AF events, % (n)	Person-years (mean $\pm$ SD)	Model 1, HR (95% CI)	Model 1, p-value	Model 2, HR (95% CI)	Model 2, p-value
Sedentary <sup>a</sup>	265	17.7 (47)	15.2 (6.8)	1.00 (ref.)		1.00 (ref.)	
Inactive <sup>b</sup>	1236	18.0 (222)	16.1 (6.7)	0.94 (0.68-1.28)	0.682	1.00 (0.73-1.38)	0.987
Low <sup>c</sup>	381	13.1 (50)	17.4 (6.5)	0.61 (0.41-0.91)	0.014	0.80 (0.54-1.21)	0.290
Moderate <sup>d</sup>	390	12.3 (48)	17.8 (6.0)	0.56 (0.37-0.83)	0.004	0.68 (0.45-1.03)	0.068
Vigorous <sup>e</sup>	200	15.5 (31)	17.7 (6.1)	0.71 (0.45-1.11)	0.131	0.85 (0.54-1.36)	0.500

PA: physical activity, AF: atrial fibrillation, HR: Hazard ratio, CI: confidence interval, SD: standard deviation, ref.: reference. Model 1 was unadjusted. Model 2 was adjusted for sex, body mass index, and systolic blood pressure.

<sup>a</sup> = light and hard PA 0 hours/week

<sup>b</sup> = light PA >0 hours/week and hard PA 0 hours/week

<sup>c</sup> = hard PA 0-1 hour/week

<sup>d</sup> = hard PA 1-2 hours/week

<sup>e</sup> = hard PA  $\geq$ 3 hours/week

**Table S7.** Sensitivity analysis: Association between PA and AF adjusted for hypertension groups (HR  $\pm$ 95% CI). The Tromsø Study 1994-95.

	N (n=2468)	AF events, % (n)	Model 1, HR (95% CI)	Model 2, HR (95% CI)	Model 3, HR (95% CI)
Inactive	1497	18.0 (269)	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
Low	382	13.1 (50)	0.64 (0.47-0.87)	0.80 (0.59-1.09)	0.79 (0.58-1.08)
Moderate	388	12.1 (47)	0.58 (0.42-0.79)	0.67 (0.49-0.92)	0.68 (0.50-0.93)
Vigorous	201	15.9 (32)	0.76 (0.53-1.10)	0.89 (0.61-1.29)	0.88 (0.61-1.28)

PA: physical activity, AF: atrial fibrillation, HR: Hazard ratio, CI: confidence interval, ref.: reference.

Model 1 was unadjusted. Model 2 was adjusted for age, sex, body mass index, and systolic blood pressure.

Model 3 was adjusted for age, sex, body mass index, and hypertension groups.

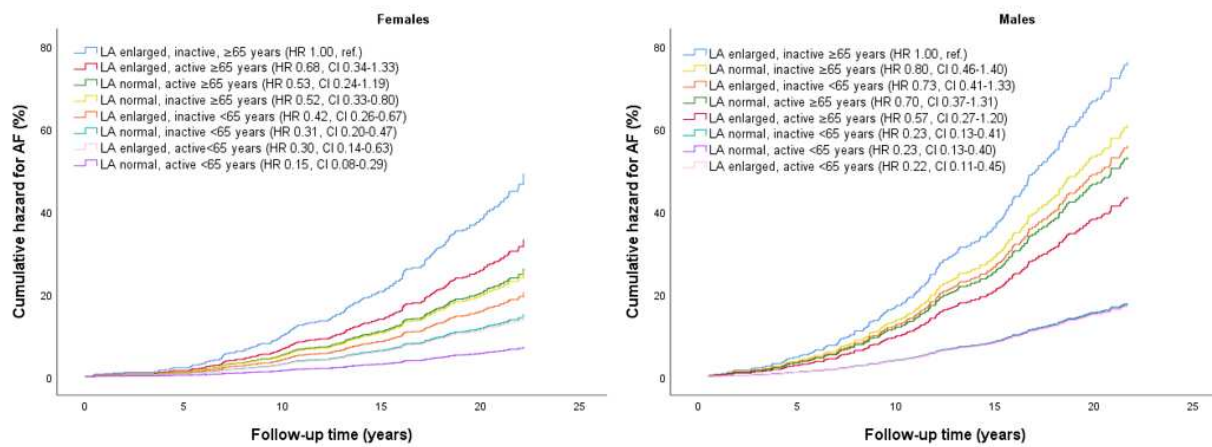


**Table S8.** Sensitivity analysis: Association between PA and AF with covariates in Model 3 (HR  $\pm$ 95% CI). The Tromsø Study 1994-95.

	N (n=1614)	AF events, % (n)	Model 1, HR (95% CI)	Model 2, HR (95% CI)	Model 3, HR (95% CI)
Inactive	872	16.1 (140)	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
Low	293	14.0 (41)	0.80 (0.56-1.13)	0.95 (0.66-1.35)	0.95 (0.66-1.37)
Moderate	298	10.7 (32)	0.60 (0.41-0.88)	0.65 (0.44-0.97)	0.66 (0.45-0.98)
Vigorous	151	16.6 (25)	0.95 (0.62-1.45)	1.01 (0.65-1.56)	0.95 (0.61-1.47)

PA: physical activity, AF: atrial fibrillation, HR: Hazard ratio, CI: confidence interval, ref.: reference, LDL: low-density lipoprotein, LV: left ventricular.

Model 1 was unadjusted. Model 2 was adjusted for age, sex, body mass index, systolic blood pressure. Model 3 was adjusted for Model 2 in addition to smoke, coffee, diabetes, LDL cholesterol, palpitations, LV myocardial mass index, thyroid disease, C-reactive protein, alcohol, resting heart rate.



**Figure S1.** Adjusted cumulative hazard for AF by joint associations of PA, LA size, and age with AF risk, stratified by sex. Differences between groups are indicated with HR and 95% CI. The model is adjusted for body mass index and systolic blood pressure. AF: atrial fibrillation, LA: left atrial/left atrium, HR: hazard ratio, CI: confidence interval. The Tromsø Study 1994-95.