Making Use of Accessible Technologies in Rowing

Andrew Carter

Goals and Aims

In recent years, electronic technologies have become more common in rowing and their presence sometimes goes unnoticed. As a result, they often go under-utilized. The goal of this presentation is to explore some uses of these readily available technologies in rowing.

The use of video, HR monitors, computers & software, the Concept2 Indoor Rower, and the NK SpeedCoach™ will be discussed as they apply to:

Training Analysis

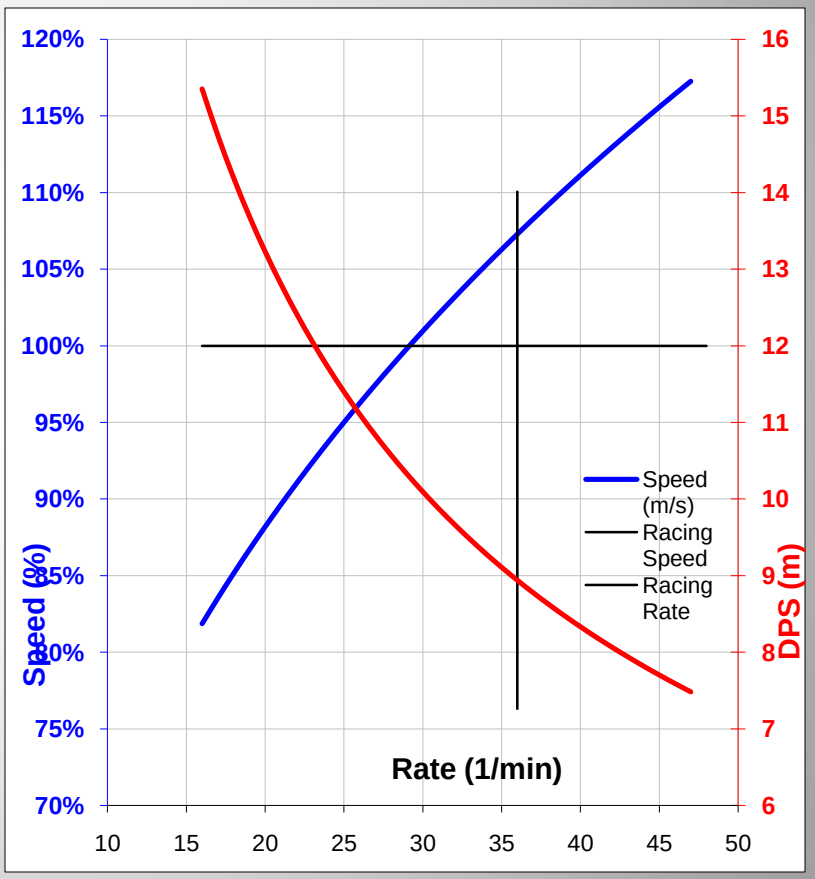
Performance Analysis

Technique Analysis

Training Analysis

Training Zones/Categories

- (dryland)
  - Heart Rate Monitor
  - Concept2™
  - Excel
- (on-water)
  - SpeedCoach™
  - AIS Table (Excel)



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ROWING CANADA AVIRON
SYSTEM OF TRAINING INTENSITY CATEGORIES

Int. Cat.	Approx. HR Range	Piece Range	Ratio Work: Rest	Goals of the Training Intensity	Practical Examples	[LA]
I	max i.e. 180 - 200	0.5 - 1.5	1:4 - 1:5	• Development of anaerobic power/capacity • Ability & feeling of start/spurt speed • Aggression	• 1 - 6 x 500m • Intervals of: 30 - 60 strokes 1 - 2' SR: > race rate	> 10
II	max i.e.180 - 200	2 - 7	1:2 - 1:3	• Development of anaerobic capacity • Race endurance • Development of aerobic capacity (core) • Race speed feeling • Race attitude/plan	• race over 1500 - 2000m • 6 x 2' • 3 x 1000m • 5 x 750m SR: race rate 2	8 - 14
III	180 - 190	6 - 10	2:1 - 1:2	• Development of aerobic capacity (core) • Strength endurance • Tactics • Technique	• 4 x 7' • 3 x 2000m constant speed SR: 27-32	5 - 8
IV	165 - 175	10 - 45	4:1	"ANAEROBIC THRESHOLD" • Development of aerobic capacity (core/peripheral) • Efficiency • Strength endurance	• 2 x 20' with SR change • 3 x 5 km time control • 10 km time SR: 24-28	~ 4
V	150 - 160	30 - 90	-	• Basic endurance (peripheral) • Maintenance • Coordination of movements • Technique	• 30 - 90' steady state SR: 21-26	~ 3
VI	135 - 150	> 45	-	• Regeneration • Basic endurance (peripheral) • Maintenance • Coordination of movements • Technique	• 45 - 120' steady state SR: 18-22	< 2

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Method of Defining Intensity Categories

Concept2 Ergometer

Convert 6000m test pace to watts

or

Identify step test deflection wattage

Category	Method to Determine Pace
I	All out effort
II	2000m test pace ***or*** Step test failure pace
III	95-105% of Step Test deflection wattage Convert power to pace to determine range
IV	85-95% of Step Test deflection wattage Convert power to pace to determine range
V	75-85% of Step Test deflection wattage Convert power to pace to determine range
VI	65-75% of Step Test deflection wattage Convert power to pace to determine range

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Ergometer Step Test

Protocol

- No warm-up
- Row two minutes at preliminary wattage
- Increase power by 20 watts every minute thereafter until prescription cannot be maintained
- Sprint all-out for 30 seconds
- Record HR every 15 seconds throughout test

Analysis

- Graph Power vs. HR
- Add a linear trendline or “line of best fit”
- Identify power at deflection in slope
  - This wattage may be interpreted as “AT” and can be used in category calculations and 20’ and 6000m test predictions.
- Identify power at failure
  - This wattage may be interpreted as VO_2 max and can be used in category calculations and as 2000m test predictor

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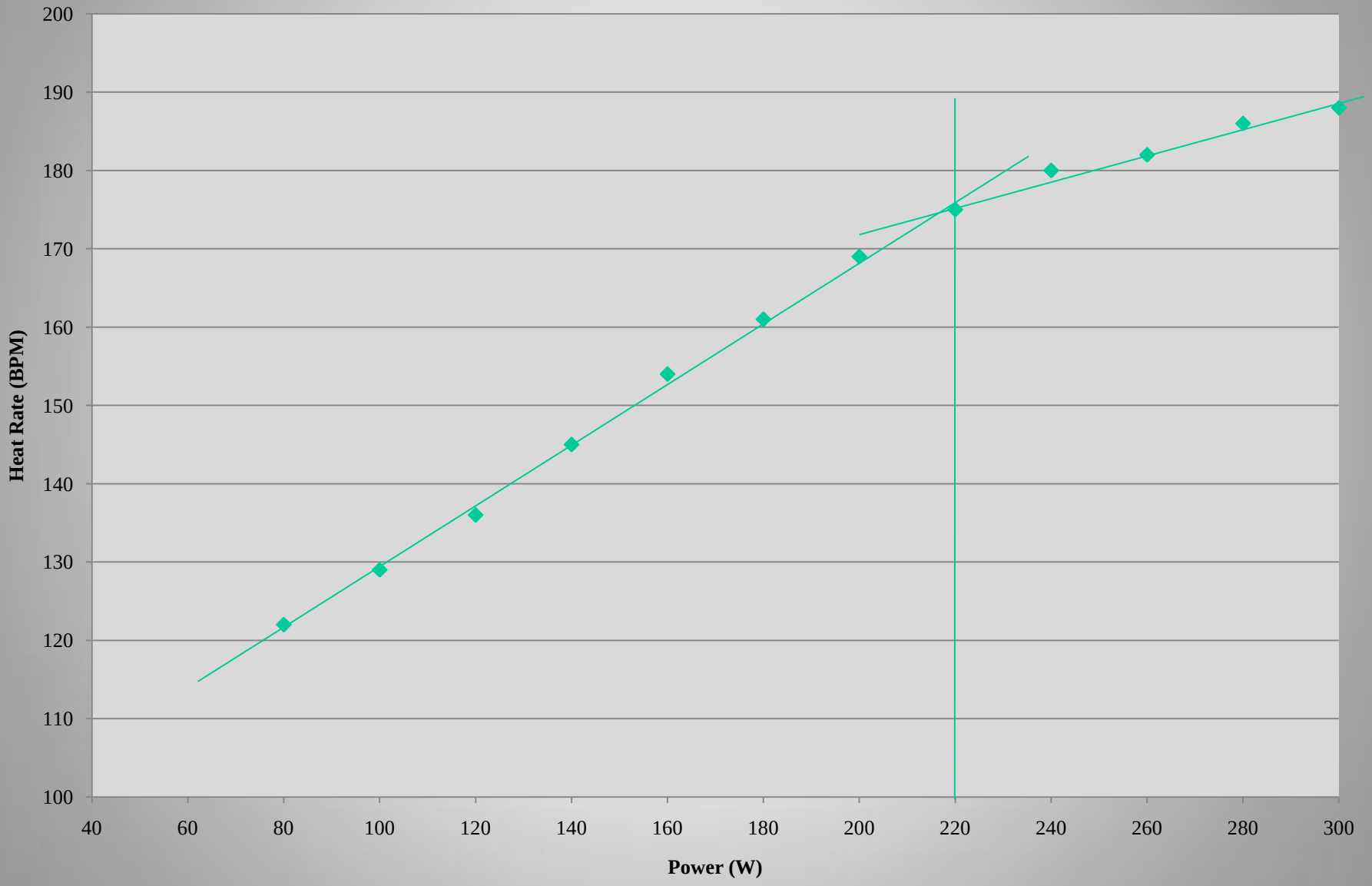
SM
9-6-10



