Comparison of cardiac biomarker fluctuation in runners of marathons, semi-marathons and untrained runners

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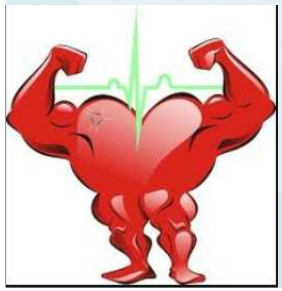
Background:

- Regular exercise like running is one important part of the prevention program of cardiovascular disease.
- Several studies on biomarker changes during marathons : mild to moderate elevations described as a result of a running exercise.
- Exact underlying mechanism: physiological or even pathophysiological changes is unknown and less-trained athletes might exhibit a higher risk compared to well-trained.



Aim of the study

- **What?**

➔ A comparaison between 3 cardiac biomarkers:

(1) ischemic condition (Troponin I and T), (2) cardiac stretch (natriuretic peptides, BNP and NT-proBNP), (3) fibrotic processes (Galectin-3) .

- **In which population?**

➔ *Different types of runners*

✓ Marathon runners → 23 (41± 8.8 yo) marathon runners (➔42.195km)

✓ Semi-marathon runners→ 15 semi-marathon runners(44.1±8.4yo) (➔21.097 km)

✓ Untrained runners " control group"→ 17 healthy sedentary subjects (37± 4.4 yo) (race of 1h, <2h of sport/week)

the running exercise

Subjects and pre-analytical phase

When?

➔Before (T0)

➔Directly after (T post or T1)

➔ 3 hours after (T3 post or T2)

Times

Runners	Weekly training plan	Performance
Marathon	5 h28 min ± 2 h 33 min	3h50 min 48 sec (±27 min 30 sec)
Semi-marathon	4 h 22 min ± 1 h 29 min	1 h 55 min 18 sec (±15min 31 sec)
Control group	< 2h	1 hour in an athletic stadium being at their limits at the end of the exercise

Methods

- The analyses were performed on :

➔ the Abbott ARCHITECT *i*2000$_{SR}$ (Abbott Laboratories, Germany) for the hs cTnI, BNP and Gal-3 ➔

- For hs cTnI
  - LOD :1.9 ng/L and CV 10%: 5 ng/L.
  - The 99th percentile values are gender dependent: 26.2 ng/L for all (15.2 ng/L for females and 34.1 ng/mL for healthy males)
- For BNP
  - LOD :< 10 ng/L and CV 10%: 5 ng/L.
  - An imprecision of less than 5% at 90 ng/L
  - In non-acute setting a value of 35 ng/L BNP is the recommended threshold for further follow-up for potential heart failure in asymptomatic individuals at risk
- For Gal 3
  - LOQ: 6 ng/L
  - 97.5th percentile: 25.7 ng/mL

Methods

- The analyses were performed on :

➔ the C8000 (Roche Diagnostics,Switzerland) for hs-cTnT and NT-proBNP according to the manufacturer's instructions for use.

- For hs TnT
  - LOD: 5 ng/L and CV 10%: 13 ng/L.
  - The 99th percentile values are gender dependent: 14 ng/L for all (15.2 ng/L for females and 34.1 ng/mL for healthy males)
- For NT-proBNP
  - LOD:5 ng/L and LOQ: 30 ng/L.
  - In non-acute setting a value of 125 ng/L NT-proBNP is the recommended threshold for further follow-up for potential heart failure in asymptomatic individuals at risk

- Hematocrit and hemoglobin levels were determined at all 3 time points to correct for possible dehydration post exercise (Advia, Siemens).

