**Table 1**: baseline parameters among the four different races in finishers. SSR: singlestage race; MSR: multistage race.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Distance**  **+ elevation** | **42 km**  **2 500** | **95 km**  **5 500** | **169 km (SSR)**  **11 000** | **169 km (MSR)**  **11 000** |
| Starters, n (females) | 18 (5) | 12 (1) | 29 (2) | 20 (4) |
| Finishers, n (females) | 18 (5) | 11 (1) | 18 (1) | 16 (4) |
| Age (y) | 35.8 ± 1.8 | 34.6 ± 2.5 | 42.9 ± 2.2 | 38.2 ± 1.9 |
| Height (cm) | 173 ± 2.3 | 175.4 ± 1.7 | 173.8 ± 1.4 | 175 ± 1.9 |
| Weight (Kg) | 68.1 ± 8.4 | 69.1 ± 2.6 | 69.6 ± 8.3 | 70.5 ± 1.8 |
| Body fat (%) | 17.6 ± 7.2 | 14.5 ± 3 | 15.5 ± 3.2 | 19.3 ± 4.3 |
| BMI (Kg.m-2) | 22.7 ± 0.4 | 22.4 ± 0.6 | 23.0 ± 0.5 | 23.0 ± 0.5 |
| VO2 max. (L.min-1) | 3.6 ± 0.8 | 3.9 ± 0.2 | 3.9 ± 0.1 | 3.9 ± 0.2 |
| VO2 max. (% th. values) | 132 ± 5 | 140 ± 6 | 150 ± 5 | 141 ± 5 |
| VO2/Kg (mL.kg-1.min-1) | 53.9 ± 2.4 | 57.3 ± 2.3 | 56.6 ± 1.4 | 55.1 ± 2.0 |
| Training (years) | 3.4 ± 1.2 | 3.6 ± 1.1 | 4.1 ± 1.2 | 4 ± 1.4 |
|  |  |  |  |  |
|  |  |  |  |  |

**Table 2**: race characteristics and performance of finishers

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **42 km** | **95 km** | **169 km (SSR)** | **169 km (MSR)** |
| n (females) | 18 (5) | 11 (1) | 18 (1) | 16 (4) |
| race duration (HH:MM) | 07:35 ± 00:24 | 21:00 ± 01:14 | 48:48 ± 00:57 | 32:31 ± 01:27 |
| % of winning time |  | 66.4 ± 10.9  [30-162] |  |  |
| Mean race speed (km.h-1) | 5.5 ± 0.3 | 4.7 ± 0.2 | 3.7 ± 0.1\* | 5.1 ± 0.2 |
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|  |  |  |  |  |

\*significantly lower with all the other races (p=0.02 with the 95km and p<0.0001 with 42 km and 169 km (MSR)).