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Power to Pace Conversion Chart

$$\text{Pace} = ((2.8/\text{Power})^{0.333}) \times 500$$

POWER (W)	PACE (time/500m)
100	02:32.0
110	02:27.1
120	02:22.9
130	02:19.1
140	02:15.7
150	02:12.6
160	02:09.8
170	02:07.2
180	02:04.8
190	02:02.6
200	02:00.5
210	01:58.6
220	01:56.7
230	01:55.0
240	01:53.4
250	01:51.9
260	01:50.4
270	01:49.0
280	01:47.7
290	01:46.5
300	01:45.3

POWER (W)	PACE (time/500m)
310	01:44.1
320	01:43.0
330	01:42.0
340	01:41.0
350	01:40.0
360	01:39.1
370	01:38.2
380	01:37.3
390	01:36.5
400	01:35.6
410	01:34.9
420	01:34.1
430	01:33.4
440	01:32.7
450	01:32.0
460	01:31.3
470	01:30.6
480	01:30.0
490	01:29.4
500	01:28.8

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Sample Calculation

Deflection at 220 watts

Failure at 300 watts

Category VI Calculation

220W x .65	≈	145W	≈	2:14
220W x .75	≈	165W	≈	2:08

I	=	all-out effort
II	≈	1:45 – 1:48
III	≈	1:55 – 1:59
IV	≈	1:59 – 2:03
V	≈	2:03 – 2:08
VI	≈	2:08 – 2:14

Method of Defining Intensity Categories

NK SpeedCoach™

Category	Method to Determine Pace
I	Normal Speed @ 2000m Target Stroke Rate + 2+
II	Normal Speed @ 2000m Target Stroke Rate ± 2
III	Normal Speed @ Stroke Rate 27-32
IV	Normal Speed @ Stroke Rate 24-28
V	Normal Speed @ Stroke Rate 21-26
VI	Normal Speed @ Stroke Rate 18-22

Rowing Step Test

Protocol

- Warm-up
- Row 5 x 500m with full pressure at steady rates of 20, 24, 28, 32, and 36 spm

Analysis

- Enter data into WPS Calculator (© Kleshnev 2005)
- Identify Normal Speed ranges for prescribed stroke rate zones

Kleshnev eWPS Model Calculator ©

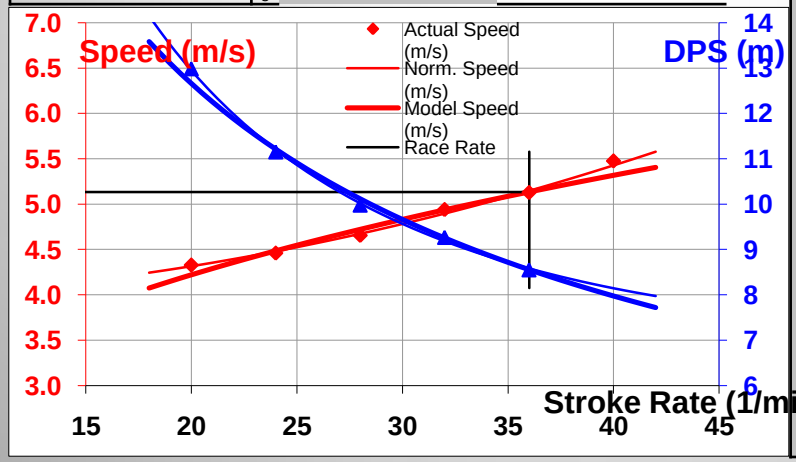
Effective Work Per Stroke Modelling V1.1.3 © 2005 Dr. Valery Kleshnev, EIS/Biomechanics

Model Race Speed: **4.78**

Base Rate **30.0** Base Speed **4.54** Base DPS **9.5** Race Rate: **35** Model Race Time: **6:58.3**

Piece Length (m)	**500**
Crew Name	**Crew 1**
Boat type	**M1x**
Date	**4/29/2006**
Wind Speed	
Wind direction	

N	Time 500m	Number of strokes	Rate (str/min)	Actual Speed (m/s)	Model Speed (m/s)	Actual DPS (m)	Model DPS (m)	eWPS (%)
1	**1:59.00**	**40.7**	**20.0**	4.20	3.97	12.61	11.90	**5.9%**
2	**1:55.00**	**45.0**	**24.0**	4.35	4.22	10.87	10.54	**3.1%**
3	**1:51.50**	**53.9**	**28.0**	4.48	4.44	9.61	9.51	**1.0%**
4	**1:48.20**	**58.6**	**32.0**	4.62	4.64	8.66	8.70	**-0.4%**
5	**1:45.70**	**63.1**	**36.0**	4.73	4.83	7.88	8.04	**-2.0%**
6	**1:42.80**	**67.7**	**40.0**	4.86	5.00	7.2957	7.498	**-2.7%**
7								
8								



Norm. Rate (1/min)	Norm. Speed (m/s)	Model Speed (m/s)	Norm. DPS (m)	Model DPS (m)	eWPS (%)	Model Time (m:s.0)	Ratio Model Time/ Progn.
18	4.12	**3.83**	13.74	**12.77**	**7.6%**	2:10.5	80.1%
19	4.16	**3.90**	13.14	**12.32**	**6.7%**	2:08.2	81.6%
20	4.20	**3.97**	12.60	**11.90**	**5.9%**	2:06.0	83.0%
21	4.24	**4.03**	12.11	**11.52**	**5.1%**	2:04.0	84.3%
22	4.28	**4.10**	11.66	**11.17**	**4.4%**	2:02.1	85.7%
23	4.31	**4.16**	11.25	**10.84**	**3.8%**	2:00.3	86.9%
24	4.35	**4.22**	10.87	**10.54**	**3.2%**	1:58.6	88.2%
25	4.38	**4.27**	10.52	**10.26**	**2.6%**	1:57.0	89.4%
26	4.42	**4.33**	10.20	**9.99**	**2.1%**	1:55.5	90.6%
27	4.45	**4.38**	9.90	**9.74**	**1.6%**	1:54.0	91.7%
28	4.49	**4.44**	9.62	**9.51**	**1.1%**	1:52.7	92.8%
29	4.52	**4.49**	9.35	**9.29**	**0.7%**	1:51.3	93.9%
30	4.55	**4.54**	9.11	**9.08**	**0.2%**	1:50.1	95.0%
31	4.58	**4.59**	8.87	**8.89**	**-0.2%**	1:48.9	96.0%
32	4.62	**4.64**	8.65	**8.70**	**-0.5%**	1:47.8	97.1%
33	4.65	**4.69**	8.45	**8.52**	**-0.9%**	1:46.7	98.1%
34	4.68	**4.73**	8.25	**8.36**	**-1.3%**	1:45.6	99.0%
35	4.70	**4.78**	8.06	**8.20**	**-1.6%**	1:44.6	100.0%
36	4.73	**4.83**	7.89	**8.04**	**-1.9%**	1:43.6	100.9%
37	4.76	**4.87**	7.72	**7.90**	**-2.3%**	1:42.7	101.9%
38	4.79	**4.91**	7.56	**7.76**	**-2.6%**	1:41.8	102.8%
39	4.81	**4.96**	7.41	**7.63**	**-2.9%**	1:40.9	103.7%
40	4.84	**5.00**	7.26	**7.50**	**-3.2%**	1:40.0	104.6%
41	4.86	**5.04**	7.12	**7.38**	**-3.5%**	1:39.2	105.4%
42	4.89	**5.08**	6.98	**7.26**	**-3.8%**	1:38.4	106.3%