Results

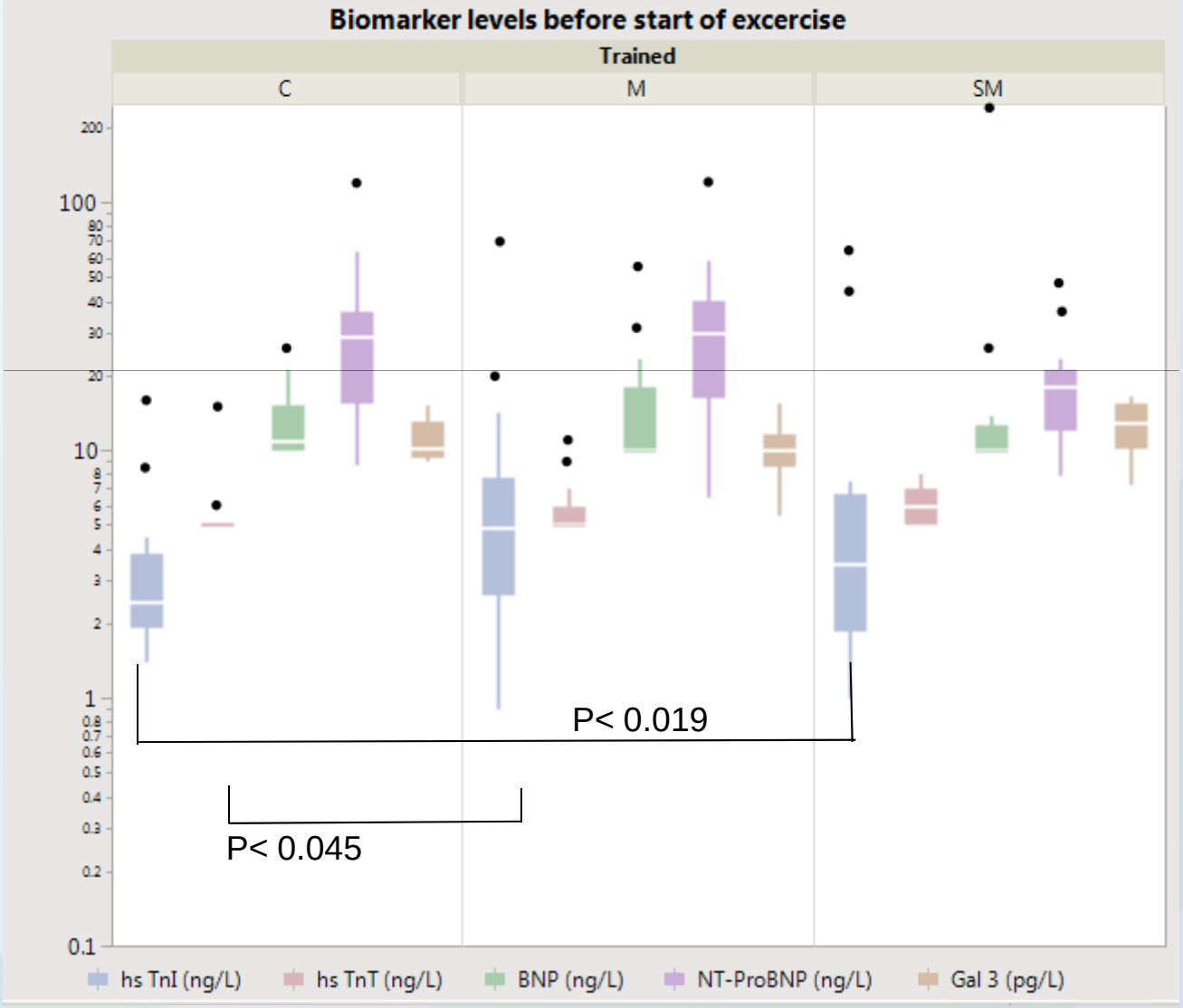
Biometric values

					Heart Rate, beats per minute			Arterial pressure mm Hg		
	Age (ans)	**Height (cm)**	**Weight (kg)**	**BMI**	**T0**	**T post**	**T 3 h post**	**T0**	**T post**	**T 3 h post**
Marathon	41 ± 8,76	178,8 ± 7,78	74,4 ± 10,23	23,21 ± 2,26	56 ± 10	**97 ± 17***	80 ± 13**	123 ± 11	**97 ± 11***	**108 ± 9****
Semi-Marathon	44,1 ± 8,37	177,2 ± 7,38	73,8 ± 8,49	23,43 ± 1,68	66 ± 18	**89 ± 19***	79 ± 9	119 ± 9	**106 ± 10***	108 ± 9
Control	37 ± 4,39	178,9 ± 7,82	75,9 ± 8,88	23,74 ± 2,46	72 ± 14	**99 ± 13***	83 ± 14**	125 ± 14	121± 16	120 ± 12