**Table 3**: parameters before (PRE), at the end of the race (POST) and during the recovery period (D+2, D+5 and D+10).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | | | | |  | | | | | One stage/multistage race effect | | | | | | | | | |
|  |  | Distance effect | | | | | | | | | | | | | | |  | | | | |
|  |  | 42 km | | | | | 95 km | | | | | 169 km | | | | | 169 km/4 days | | | | |
|  |  | PRE | POST | D+2 | D+5 | D+10 | PRE | POST | D+2 | D+5 | D+10 | PRE | POST | D+2 | D+5 | D+10 | PRE | POST | D+2 | D+5 | D+10 |
|  | Weight (kg) | 68.1±2.0 | 66.6±2.0 | 68.5±1.9 | 67.8±1.9 | 67.9±1.9 | 69.1±2.6 | 67.9±2.5 | 68.6±2.6 | 68.5±2.8 | 68.0±2.9 | 69.6±2.0 | 68.3±1.9 | 69.8±2.0 | 68.7±1.9 | 68.7±2.1 | 70.5±1.8 | 69.3±1.8 | 70.6±1.8 | 69.4±1.9 | 69.8±2.0 |
|  | HR (b/min) | 59±3 | 88±3 | 56±2 | 56±3 | 60±3 | 57±2 | 75±3 | 58±3 | 53±2 | 54±2 | 58±3 | 76±2 | 59±3 | 59±2 | 64±3 | 53±3 | 66±3 | 49±2 | 51±3 | 54±2 |
|  | BP (mmHg) | 86±2 | 79±1 | 86±2 | 85±2 | 87±2 | 87±2 | 82±3 | 88±3 | 91±3 | 88±2 | 92±2 | 88±2 | 94±2 | 93±2 | 91±2 | 90±2 | 82±2 | 94±2 | 89±2 | 90±2 |
| LEFT HEART | LA (mL) | 66±3 | 66±3 | 73±4 | 69±4 | 66±3 | 67±5 | 74±6 | 81±7 | 74±5 | 69±6 | 78±5 | 82±4 | 84±3 | 78±4 | 77±5 | 73±4 | 83±5 | 90±5 | 77±4 | 79±5 |
| LA (mL/m2) | 36.4±1.3 | 36.5±1.2 | 40.0±1.9 | 37.7±1.5 | 36.6±1.3 | 36.5±2.8 | 40.3±3.0 | 43.9±3.3 | 40.1±2.7 | 37.5±2.7 | 42.9±2.4 | 45.1±1.9 | 45.8±1.4 | 42.6±2.0 | 42.6±2.4 | 39.7±1.9 | 44.9±2.5 | 48.8±2.3 | 41.9±1.7 | 42.9±2.6 |
| LVDD (mm) | 51±1 | 48±1 | 51±1 | 50±1 | 50±1 | 51±1 | 49±1 | 53±2 | 52±1 | 51±2 | 51±1 | 49±1 | 53±1 | 53±1 | 50±1 | 52±1 | 52±1 | 55±1 | 53±1 | 52±1 |
| LVD vol (mL) | 106±5 | 101±4 | 113±6 | 105±5 | 109±4 | 118±6 | 113±5 | 126±7 | 118±5 | 115±5 | 118±4 | 115±4 | 124±4 | 116±3 | 113±4 | 122±8 | 120±7 | 138±7 | 121±6 | 117±6 |
| LVD vol (mL/m2) | 58.6±4.5 | 55.4±1.5 | 61.7±2.9 | 57.9±2.1 | 60.0±2.0 | 52.8±2.8 | 61.6±2.1 | 68.3±3.6 | 64.2±2.6 | 63.0±2.1 | 63.8±2.0 | 63.3±2.2 | 67.3±2.0 | 63.3±1.3 | 62.1±1.8 | 65.5±3.2 | 64.9±3.1 | 74.2±3.1 | 65.4±2.8 | 63.0±2.5 |