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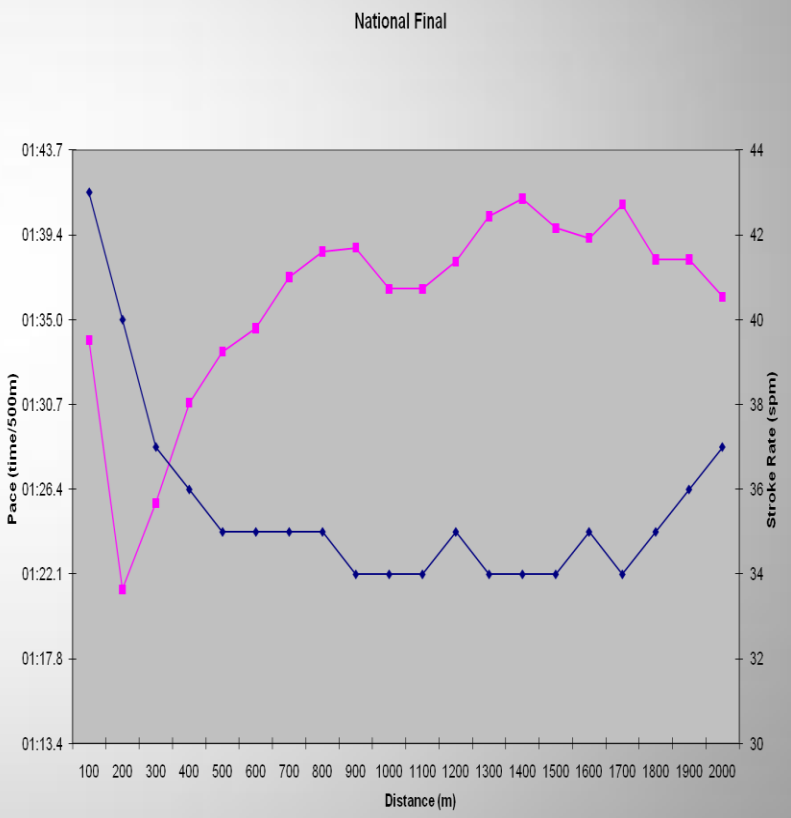
Performance Analysis

Pacing, Strategy & Tactics

- (dryland)
  - Concept2™
  - Venue Race
  - Excel
- (on-water)
  - SpeedCoach™
  - Excel



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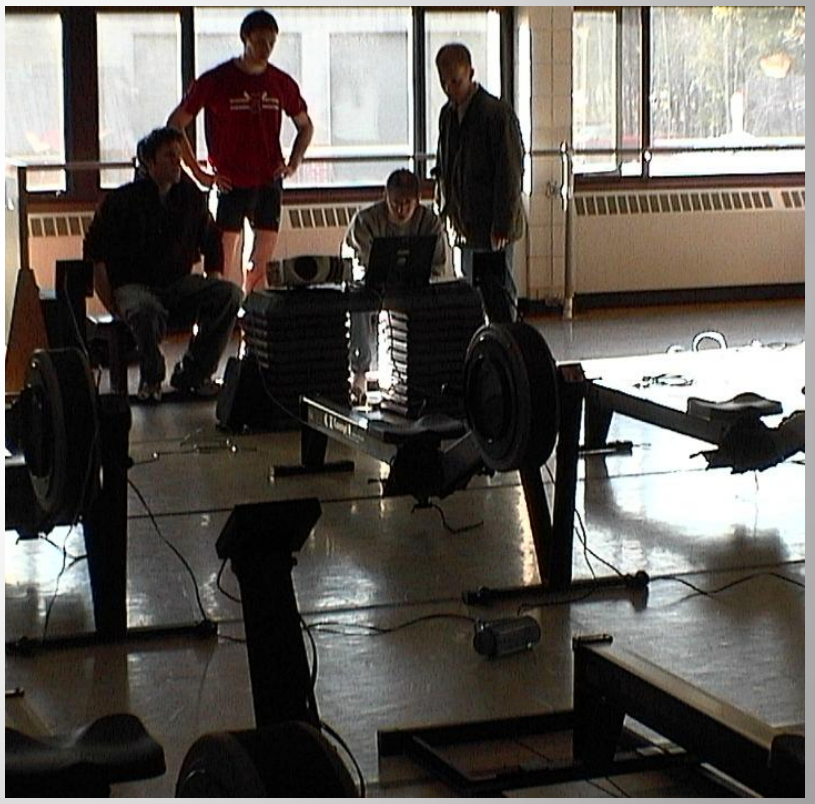
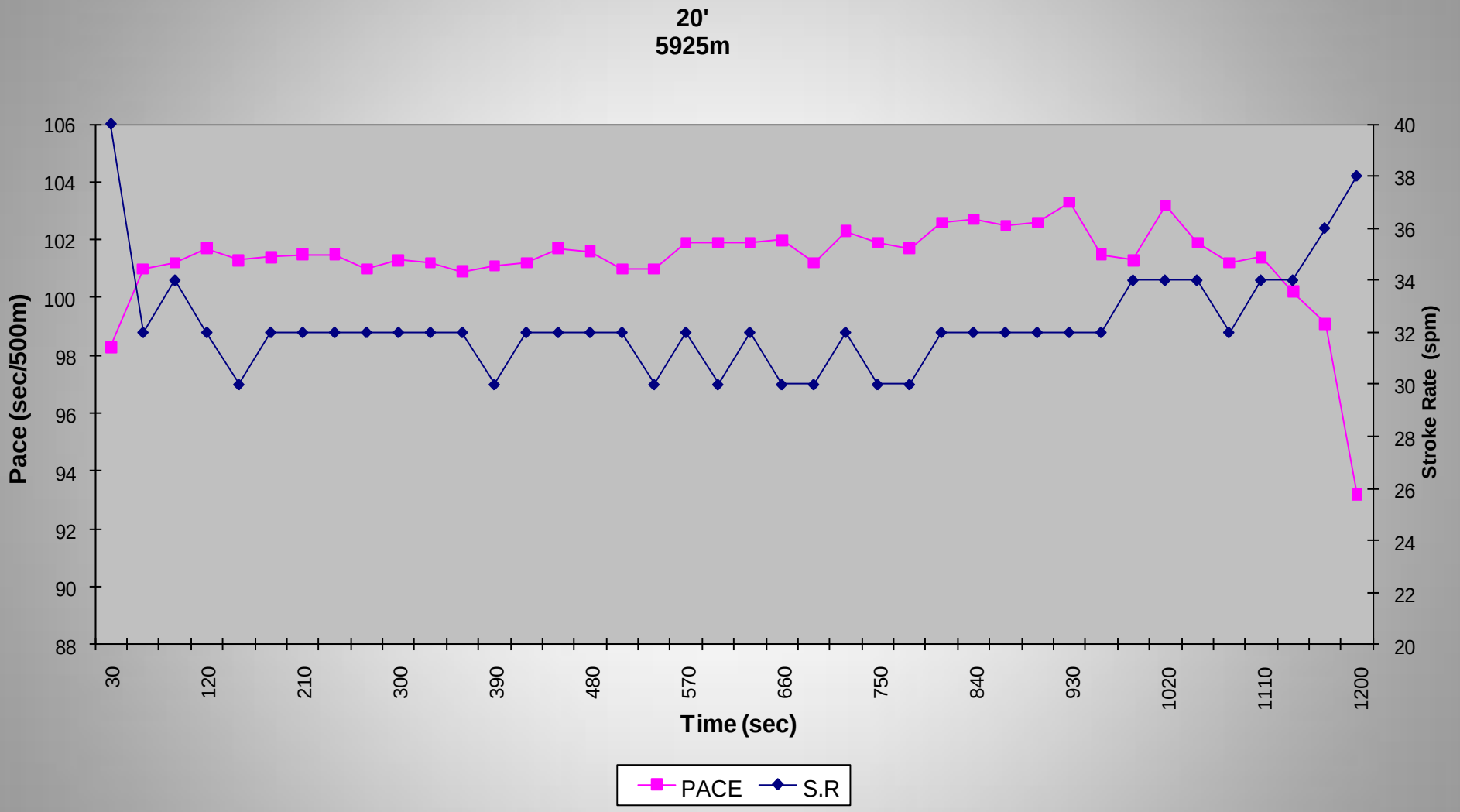
Dryland

PM3/4 & Venue Race

- Workout Management
- Test/Race Management
- Test/Race Analysis
  - Pacing
  - Strategic
  - Psychological?





