Blood pressure response to exercise in endurance athletes with and without paroxysmal atrial fibrillation.

K. Janssens[1], T. Apelland[2], A. Mitchell[3], S. Enger[2], C. Dausin[4], S. Rowe[3], P. D'ambrosio[3], S. Foulkes[5], J. Hawley[1], G. Claessen[6], M. Myrstad[2], A. La Gerche[3]

[1]The Mary MacKillop Institute for Health Research, ACU, Melbourne, Australia
[2]Baerum Hospital Vestre Viken Trust, Department of Medical Research, Gjettum, Norway
[3]St. Vincents Institute of Medical Research, Heart and Exercise Trials Laboratory, Melbourne, Australia
[4]KU Leuven, Department of movement sciences, exercise physiology research group, Leuven, Belgium
[5]University of Alberta, College of Health Sciences, Edmonton, Canada
[6]Hasselt University, Faculty of Medicine and Life Sciences, Hasselt, Belgium

Funding Acknowledgements: Type of funding sources: Other. Main funding source(s): Kristel Janssens is supported through an Australian Government Research Training Program Scholarship

Background: Atrial fibrillation (AF) is more prevalent among endurance-trained athletes when compared to non-athletes. The underlying pathophysiology and mechanisms for this phenomenon remain unknown but repeated exposure to an exaggerated blood pressure (BP) response during exercise may contribute to the development of AF in this population.

Purpose: We aimed to assess whether endurance athletes with AF have a higher maximal systolic BP (SBP) or a higher BP relative to exercise intensity compared to endurance athletes without AF.

Methods: Endurance athletes with paroxysmal AF (n=66, 96% male) from the ProAFHeart, NEXAF Detraining and Master@Heart studies were matched for age and sex to endurance athletes without AF (n=66, 96% male). Participants with a history of hypertension were excluded. All athletes underwent a maximal graded cardiopulmonary exercise test on a cycle ergometer to assess exercise BP using an automated auscultatory BP machine, maximal oxygen uptake (VO2peak) and peak workload. All athletes were in sinus rhythm at the time of testing and BP was measured pre-exercise seated on the bike and every 2 min throughout the test. Exercise BP measurements included the maximum exercise SBP (SBPmax) and the slopes of the relationships between SBP, diastolic BP (DBP) and workload (W) as determined from linear regression analysis (SBP/W-slope and DBP/W-slope, respectively). The resting SBP and DBP were measured in the supine position after 10min of rest. Independent T-test (parametric data) or the Mann-Whitney U-test (non-parametric data) assessed for the differences between the two groups.

Results: The 66 athletes with AF were of similar age and sex as the 66 athletes without AF, median age (55 [IQR 45, 61] vs 54 [IQR 44, 62] years, p=0.839), 4% female. There was no difference in (mean±SD) VO2peak (46 ±9 vs 49±10 mL/kg/min, p=0.114) and peak workload (365 ±67 vs 385±83 W, p=0.136), nor resting SBP (131±13 vs 128±13 mmHg, p=0.169) and resting DBP (76±9 vs 75±11 mmHg, p=0.465) between athletes with and without AF respectively (Table 1). Athletes with AF showed no significant difference to athletes without AF for exercise BP responses (Figure 1) including SBPmax (222±22 vs 219±28 mmHg, p=0.479), SBP/W-slope (0.22±0.07 vs 0.24±0.08 mmHg/W, p=0.310) and median DBP/W-slope (-0.01 [IQR -0.02, 0.01] vs -0.01 [IQR -0.03, 0.02] mmHg/W, p=0.703).

Conclusion: When comparing endurance athletes with and without paroxysmal AF, there were no differences in the maximal BP attained during exercise or in their BP response indexed to external workload (SBP/W-slope) suggesting that exercise-induced hypertension does not explain the athletic predisposition to AF.

Table 1: Participant characteristics for participants with and without paroxysmal atrial fibrillation

Variable	AF n=66	No-AF n=66	P-value
Age, years	55 [45, 61]	54 [44, 62]	0.839
Height, cm	181±8	182±8	0.923
Weight, kg	81±11	78±10	0.136
Body mass index, kg/m^2	24.5± 2.1	23.7±2.1	0.028
Resting SBP, mmHg	131±13	128±13	0.169
Resting DBP, mmHg	76±9	75±11	0.465
Resting heart rate, bpm	52±8	52±9	0.691
Exercise testing			
Maximal heart rate, bpm	169±13	172±16	0.165
Peak workload, Watts	365±67	385±83	0.136
Peak VO_2, mL/kg/min	46.0±8.5	48.6±9.7	0.114
Percentage of predicted[1] VO_2, %	128±18	129±18	0.642
Exercise SBP_{max}, mmHg	222±22	219±28	0.479
SBP/W-slope, mmHg/Watt	0.22±0.07	0.24±0.08	0.310
DBP/W-slope, mmHg/Watt	-0.01 [-0.02, 0.01]	-0.01 [-0.03, 0.02]	0.703

Values are median [IQR] or mean ±SD. Abbreviations: AF, atrial fibrillation; SBP, systolic blood pressure; DBP, diastolic blood pressure; VO_2, oxygen uptake; W, workload. [1]Predicted values based on the FRIEND VO_2 regression equation including sex, body height and weight.

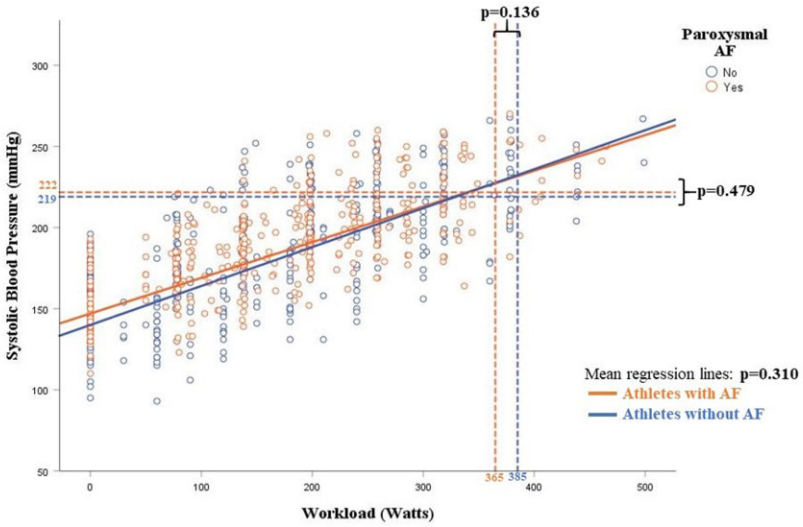

Figure 1. Scatterplot with mean linear regression lines for systolic blood pressure indexed to external workload during graded exercise in athletes with and without paroxysmal atrial fibrillation (AF). Vertical striped lines from the X-axis indicate the mean maximal workload and the horizontal striped lines from the Y-axis indicate the mean maximal systolic blood pressure in athletes with AF (orange colour) and without AF (blue colour). Athletes with AF showed no significant difference compared to athletes without AF for exercise blood pressure responses.