

Facts. Did You Know That...

✓ ...analysis of the stroke rate during the Olympic Games-2004 in Athens was conducted recently in similar way, as it was done for OG-2000 and WC-2002 (RBN 1,2/2003). The measurements were done for medal winners only using official video footage. It was measured around 70% of the total number of strokes. The data was filtered and compared with official split and final times.

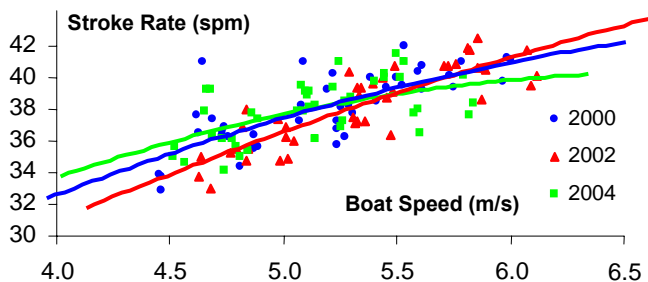
✓ ...average stroke rate of the medal winners in the last Olympics was 37.86spm. The same parameter in the Olympics-2000 was 38.07spm, and in the Worlds-2002 it was 38.19spm. So, we can see small decrease in the average stroke rate;

✓ ... since 2000-2 the average stroke rate increased in small boats: singles, doubles and pairs, except LW2x. Medal winners in big boats (quads, fours and eights) had a lower stroke rate.

Average stroke rate over 2000m in medalists of OG-2000, WC-2002 and OG-2004.

	W1x	M1x	W2-	M2-	W2x	M2x	M4-
2000	33.5	35.9	38.4	38.8	35.8	38.0	40.1
2002	33.9	36.4	36.2	38.6	35.7	38.3	41.7
2004	35.0	36.7	37.6	39.1	36.3	38.3	39.8
	LW2x	LM2x	LM4-	W4x	M4x	W8+	M8+
2000	36.8	38.9	40.5	36.2	40.2	39.3	40.7
2002	35.7	38.6	40.8	38.4	40.3	39.7	40.4
2004	35.9	38.9	40.4	37.5	37.4	38.2	38.8

✓ ...the previous fact affected the trend line of the Rate/Speed dependence, which became higher for low speeds (small boats) and lower for high speed (big boats):

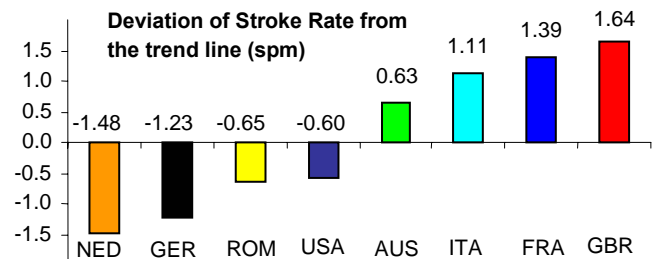


✓ ...the winners had higher variation (ratio of the standard deviation to the average over four sections of the race) of the stroke rate (5.1%), than silver (4.7%) and bronze medalists (4.0%). This tells us that the winners can spurt at high rate at the start and finish of the race, but they have lower rate at cruising speed;

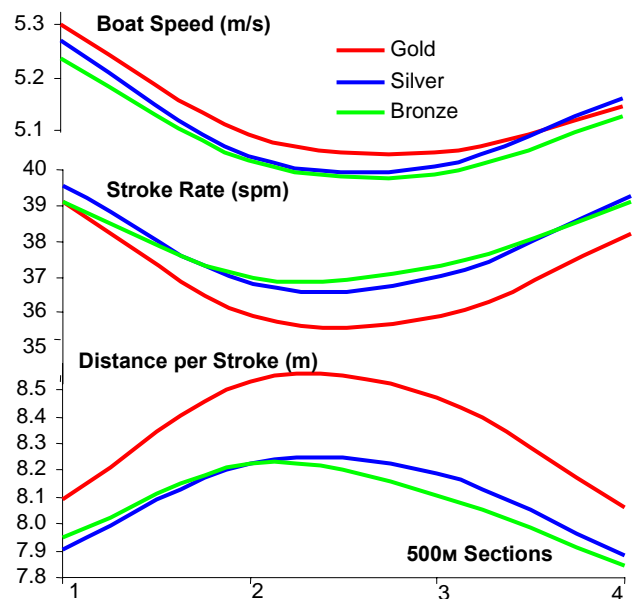
✓ ...on average, the winners had about 1spm lower stroke rate (37.3) than silver (38.3) and

bronze medalists (38.2). This difference was the most significant in winners in LM2x (3.8spm lower than 2nd place and 2.6 spm lower than 3rd place), W2- (2.5 and 1.4) and W2x (1.7 and 4.4);

✓ ...crews from the main rowing countries performed differently in regards of stroke rate: NED, GER, ROM and USA usually have a stroke rate below the trend line, with longer DPS. GBR, FRA, ITA and AUS emphasized a higher stroke rate and a shorter DPS.



