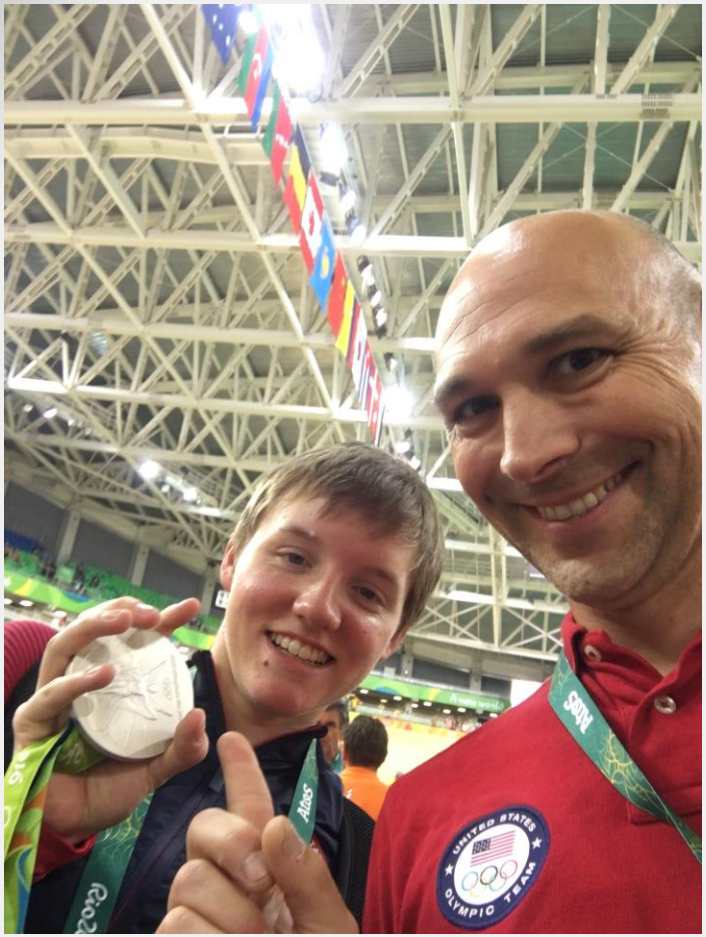
A LOGICAL APPROACH TO CHRONO PREPARATION & COMPETITION

NEAL HENDERSON
CYCLING & SCIENCE
LEUVEN, BELGIUM
SEPTEMBER 22, 2021

DEDICATED TO KELLY CATLIN – SCIENTIST & WORLD CHAMPION (1995-2019)



MY BACKGROUND

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- Sports Science Experience
  - BS Exercise Science
    - Penn State University
  - MS Kinesiology & Applied Physiology
    - CU-Boulder
  - Boulder Center for Sports Medicine
    - Physiological Reponses to Biomechanically Adapted Versus Traditional Cycling Shoes
    - Laboratory Performance Evaluations, Time Trial Performance, and Training Intensity Distribution in Elite Masters Cyclists
    - Use of pressure mapping for development of saddle width recommendations
  - Past President, Rocky Mtn ACSM
  - United States Olympic Committee – Doc Counsilman Science Award
    - Indirect calorimetry for endurance competition fueling needs & field based aerodynamic testing
  - Wahoo Sports Science
    - Lab/Office Opening December 2021

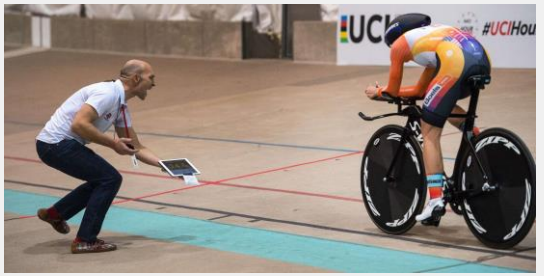
- Coaching Experience
  - Swim Coach, mid 1990s
  - Strength & Conditioning, 1997
  - Elite Triathlete, 2000-2003
  - Taylor Phinney
    - 2007 Jr ITT & 2008 3K IP; 2010 U23 ITT; 2009 & 2010 Elite 4K; 2012 2nd Elite ITT
  - Evelyn Stevens
    - 2012 2nd Elite ITT; 2014 3rd Elite ITT; 2016 UCI Hour Record
  - Team USA 2012, 2016; AUS 2020
  - Rohan Dennis
    - 2018 & 2019 Elite ITT; ITT wins & leaders jersey in all 3 Grand Tours; 2015 UCI Hour Record
  - Triathlon
    - 1996 & 1999 USA Triathlon Teams
    - Flora Duffy 2009-2017
    - Cam Dye 2011-2019
    - Taylor Knibb 2017-2020