| SV (mL) | 58±3 | 52±3 | 61±3 | 58±3 | 60±3 | 64±3 | 64±4 | 70±6 | 64±3 | 64±4 | 65±4 | 64±3 | 64±3 | 63±3 | 62±2 | 69±5 | 69±5 | 75±4 | 69±4 | 66±4 |
| EF (Simpson) | 55±2 | 53±2 | 55±2 | 56±2 | 57±1 | 55±1 | 53±2 | 54±2 | 59±3 | 56±1 | 56±1 | 56±1 | 53±1 | 57±1 | 57±1 | 57±1 | 56±2 | 55±1 | 59±2 | 59±1 |
| GLV strain (%) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mitral E/A | 1.8±0.1 | 1.2±0.1 | 1.8±0.1 | 1.9±0.1 | 1.8±0.1 | 1.7±0.1 | 1.4±0.1 | 1.8±0.1 | 1.7±0.1 | 1.6±0.1 | 1.6±0.2 | 1.3±0.1 | 1.8±0.1 | 1.6±0.1 | 1.4±0.1 | 1.8±0.2 | 1.5±0.1 | 2.0±0.2 | 1.8±0.1 | 1.7±0.1 |
| RIGHT HEART | RA (mL) | 55±4 | 57±5 | 64±6 | 61±5 | 57±5 | 60±6 | 63±6 | 66±6 | 61±5 | 59±6 | 64±3 | 70±4 | 73±4 | 65±3 | 67±4 | 59±4 | 65±4 | 77±4 | 62±4 | 66±5 |
| RA (mL/m2) | 30.0±1.8 | 31.2±2.1 | 35.1±2.8 | 33.4±2.0 | 31.0±2.0 | 32.3±2.7 | 34.2±2.9 | 35.8±2.9 | 32.9±2.7 | 32.2±2.9 | 34.7±1.5 | 38.4±2.1 | 39.9±1.7 | 35.8±1.6 | 37.2±1.9 | 31.4±1.7 | 35.3±1.9 | 41.6±1.6 | 33.7±1.9 | 35.9±2.2 |
| RVEDA (cm2) | 21.5±1.7 | 22.3±1.2 | 23.4±1.3 | 22.7±1.0 | 22.3±1.2 | 22.7±1.1 | 22.7±0.6 | 23.7±0.8 | 22.4±1.2 | 22.6±1.1 | 22.4±0.8 | 25.0±1.0 | 25.5±0.9 | 22.9±0.9 | 22.8±1.0 | 21.7±1.0 | 25.1±1.1 | 23.8±0.9 | 23.7±1.0 | 24.1±0.9 |
| RVEDA (cm2/m2) | 11.9±0.6 | 12.6±0.8 | 13.0±0.7 | 12.5±0.4 | 12.3±0.5 | 12.4±0.5 | 12.4±0.4 | 12.9±0.4 | 12.2±0.5 | 12.3±0.4 | 12.2±0.8 | 14.4±0.5 | 13.9±0.4 | 12.5±0.5 | 12.6±0.5 | 11.7±0.5 | 13.1±0.5 | 13.1±0.6 | 12.5±0.5 | 13.1±0.5 |
| RVAC (%) | 47±1 | 44±2 | 44±1 | 45±2 | 45±2 | 47±2 | 44±2 | 44±2 | 43±2 | 47±2 | 44±1 | 42±1 | 42±2 | 45±1 | 44±1 | 47±2 | 45±2 | 45±2 | 47±1 | 48±2 |
| RV strain (%) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tricuspid E/A | 2.1±0.1 | 1.3±0.1 | 2.2±0.1 | 2.1±0.1 | 2.2±0.1 | 2.2±0.1 | 1.7±0.1 | 2.3±0.2 | 2.0±0.1 | 2.0±1.0 | 2.3±0.2 | 1.7±0.1 | 2.1±0.1 | 1.9±0.1 | 1.8±0.1 | 2.2±0.1 | 1.9±0.1 | 2.2±0.1 | 2.2±0.2 | 2.0±0.1 |
| S’ (cm/s) | 13.8±0.4 | 13.2±0.5 | 13.7±0.3 | 12.8±0.3 | 13.0±1.0 | 14.3±0.7 | 13.6±0.7 | 13.7±0.3 | 12.2±0.6 | 13.6±0.4 | 13.2±0.3 | 15.2±0.5 | 13.6±0.4 | 11.8±0.3 | 13.7±0.5 | 15.2±0.9 | 14.4±0.7 | 13.2±0.3 | 13.3±0.5 | 13.8±0.5 |