✓ ...below are the graphs of the boat speed, rate and DPS averaged in medal winners for each of four sections of the race:



It is obvious, that the winners had significantly longer DPS, especially in the middle of the race. You can find details of the stroke rate analysis for each medal winner in the Appendix 1.

References

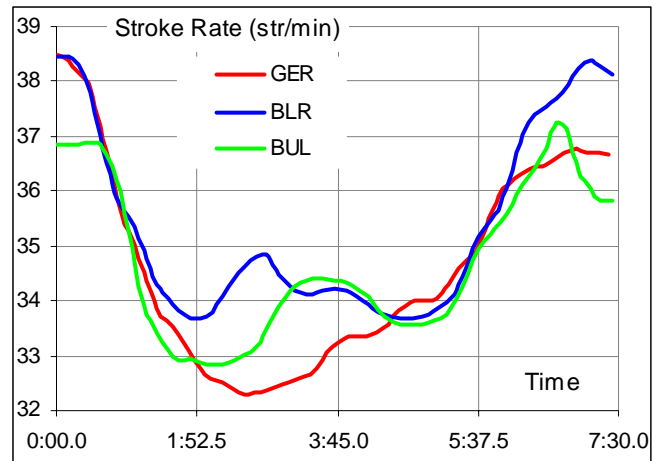
1. Kleshnev V. 2001. Stroke Rate vs. Distance in Rowing during the Sydney Olympics. Australian Rowing. 25(2), 18-21.

Contact Us:

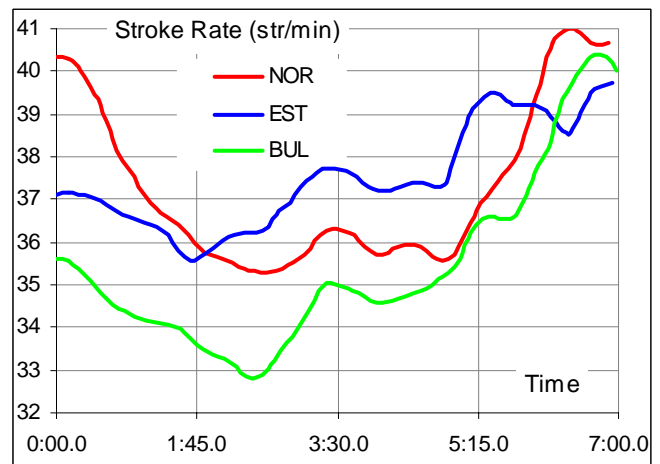
✉ ©2003 Dr. Valery Kleshnev, AIS/Biomechanics tel. (+61 2) 6214 1659, (m) 0413 223 290, fax: 6214 1593 e-mail: kleshnev@ausport.gov.au

Boat speed, stroke rate and distance per stroke in the medalists of the Olympic Games -2004 in Athens.