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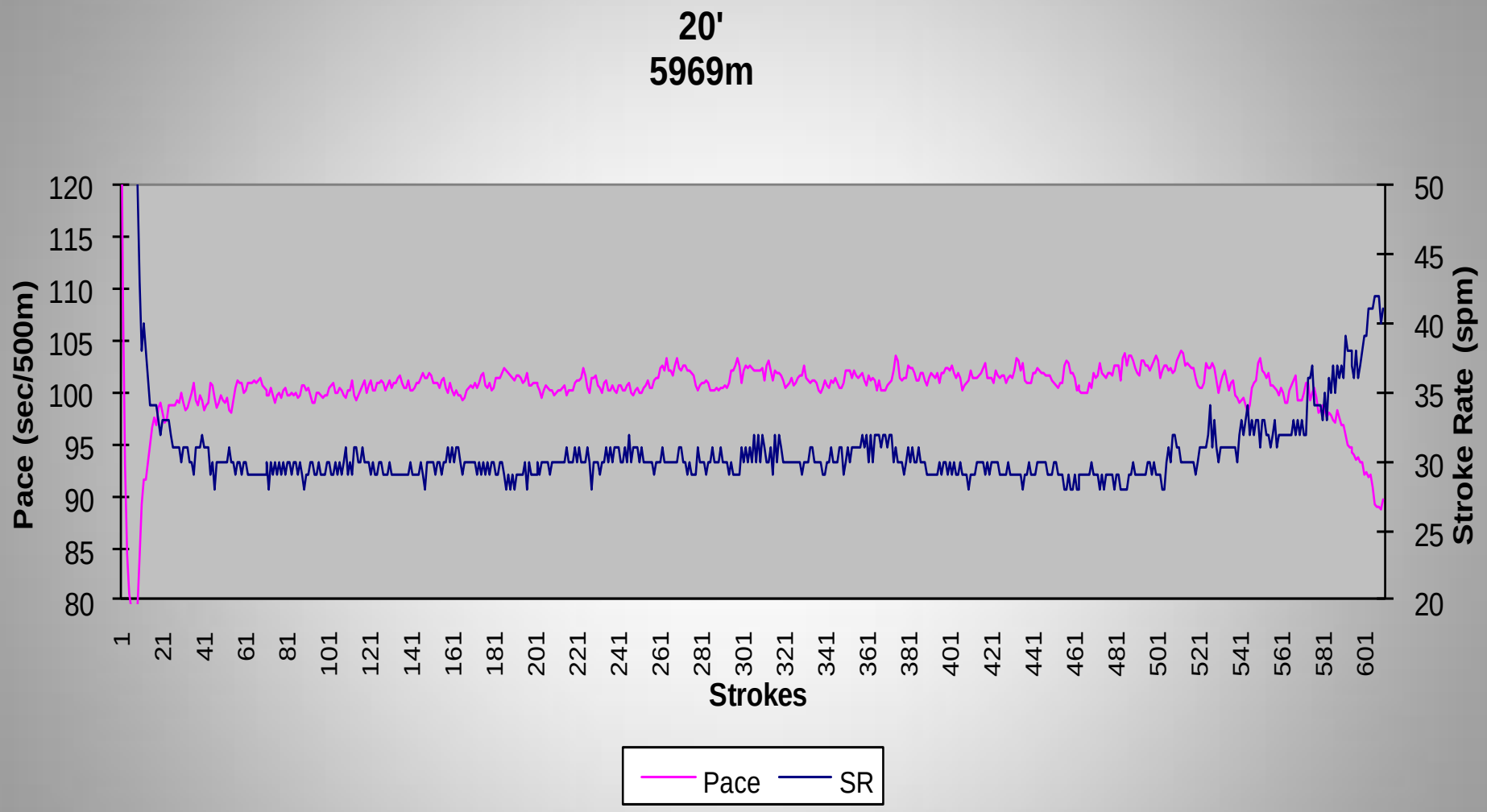

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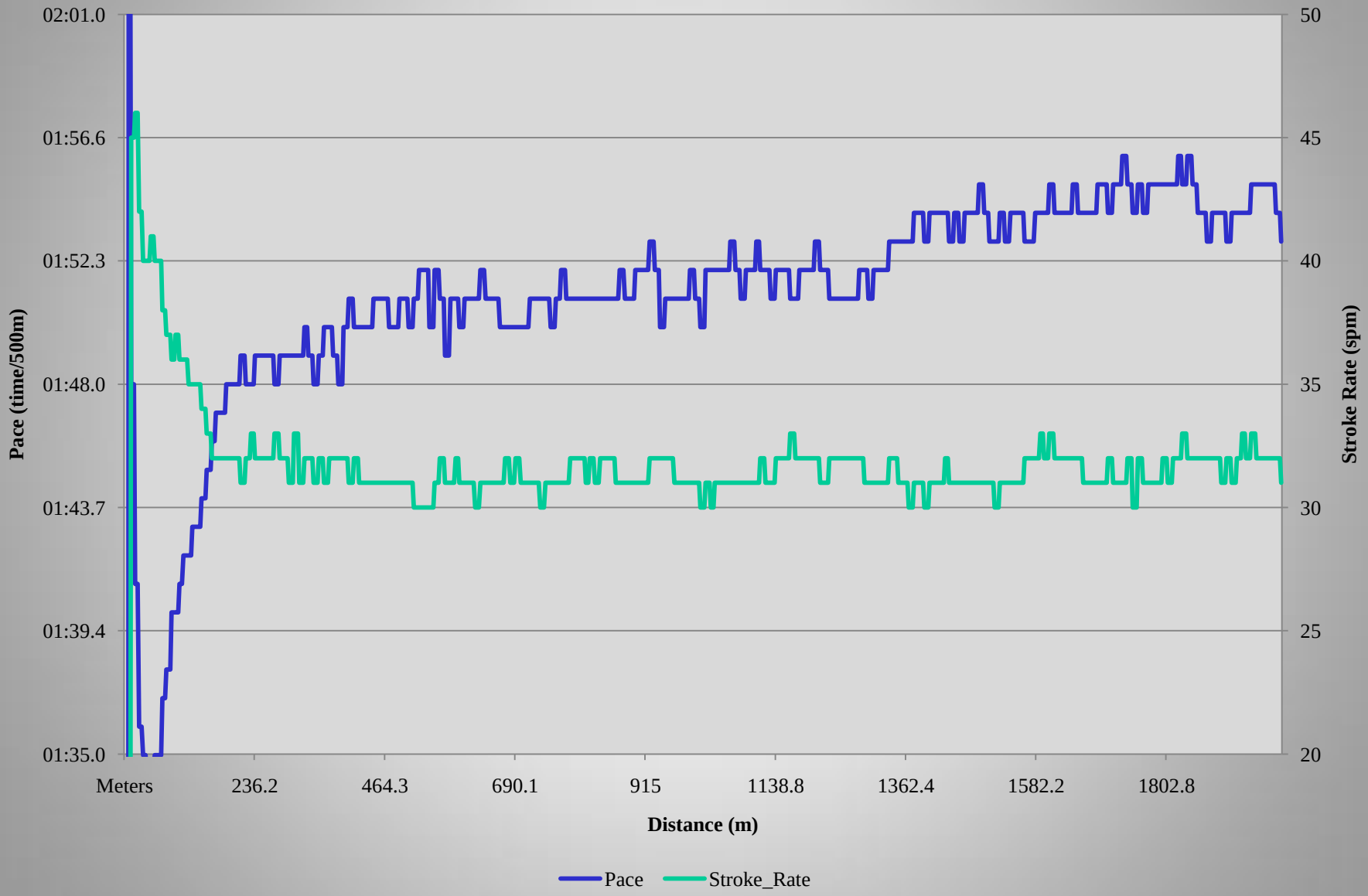
2000m
7:25.1



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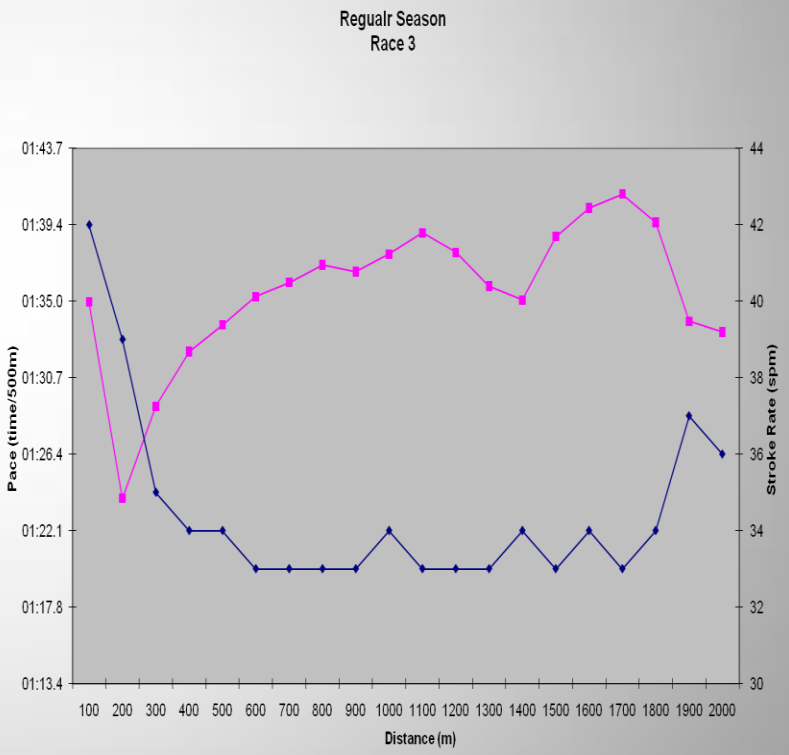
On-Water

NK SpeedCoach™

- Workout Management
- Test/Race Analysis
  - Pacing
  - Strategic
  - Psychological?
  - Conditions?