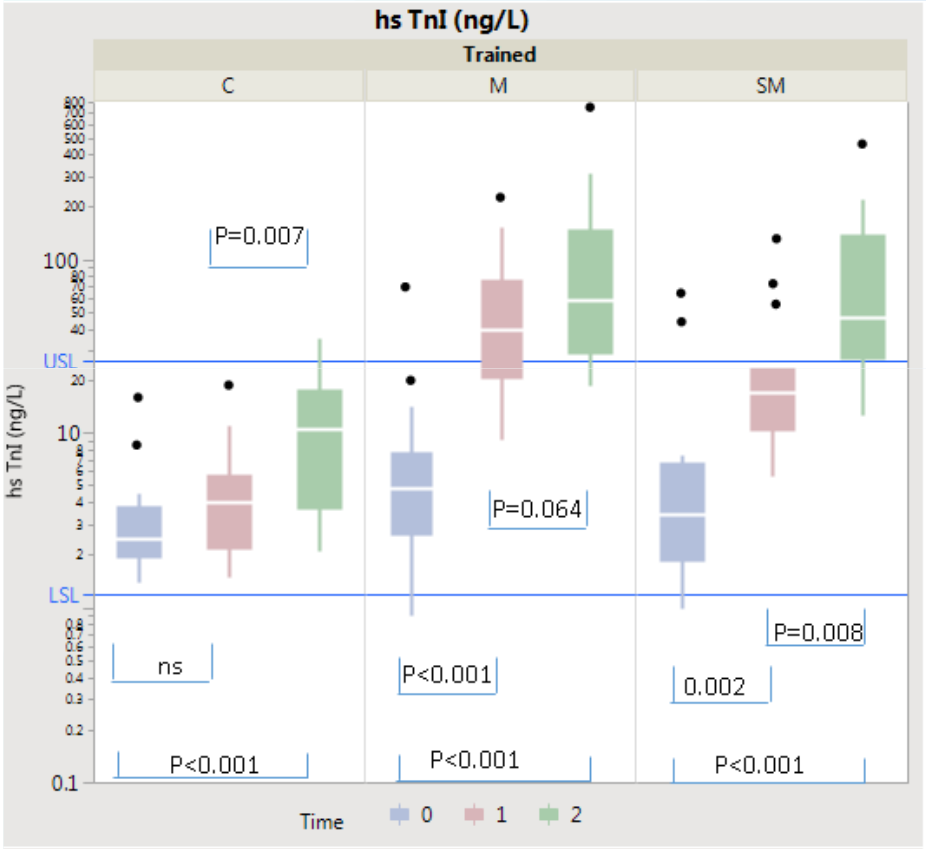
*P value (T0-Tpost)

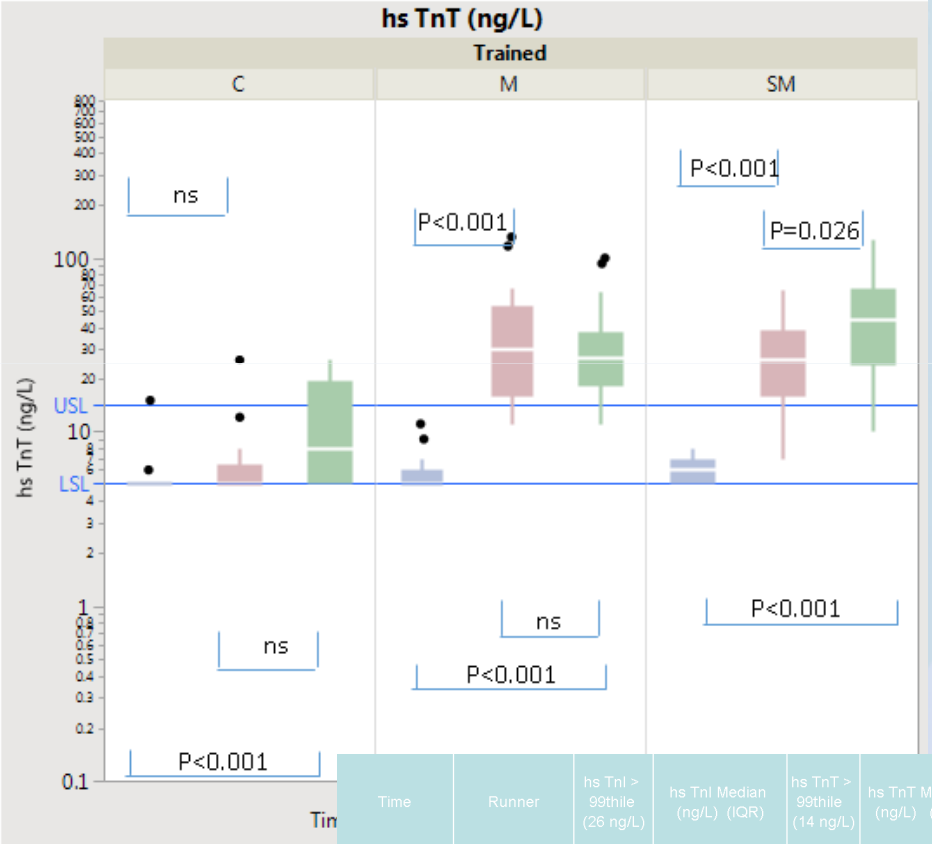
**P-value (T post – T 3h post)