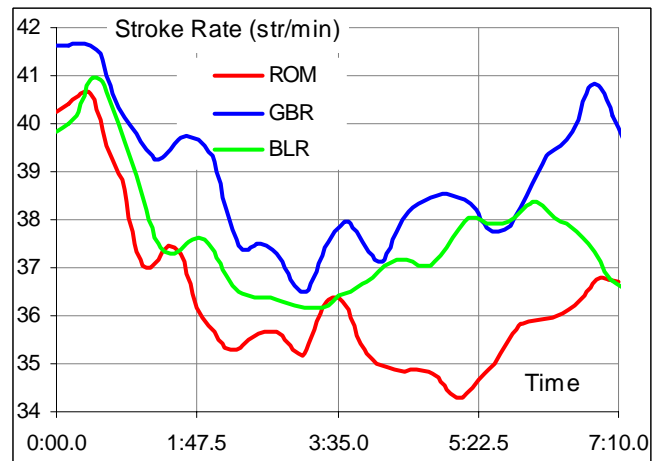
W1x		Speed over the 500m section (m:s)				
Crew		1	2	3	4	2000
1	GER	1:50.62	1:51.00	1:48.81	1:47.69	7:18.12
2	BLR	1:49.62	1:52.69	1:51.43	1:48.30	7:22.04
3	BUL	1:49.26	1:53.40	1:50.65	1:49.79	7:23.10
		Stroke Rate (str/min)				
1	GER	35.8	32.6	33.8	36.4	34.6
2	BLR	36.2	34.4	34.1	37.5	35.5
3	BUL	35.6	33.7	33.9	36.3	34.9
		Distance per Stroke (m)				
1	GER	7.58	8.29	8.15	7.66	7.91
2	BLR	7.57	7.75	7.90	7.39	7.64
3	BUL	7.72	7.84	7.99	7.53	7.77



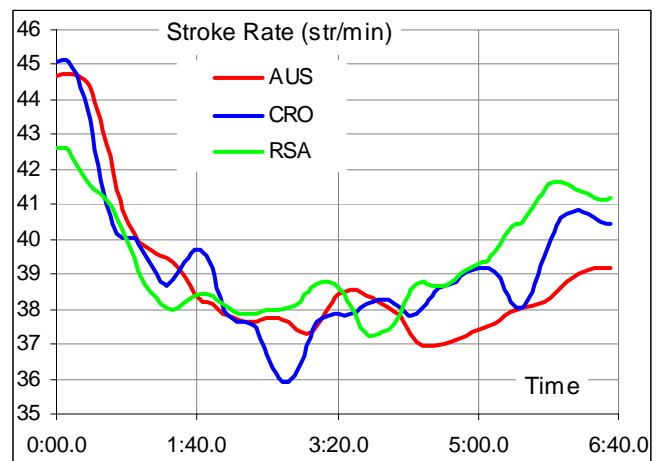
M1x		Speed over the 500m section (m:s)				
Crew		1	2	3	4	2000
1	NOR	1:41.77	1:43.63	1:43.02	1:40.88	6:49.30
2	EST	1:42.64	1:43.44	1:41.92	1:43.42	6:51.42
3	BUL	1:42.41	1:44.00	1:43.59	1:42.80	6:52.80
		Stroke Rate (str/min)				
1	NOR	38.0	35.7	35.9	39.5	37.3
2	EST	36.5	36.7	37.5	39.2	37.5
3	BUL	34.6	33.7	35.1	38.2	35.4
		Distance per Stroke (m)				
1	NOR	7.75	8.12	8.11	7.52	7.86
2	EST	8.02	7.90	7.85	7.40	7.79
3	BUL	8.48	8.57	8.25	7.63	8.21



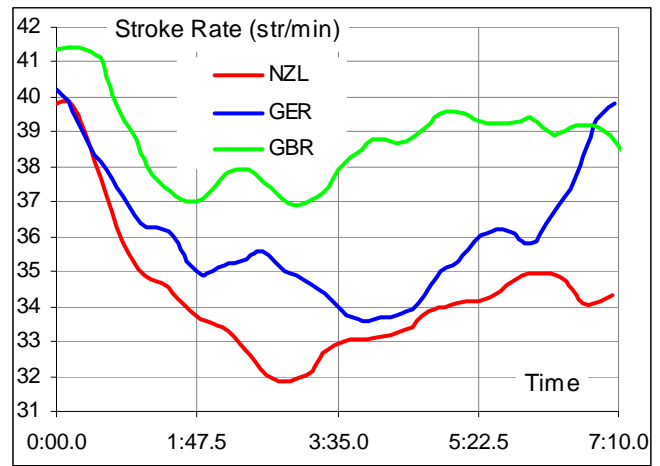
W2-		Speed over the 500m section (m:s)				
Crew		1	2	3	4	2000
1	ROM	1:44.03	1:45.60	1:48.46	1:48.46	7:06.55
2	GBR	1:44.53	1:48.45	1:49.99	1:45.69	7:08.66
3	BLR	1:44.21	1:47.67	1:50.18	1:47.80	7:09.86
		Stroke Rate (str/min)				
1	ROM	38.5	35.6	35.0	36.1	36.3
2	GBR	40.3	37.6	37.8	39.5	38.8
3	BLR	39.2	36.6	37.2	37.7	37.7
		Distance per Stroke (m)				
1	ROM	7.49	7.99	7.90	7.66	7.75
2	GBR	7.13	7.35	7.22	7.19	7.22
3	BLR	7.35	7.61	7.31	7.38	7.41