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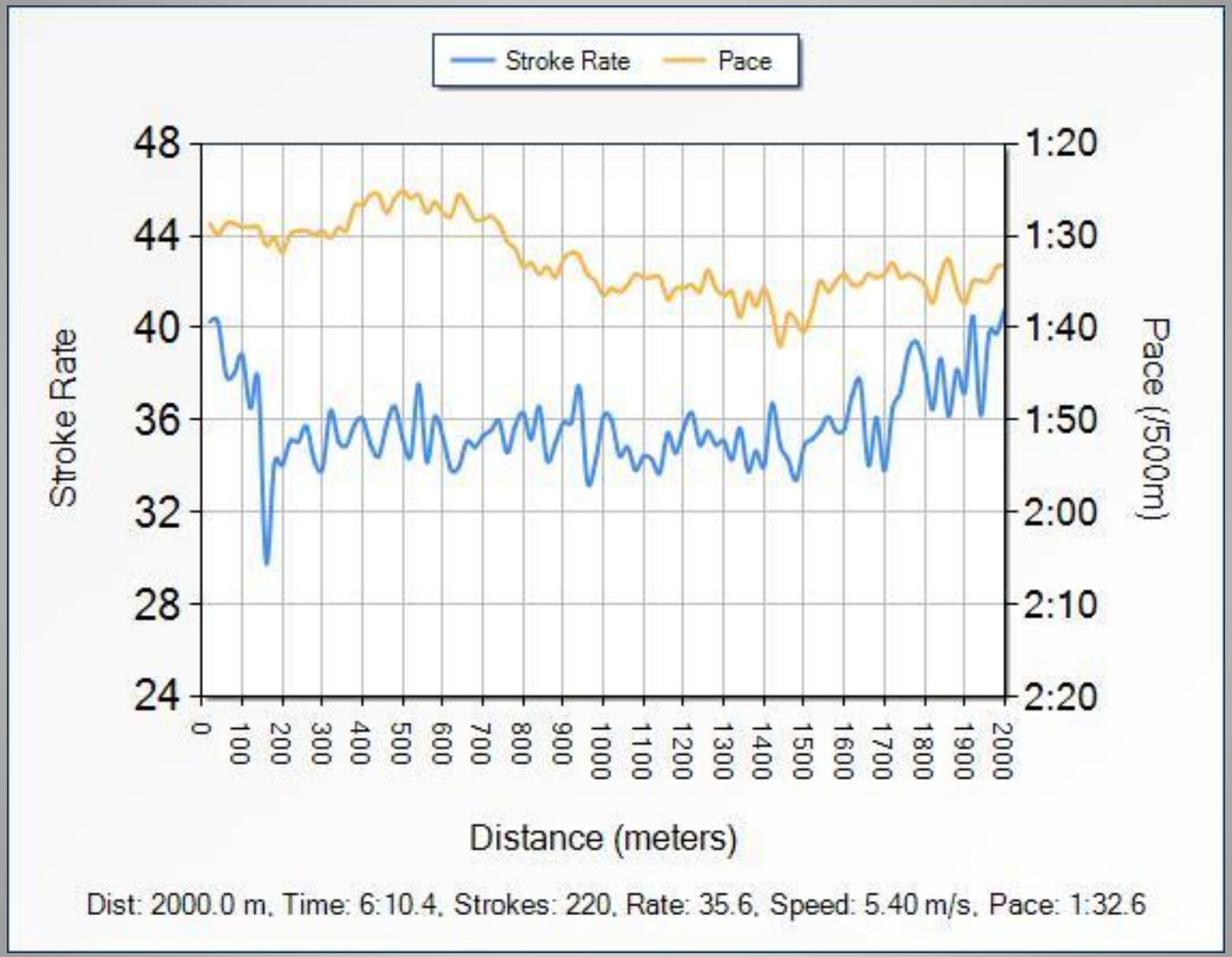

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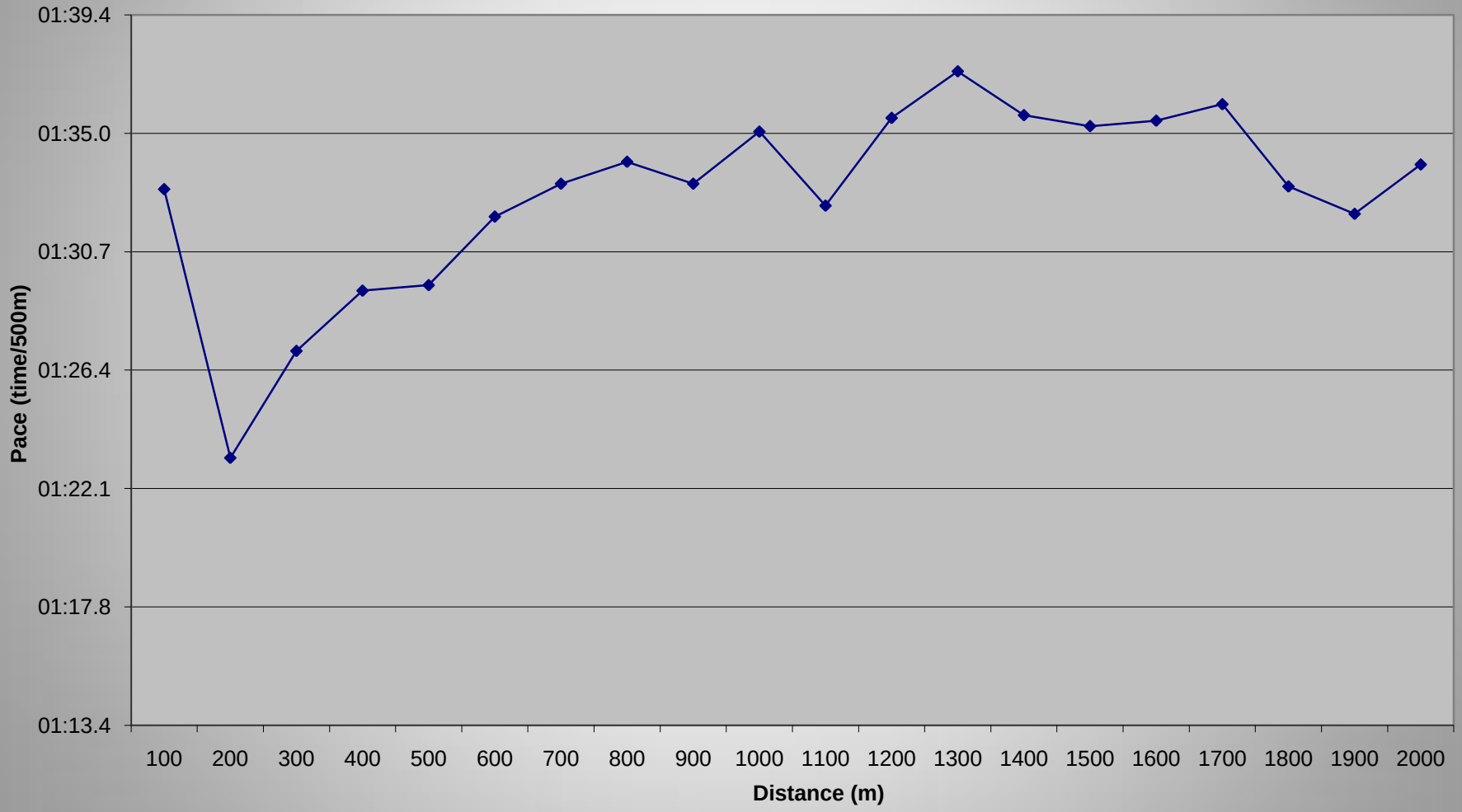
Regular Season
Race 1