| mPAP (mmHg) | 18±1 | 18±1 | 18±1 | 17±1 | 17±1 | 17±1 | 16±1 | 15±1 | 17±1 | 16±1 | 19±1 | 20±1 | 17±1 | 18±1 | 19±1 | 18±1 | 21±1 | 19±1 | 18±1 | 19±1 |

Table 4: time course of the clinical and echocardiographic parameters during the 169 km multi-stage race.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | PRE | POST 1 | POST 2 | POST 3 | POST | D+2 | D+5 | D+10 |
|  | Weight (kg) | 70.5±1.8 | 68.2±1.7 | 68.7±1.9 | 68.7±1.7 | 69.3±1.8 | 70.6±1.8 | 69.4±1.9 | 69.8±2.0 |
| HR (b/min) | 53±2 | 73±2 | 70±2 | 63±5 | 66±3 | 49±2 | 51±3 | 54±2 |
| BP (mmHg) | 90±2 | 84±1 | 84±2 | 81±6 | 82±2 | 94±2 | 89±2 | 90±2 |
| LEFT HEART | LA (mL) | 73±4 | 75±3 | 76±4 | 81±4 | 83±5 | 90±5 | 77±4 | 79±5 |
| LA (mL/m2) | 39.7±1.9 | 40.8±1.6 | 41.0±1.9 | 43.3±2.0 | 44.9±2.5 | 48.8±2.3 | 41.9±1.7 | 42.9±2.6 |
| LVDD (mm) | 52±1 | 51±1 | 50±1 | 52±1 | 52±1 | 55±1 | 53±1 | 52±1 |
| LVD vol (mL) | 122±8 | 120±7 | 119±6 | 122±7 | 120±7 | 138±7 | 121±6 | 117±6 |
| LVD vol (mL/m2) | 65.5±3.2 | 64.6±2.9 | 64.3±2.3 | 65.1±2.8 | 64.9±3.1 | 74.2±3.1 | 65.4±2.8 | 63.0±2.5 |
| SV (mL) | 69±5 | 70±5 | 68±4 | 71±5 | 69±5 | 75±4 | 69±4 | 66±4 |
| EF (Simpson) | 57±1 | 54±1 | 56±1 | 57±2 | 56±2 | 55±1 | 59±2 | 59±1 |
| GLV strain (%) |  |  |  |  |  |  |  |  |
| Mitral E/A | 1.8±0.2 | 1.2±0.1 | 1.4±0.1 | 1.5±0.1 | 1.5±0.1 | 2.0±0.2 | 1.8±0.1 | 1.7±0.1 |
| RIGHT HEART | RA (mL) | 59±4 | 63±4 | 65±4 | 65±4 | 65±4 | 77±4 | 62±4 | 66±5 |
| RA (mL/m2) | 31.4±1.7 | 33.7±1.8 | 34.9±2.0 | 34.8±2.2 | 35.3±1.9 | 41.6±1.6 | 33.7±1.9 | 35.9±2.2 |
| RVEDA (cm2) | 21.7±1.0 | 23.4±1.0 | 23.7±1.0 | 24.3±0.8 | 25.1±1.1 | 23.8±0.9 | 23.7±1.0 | 24.1±0.9 |
| RVEDA (cm2/m2) | 11.7±0.5 | 12.6±0.5 | 12.8±0.5 | 13.4±0.6 | 13.1±0.5 | 13.1±0.6 | 12.5±0.5 | 13.1±0.5 |
| RVAC (%) | 47±2 | 46±2 | 43±2 | 45±1 | 45±2 | 45±2 | 47±1 | 48±2 |
| RV strain (%) |  |  |  |  |  |  |  |  |
| Tricuspid E/A | 2.2±0.1 | 1.4±0.1 | 1.6±0.1 | 1.7±0.1 | 1.9±0.1 | 2.2±0.1 | 2.2±0.2 | 2.0±0.1 |
| S’ (cm/s) | 15.2±0.9 | 13.4±0.4 | 14.9±1.3 | 14.3±0.8 | 14.4±0.7 | 13.2±0.3 | 13.3±0.5 | 13.8±0.5 |
| mPAP (mmHg) | 18±1 | 17±1 | 18±1 | 20±1 | 21±1 | 19±1 | 18±1 | 19±1 |