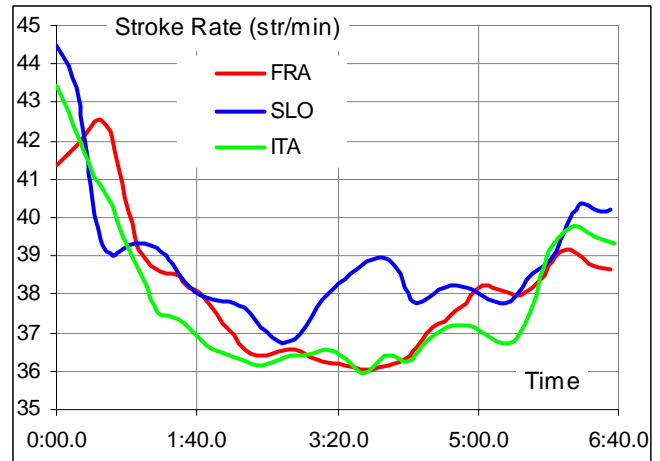
M2-		Speed over the 500m section (m:s)				
Crew		1	2	3	4	2000
1	AUS	1:34.68	1:39.37	1:39.03	1:37.68	6:30.76
2	CRO	1:35.57	1:40.09	1:39.69	1:37.29	6:32.64
3	RSA	1:36.93	1:40.06	1:39.75	1:36.66	6:33.40
		Stroke Rate (str/min)				
1	AUS	41.8	37.8	37.7	38.5	38.9
2	CRO	41.1	37.4	38.3	39.6	39.1
3	RSA	40.2	38.2	38.4	40.8	39.4
		Distance per Stroke (m)				
1	AUS	7.58	7.99	8.04	7.98	7.89
2	CRO	7.64	8.02	7.86	7.79	7.82
3	RSA	7.70	7.85	7.84	7.61	7.75



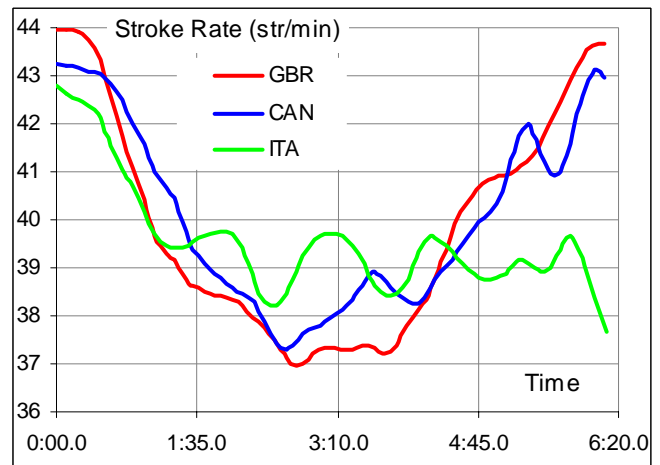
W2x		Speed over the 500m section (m:s)				
Crew		1	2	3	4	2000
1	NZL	1:40.89	1:46.17	1:46.72	1:48.01	7:01.79
2	GER	1:42.58	1:46.79	1:48.46	1:44.95	7:02.78
3	GBR	1:43.09	1:49.06	1:47.92	1:47.51	7:07.58
		Stroke Rate (str/min)				
1	NZL	36.4	32.9	33.4	34.4	34.3
2	GER	37.4	35.1	34.3	37.2	36.0
3	GBR	39.1	37.5	39.0	39.2	38.7
		Distance per Stroke (m)				
1	NZL	8.16	8.59	8.41	8.08	8.30
2	GER	7.82	8.01	8.06	7.68	7.88
3	GBR	7.44	7.34	7.13	7.12	7.25