Pre-exercise levels



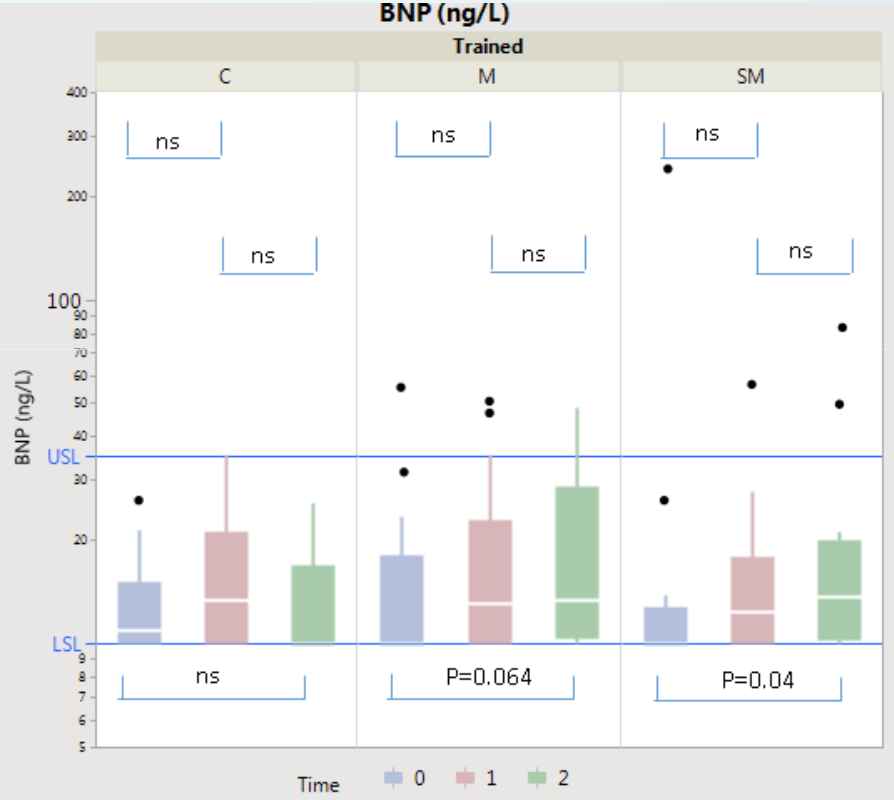
Change of the biomarker levels during and after the run TnT-TnI