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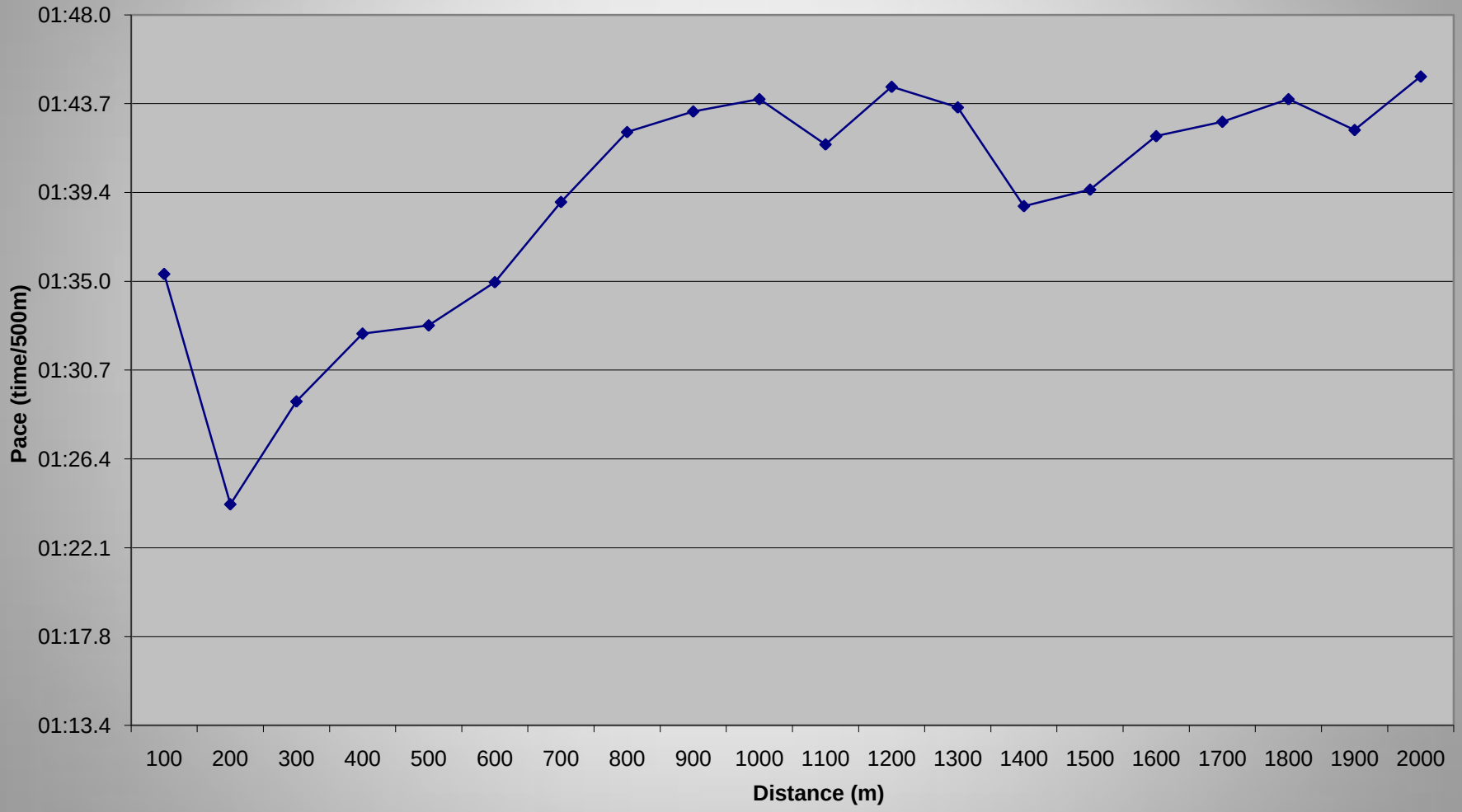
Regular Season
Race 2



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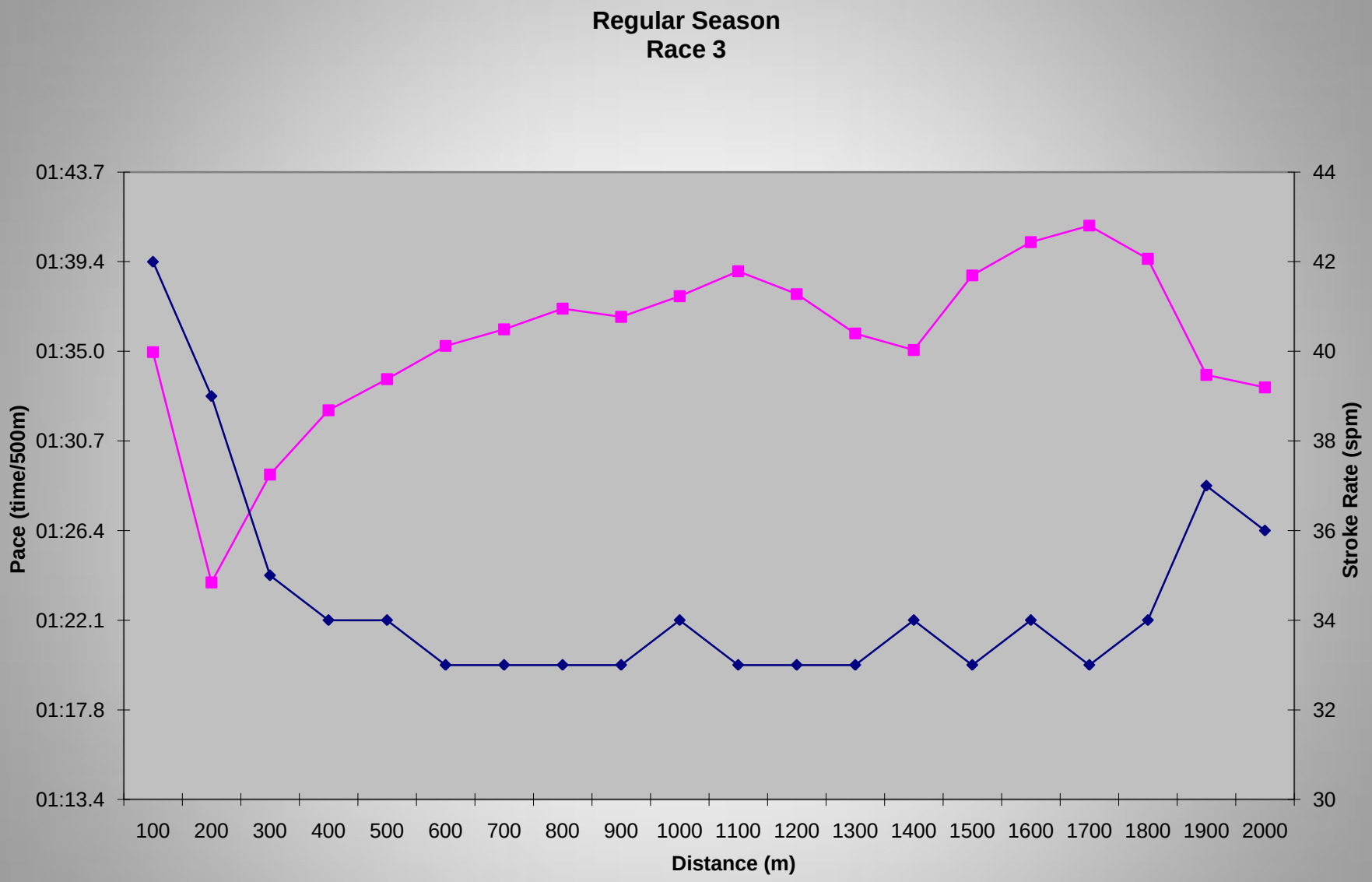