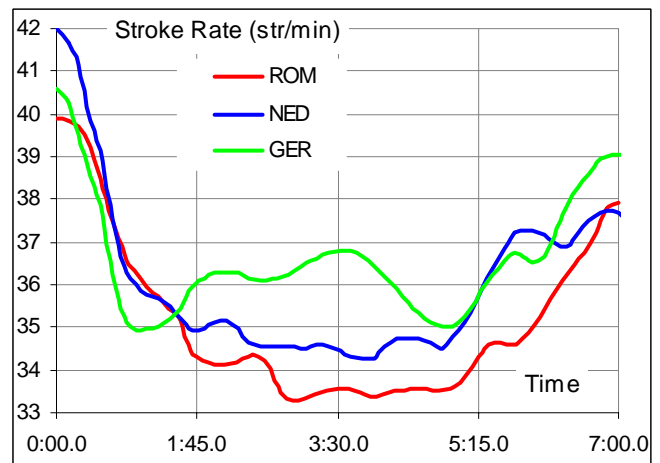
M2x		Speed over the 500m section (m:s)				
Crew		1	2	3	4	2000
1	FRA	1:33.63	1:38.83	1:39.85	1:36.69	6:29.00
2	SLO	1:33.99	1:38.75	1:39.90	1:39.08	6:31.72
3	ITA	1:32.58	1:38.16	1:41.20	1:40.99	6:32.93
		Stroke Rate (str/min)				
1	FRA	40.8	36.7	36.6	38.6	38.1
2	SLO	40.2	37.4	38.3	39.1	38.7
3	ITA	39.7	36.4	36.4	38.4	37.7
		Distance per Stroke (m)				
1	FRA	7.85	8.28	8.21	8.05	8.09
2	SLO	7.95	8.12	7.84	7.75	7.91
3	ITA	8.17	8.39	8.14	7.74	8.10



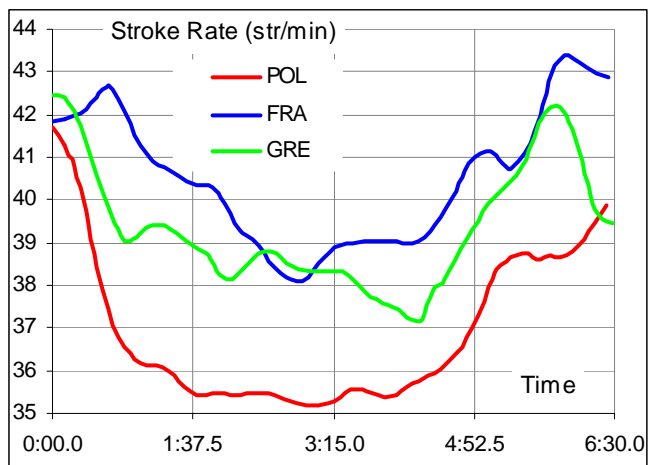
M4-		Speed over the 500m section (m:s)				
Crew		1	2	3	4	2000
1	GBR	1:28.00	1:33.68	1:35.04	1:30.26	6:06.98
2	CAN	1:28.41	1:33.71	1:34.09	1:30.85	6:07.06
3	ITA	1:31.00	1:33.35	1:33.05	1:33.01	6:10.41
		Stroke Rate (str/min)				
1	GBR	41.6	37.6	37.9	42.1	39.8
2	CAN	42.1	38.0	38.7	41.5	40.1
3	ITA	40.9	39.1	39.2	39.0	39.5
		Distance per Stroke (m)				
1	GBR	8.19	8.51	8.32	7.90	8.21
2	CAN	8.07	8.43	8.23	7.95	8.16
3	ITA	8.05	8.22	8.23	8.27	8.19



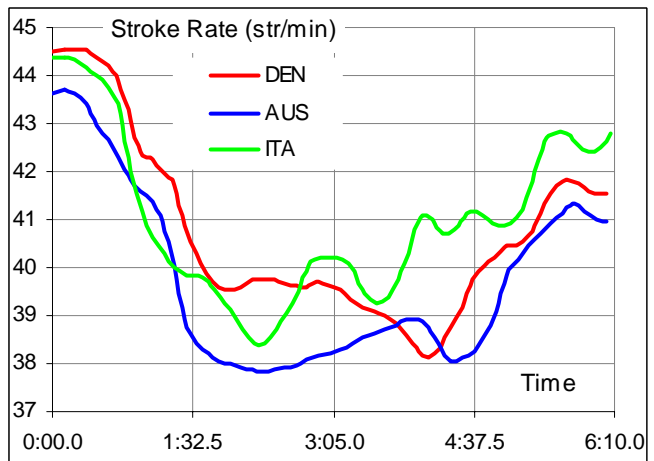
LW2x		Speed over the 500m section (m:s)				
Crew		1	2	3	4	2000
1	ROM	1:43.27	1:44.57	1:45.00	1:43.21	6:56.05
2	NED	1:41.84	1:45.36	1:47.86	1:42.27	6:57.33
3	GER	1:44.11	1:45.04	1:47.31	1:42.08	6:58.54
		Stroke Rate (str/min)				
1	ROM	37.3	33.8	33.6	35.9	35.1
2	NED	37.8	34.7	34.7	37.2	36.1
3	GER	36.8	36.4	35.8	37.4	36.6
		Distance per Stroke (m)				
1	ROM	7.78	8.50	8.51	8.10	8.21
2	NED	7.79	8.21	8.02	7.89	7.97
3	GER	7.82	7.85	7.82	7.86	7.83