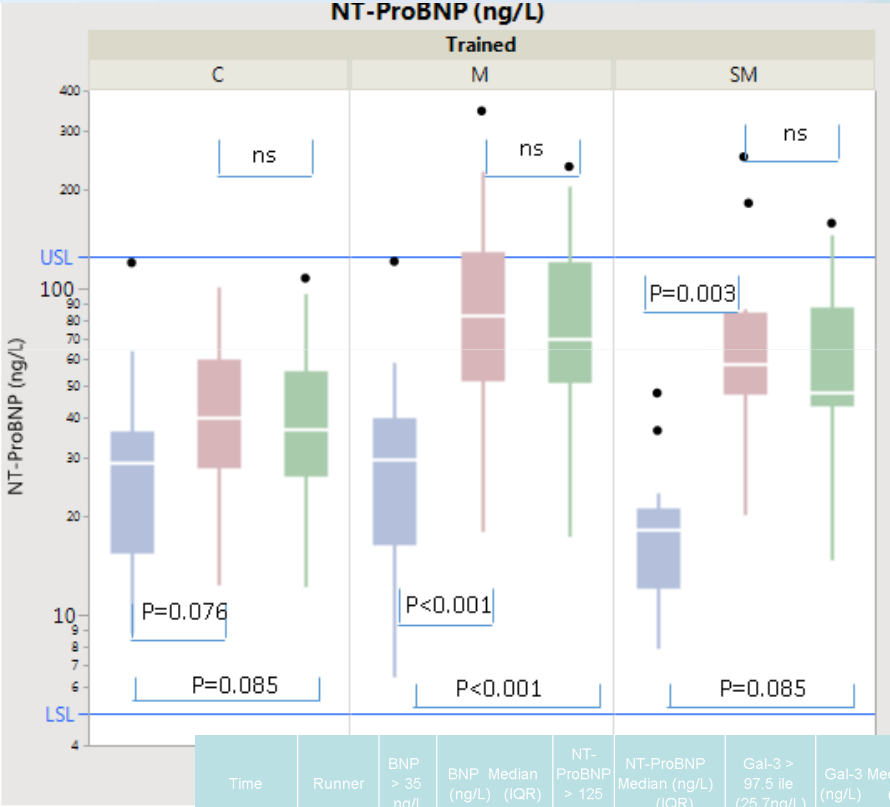




Time	Runner	hs TnI > 99thile (26 ng/L)	hs TnI Median (ng/L) (IQR)	hs TnT > 99thile (14 ng/L)	hs TnT Median (ng/L) (IQR)
Before	Marathon	1/20	4.9 (2.6-7.8)	0/23	<5.0
Directly after		11/20	39.5 (20.5-77.2)	20/23	30.0 (17.6-54.0)
3 hours after		18/21	58.4 (28.9-148.8)	19/23	27.0 (18.0-38.0)
Before	Semi-M.	2/12	3.5 (1.9-6.8)	0/15	6.0 (5.0-7.0)
Directly after		3/15	17.1 (10.2-23.8)	6/15	26.0 (16.0-39.0)
3 hours after		9/13	46.1 (13.8-141.0)	14/15	45.0 (24.0-68.0)
Before	Control	0/16	2.5 (1.9-3.8)	0/17	<5.0
Directly after		0/16	4.0 (2.2-5.8)	0/17	5.0 (5.0-7.0)
3 hours after		1/16	10.4 (3.7--18.0)	7/17	8.0 (5.0-20.0)