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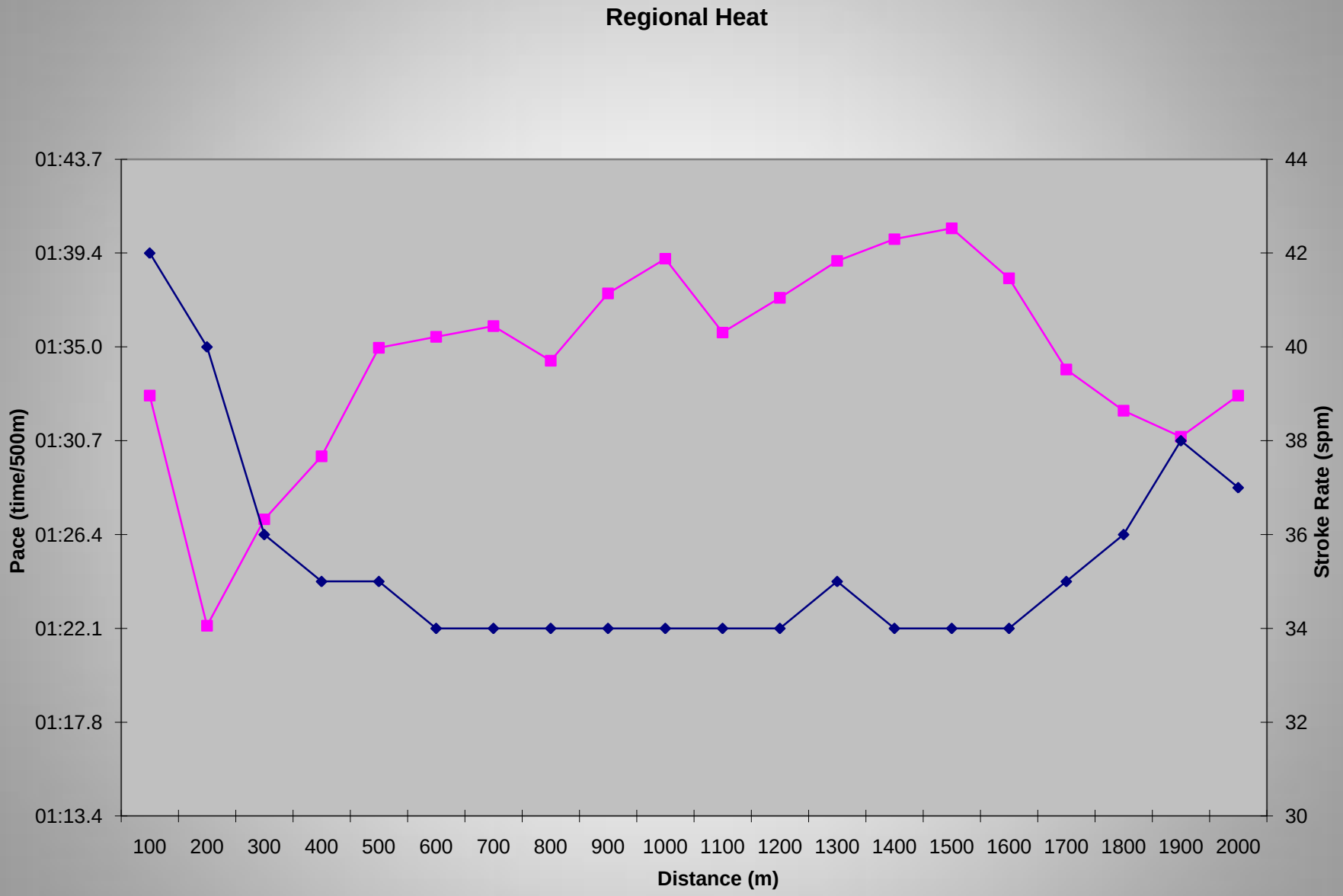

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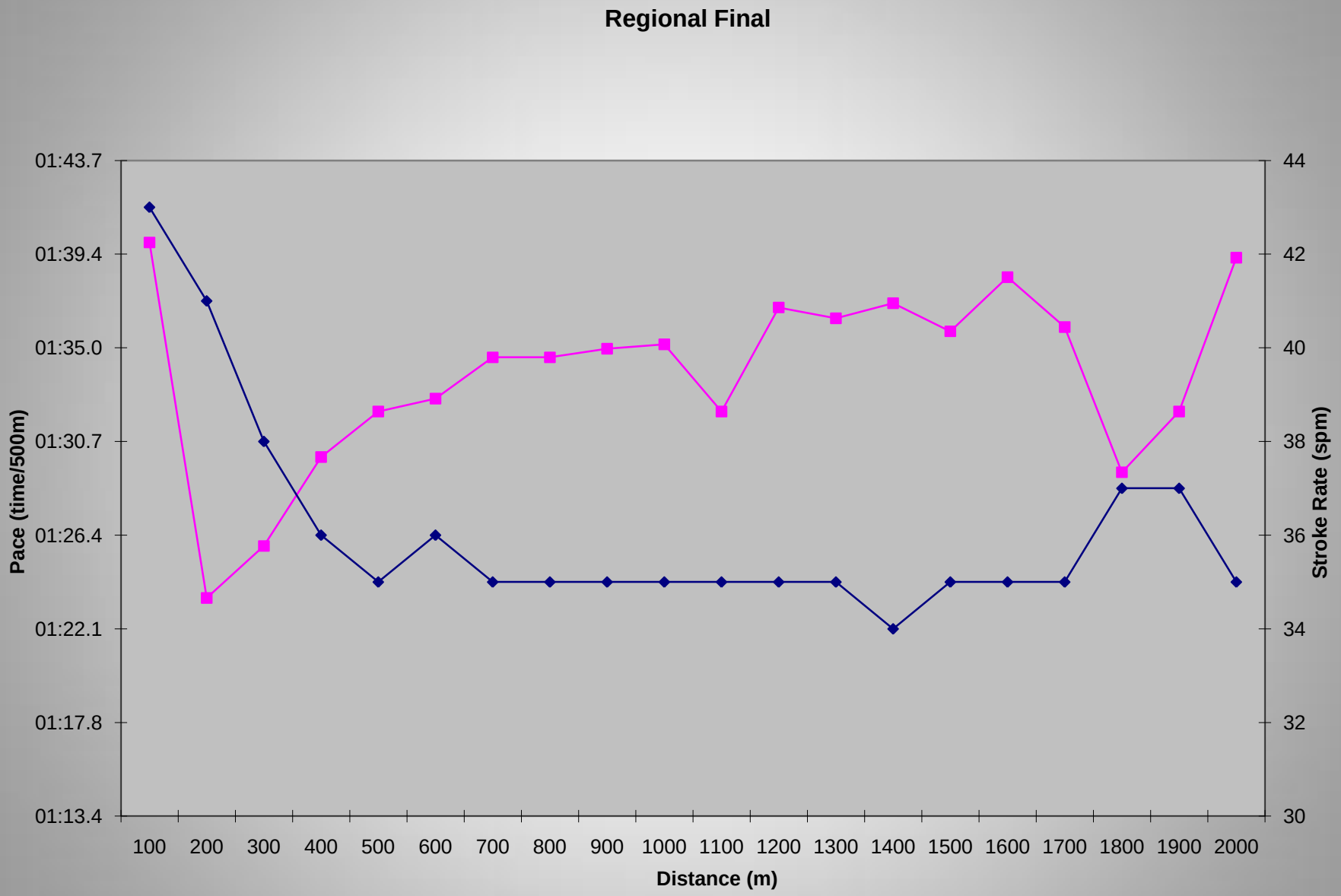
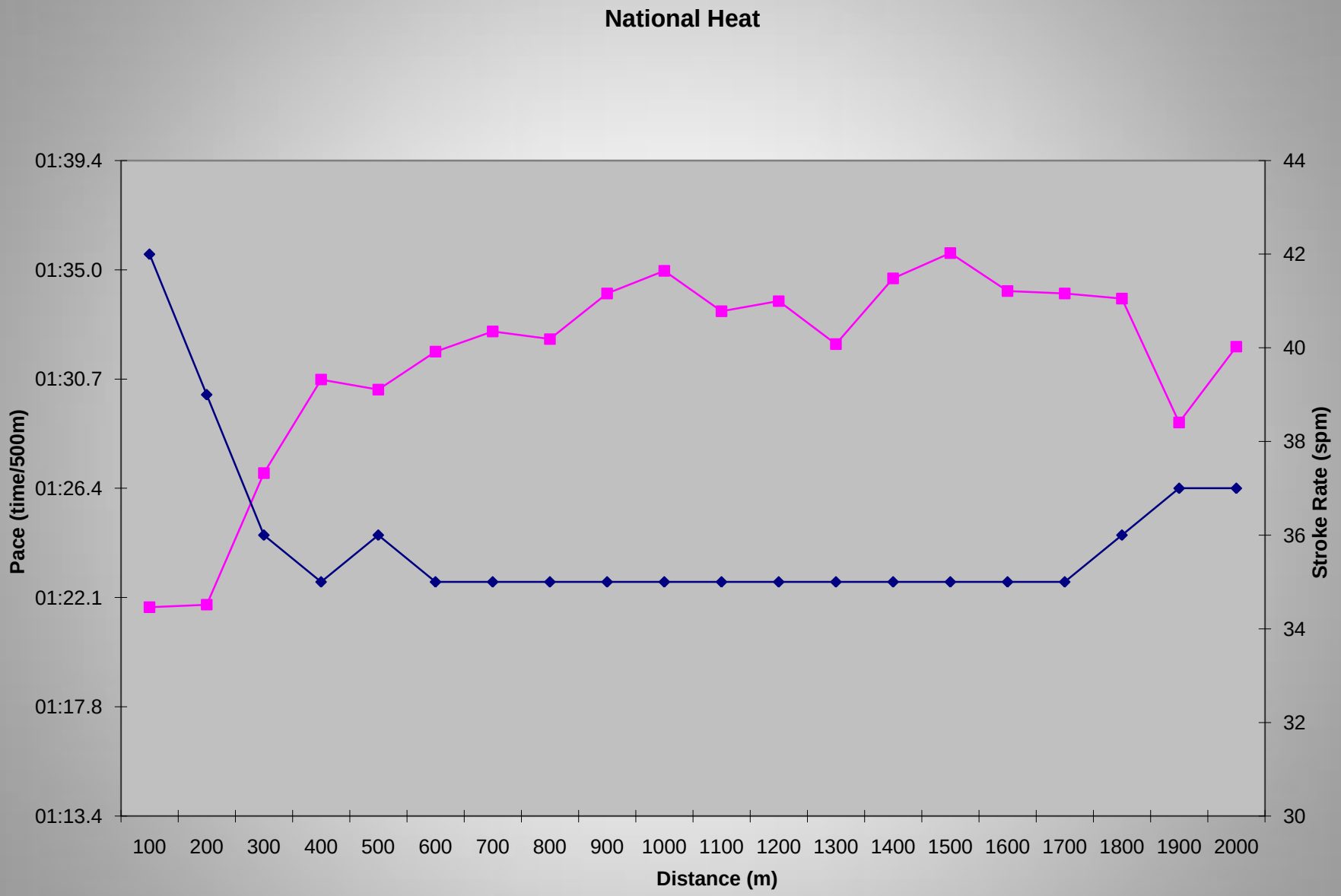