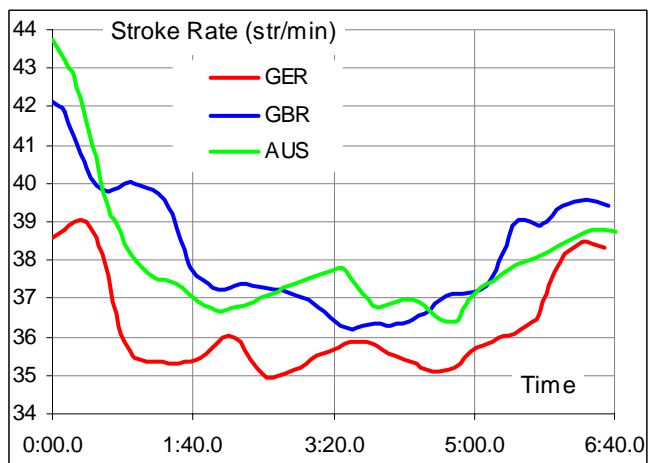
LM2x		Speed over the 500m section (m:s)				
Crew		1	2	3	4	2000
1	POL	1:31.63	1:34.69	1:35.57	1:39.04	6:20.93
2	FRA	1:32.42	1:35.98	1:37.23	1:35.83	6:21.46
3	GRE	1:32.80	1:36.58	1:37.71	1:36.14	6:23.23
		Stroke Rate (str/min)				
1	POL	37.5	35.4	35.6	38.6	36.8
2	FRA	41.8	39.1	39.4	42.1	40.6
3	GRE	40.1	38.5	37.8	41.2	39.4
		Distance per Stroke (m)				
1	POL	8.73	8.95	8.82	7.85	8.57
2	FRA	7.76	8.00	7.84	7.44	7.75
3	GRE	8.06	8.08	8.12	7.57	7.95



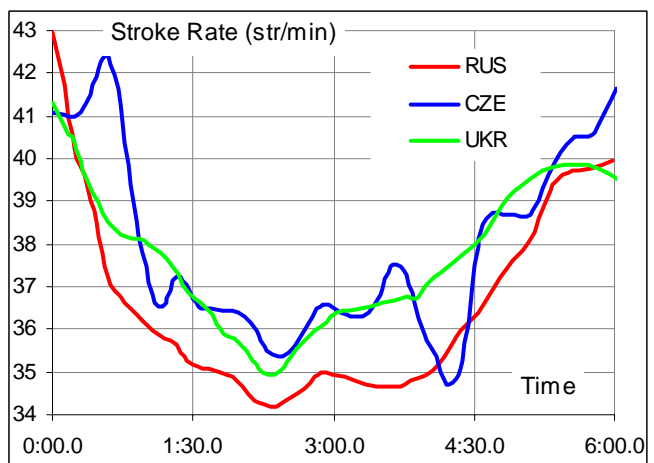
LM4-		Speed over the 500m section (m:s)				
Crew		1	2	3	4	2000
1	DEN	1:26.41	1:31.09	1:33.39	1:30.50	6:01.39
2	AUS	1:28.06	1:31.40	1:32.25	1:31.08	6:02.79
3	ITA	1:27.52	1:31.62	1:32.27	1:32.33	6:03.74
		Stroke Rate (str/min)				
1	DEN	43.2	39.8	38.9	41.0	40.7
2	AUS	41.8	38.0	38.6	40.5	39.7
3	ITA	42.1	39.2	40.3	42.0	40.9
		Distance per Stroke (m)				
1	DEN	8.03	8.28	8.27	8.08	8.15
2	AUS	8.16	8.64	8.43	8.13	8.33
3	ITA	8.13	8.34	8.07	7.74	8.06