Change of the biomarker level during and after the run
BNP-NT-proBNP

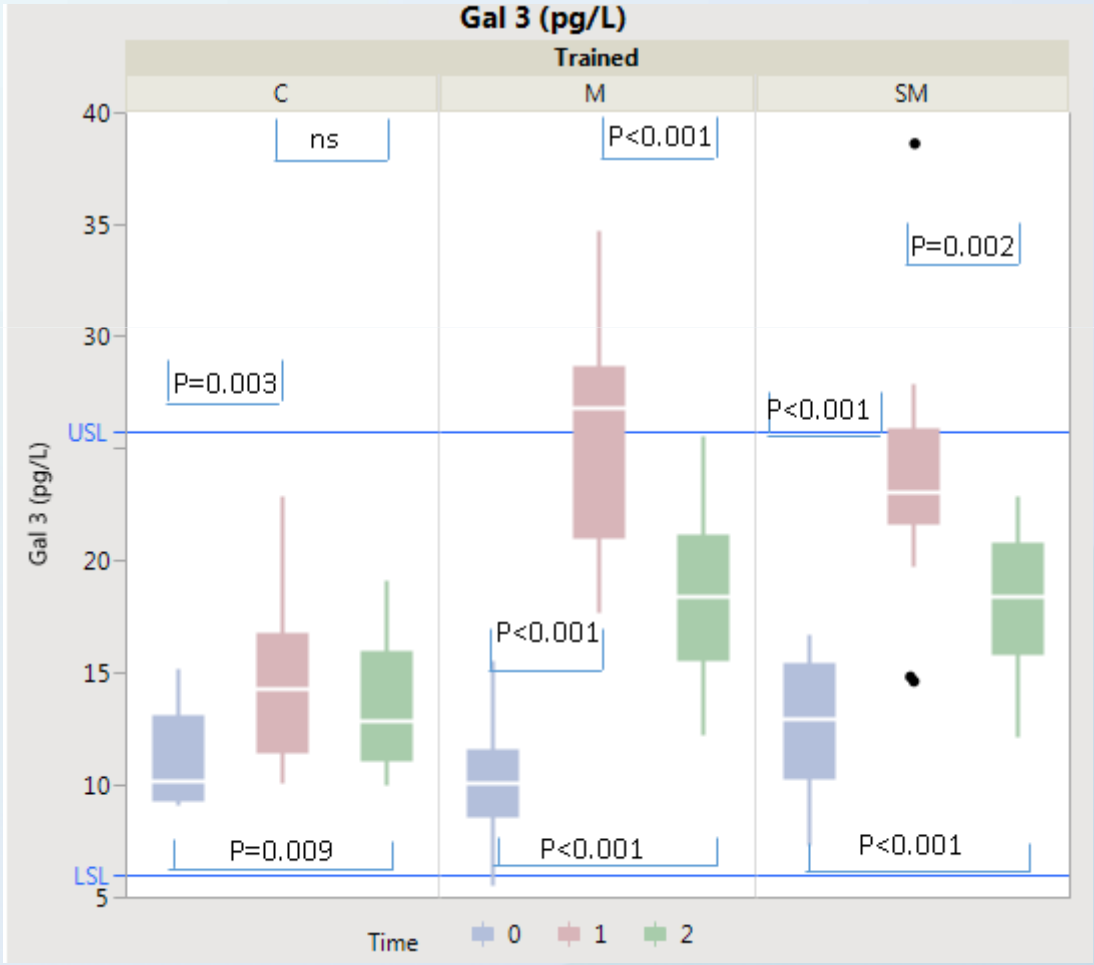




Time	Runner	BNP > 35 ng/L	BNP Median (ng/L) (IQR)	NT-ProBNP > 125 ng/L	NT-ProBNP Median (ng/L) (IQR)	Gal-3 > 97,5 ile (25.7ng/L)	Gal-3 Median (ng/L) (IQR)
Before		1/22	10 (10 - 18)	0/23	30 (16 - 54)	0/22	10 (9 - 12)
Directly after	Marathon	3/22	13 (10 - 23)	6/23	83 (52 -128)	11/22	27 (21 - 29)
3 hours after		3/22	13 (11 - 29)	5/23	70 (51 - 120)	0/22	18 (16 - 21)
Before		1/14	10 (10 - 13)	0/15	18 (21 21)	0/14	13 (10 - 15)
Directly after	Semi-M.	1/15	12 (10 - 18)	2/15	58 (47-85)	4/15	23 (22 - 26)
3 hours after		2/14	14 (10 - 20)	2/15	48 (43-88)	0/14	18 (16 - 21)
Before		0/17	11 (10 - 15)	0/17	29 (15 - 37)	0/17	10 (9 - 13)
Directly after	Control	0/17	13 (10 - 21)	0/17	40 (28 - 60)	0/17	14 (12 - 17)
3 hours after		0/17	10 (10 - 17)	0/17	37 (27 55)	0/17	13 (11 - 16)

Change of the biomarker level during and after the run

Galectin-3



Main findings of the study

- Increase of all the biomarkers.
- Notable differences in the pattern of individual increase during and after completion of the exercise.
- Biomarker increase depends on the intensity and duration of the exercise.
- Troponin I and Troponin T values continued to increase with highest levels seen 3 hours after the race.

Conclusion

- Our study demonstrates that exercises of different intensity can be associated with biochemical abnormalities that may reflect adverse consequences on the heart like possible micro necrosis, oxidative stress, fibrosis and myocardial stretch.

- With the exception of Troponin where levels continue to raise after end of running, NPs and Gal-3 levels normalized relatively fast after the exercise.


thank you
danke
謝謝
ngiyabonga
teşekkür ederim
gracias
спасибо
dziękuję
bedankt
obrigado
merci
go raibh maith agat
mochchakkeram
dakujem
arigatō
sukriya
kop khun krap
terima kasih
감사합니다
ευχαριστώ
grazie
tapadh leat
dank je
mauruuru
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Баярлалаа
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Hourly change of biomarker level in%