Regional Final
Pace (time/500m)
01:43.7
01:39.4
01:35.0
01:30.7
01:26.4
01:22.1
01:17.8
01:13.4
Stroke Rate (spm)
44
42
40
38
36
34
32
30
100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000
Distance (m)



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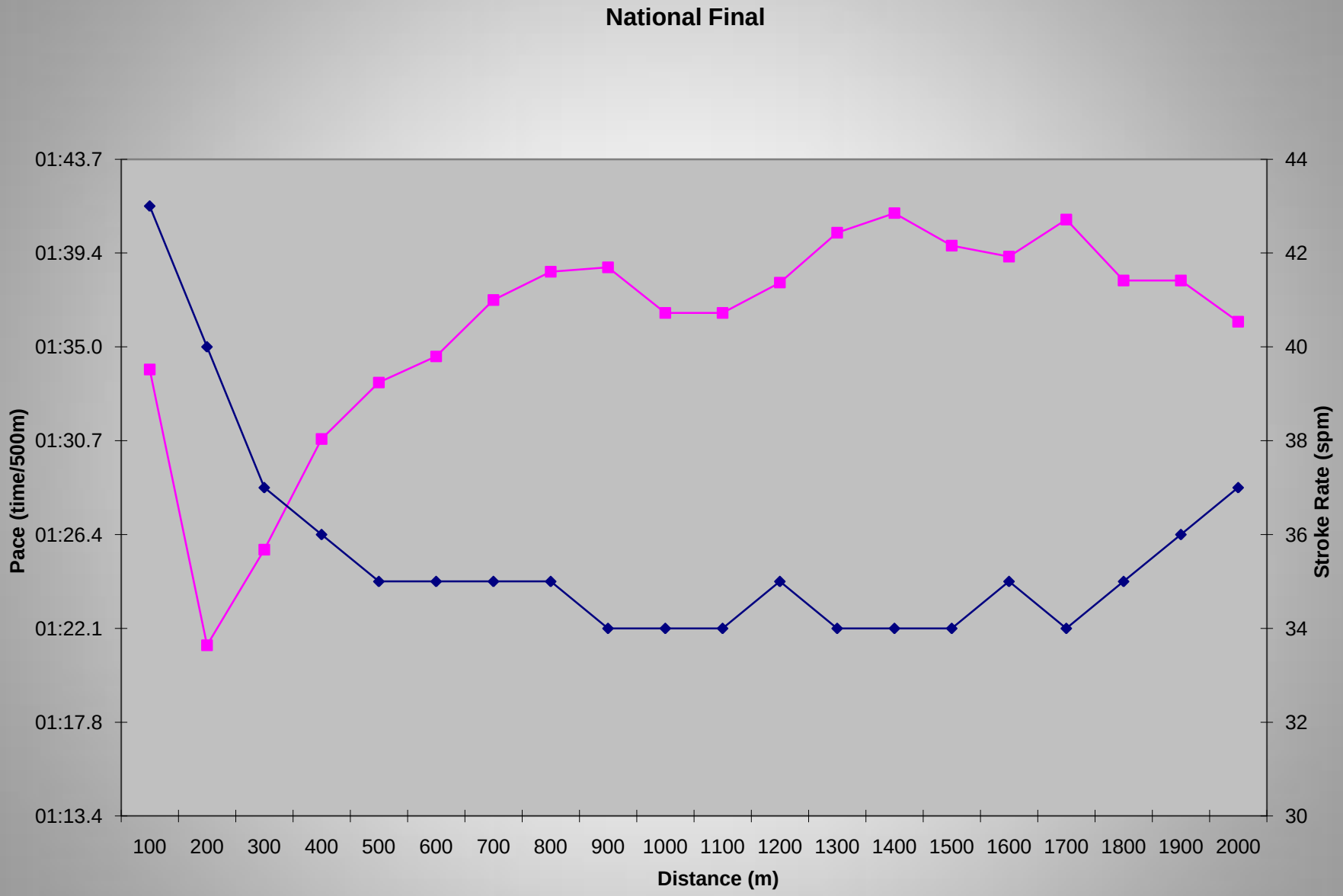
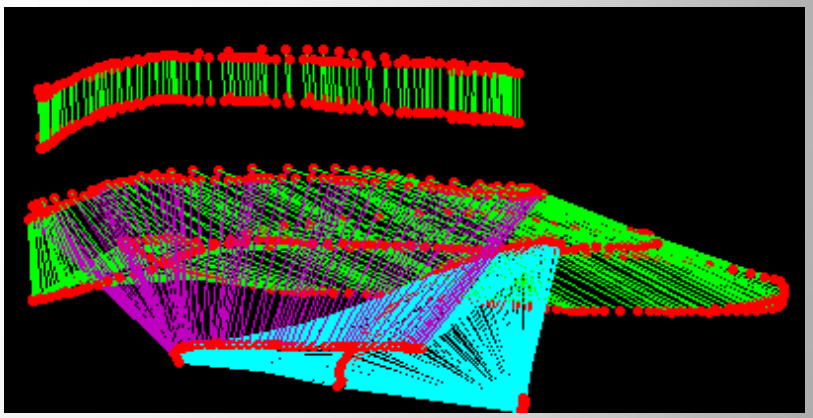

National Final
01:43.7
01:39.4
01:35.0
01:30.7
01:26.4
01:22.1
01:17.8
01:13.4
Pace (time/500m)
44
42
40
38
36
34
32
30
Stroke Rate (spm)
100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000
Distance (m)

Technique Analysis

Dryland and On-water

- Still Photo
- Video
- Movement analysis software



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Still Photos

- Can clearly display behavior
- Saves time in scrolling and managing video
- May be pulled from video during editing

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Video

- Computer Editing
  - Presentation
  - Still acquisition
- Availability
  - Saved as digital files to prevent degradation
  - File sharing for team access

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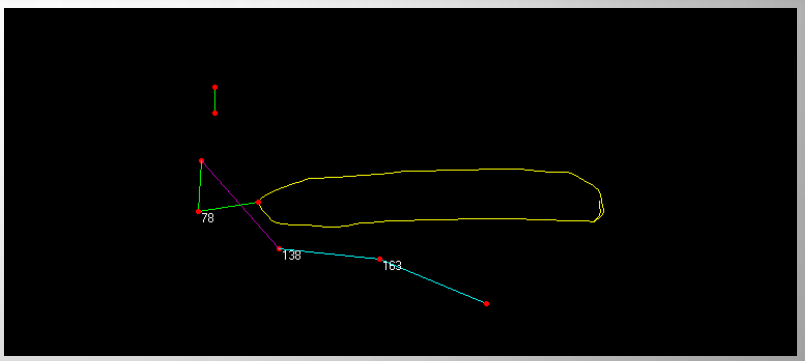
Motion Analysis

Qualitative

- Comparative
  - To “experts”
  - To self
- Experience based assessment

Quantitative

- Angle measures
- Joint and/or marker paths



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