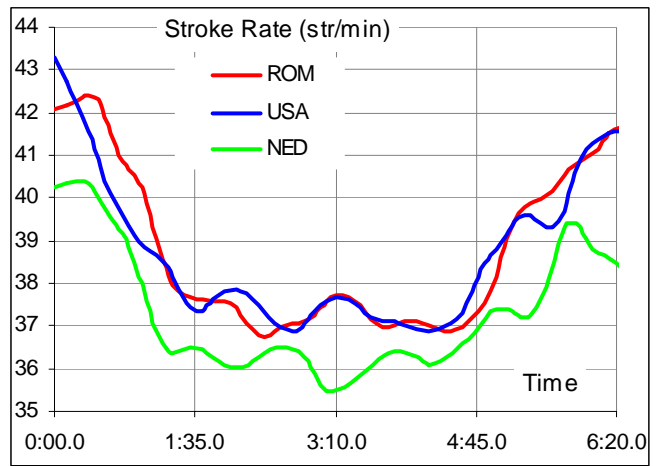
W4x		Speed over the 500m section (m:s)				
Crew		1	2	3	4	2000
1	GER	1:34.63	1:37.58	1:38.58	1:38.50	6:29.29
2	GBR	1:35.81	1:39.13	1:38.84	1:37.48	6:31.26
3	AUS	1:35.16	1:38.97	1:40.73	1:39.87	6:34.73
		Stroke Rate (str/min)				
1	GER	37.0	35.5	35.6	37.1	36.3
2	GBR	40.1	37.2	36.6	38.9	38.2
3	AUS	39.5	37.0	36.9	38.2	37.9
		Distance per Stroke (m)				
1	GER	8.57	8.66	8.56	8.21	8.49
2	GBR	7.81	8.13	8.30	7.91	8.03
3	AUS	7.97	8.19	8.06	7.87	8.02



M4x		Speed over the section (m:s)				
Crew		1	2	3	4	2000
1	RUS	1:25.79	1:31.15	1:30.48	1:29.43	5:56.85
2	CZE	1:25.49	1:31.16	1:31.87	1:28.91	5:57.43
3	UKR	1:28.23	1:31.73	1:32.14	1:26.77	5:58.87
		Stroke Rate (str/min)				
1	RUS	37.8	34.7	35.0	38.6	36.5
2	CZE	39.6	36.1	36.3	39.8	37.9
3	UKR	38.9	35.7	37.1	39.2	37.7
		Distance per Stroke (m)				
1	RUS	9.26	9.50	9.47	8.69	9.21
2	CZE	8.87	9.10	8.99	8.49	8.85
3	UKR	8.75	9.17	8.78	8.82	8.87



W8+		Speed over the 500m section (m:s)				
Crew		1	2	3	4	2000
1	ROM	1:32.49	1:36.67	1:36.26	1:32.28	6:17.70
2	USA	1:32.24	1:36.66	1:37.35	1:33.31	6:19.56
3	NED	1:34.53	1:36.55	1:36.74	1:32.03	6:19.85
		Stroke Rate (str/min)				
1	ROM	40.5	37.2	37.1	40.1	38.7
2	USA	40.0	37.4	37.2	40.1	38.7
3	NED	38.5	36.1	36.3	38.2	37.3
		Distance per Stroke (m)				
1	ROM	8.01	8.33	8.40	8.10	8.20
2	USA	8.14	8.30	8.28	8.01	8.17
3	NED	8.23	8.61	8.54	8.53	8.47



M8+		Speed over the 500m section (m:s)				
Crew		1	2	3	4	2000
1	USA	1:21.95	1:26.23	1:28.77	1:25.53	5:42.48
2	NED	1:23.58	1:28.86	1:26.72	1:24.59	5:43.75
3	AUS	1:22.86	1:28.58	1:28.29	1:25.65	5:45.38
		Stroke Rate (str/min)				
1	USA	41.1	37.4	36.7	38.0	38.3
2	NED	39.4	36.5	36.7	38.0	37.7
3	AUS	42.1	39.4	38.7	41.6	40.4
		Distance per Stroke (m)				
1	USA	8.92	9.31	9.20	9.23	9.15
2	NED	9.11	9.26	9.42	9.33	9.27
3	AUS	8.61	8.61	8.78	8.42	8.59