NEAL'S HIGH PERFORMANCE ALGORITHM

(Training + Rest)^Genetics ---> Capacity to Perform

(Capacity X Execution)^Tactics & Conditions = **Performance**

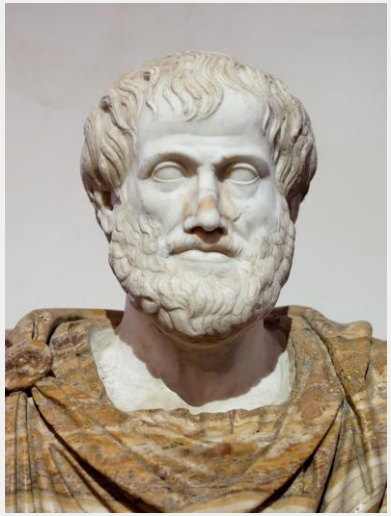
2012 USA Womens Team Pursuit
Olympic Silver Medalists



Evelyn Stevens en route to setting UCI Hour Record 47.98km

LOGIC

- Aristotle…Newton…Einstein…
- Merriam-Webster
  - “a particular way or method of thinking about something”



Aristotle

8 STEPS LOGICAL APPROACH TO TIME TRIALS

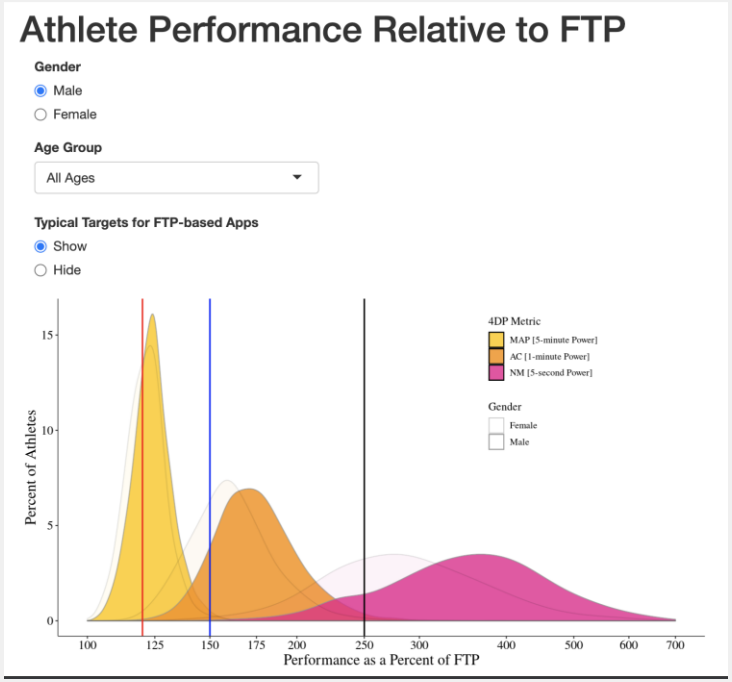
- ❑ Assess Athlete Current Capacities & Abilities
- ❑ Determine Focus Event specific Demands
- ❑ Develop Informed Training Plan Framework
- ❑ Ensure Confidence is Addressed & Enhanced
- ❑ Sequencing/Tapering
- ❑ Rehearsals & Replications
- ❑ Race Day Process
- ❑ Post Event Analysis

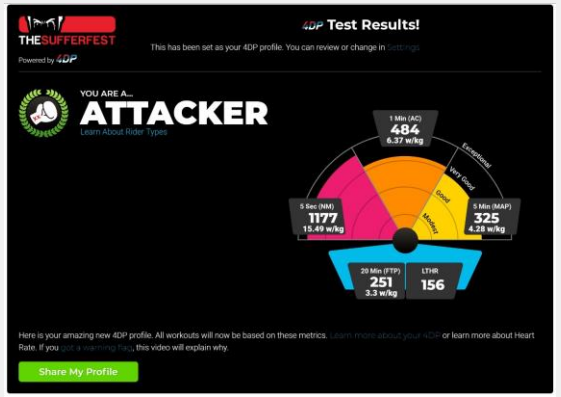
Kasia Niewiadoma

1. ASSESS ATHLETE CURRENT CAPACITIES & ABILITIES

ASSESSING CURRENT CAPACITY & ABILITY

- Current physical capacity
  - Field Test: 4DP
    - Single session, 4 max efforts
      - Identify training targets
      - Baseline to compare changes
  - Lab Tests
    - Lactate Profile, Economy
    - VO2 Max, Indirect Calorimetry
- Skills/Abilities
  - Athlete Self Assessment
  - Video Review
- Aerodynamics
  - Wind Tunnel
  - Velodrome/Field Assessment
- Psychological Assessment
  - Mental Training/Skills
- Other: General Health, Flexibility, etc.





CAPACITY RELATIVE TO FTP – WHY 4DP

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Mean Maximal Power vs. FTP Power

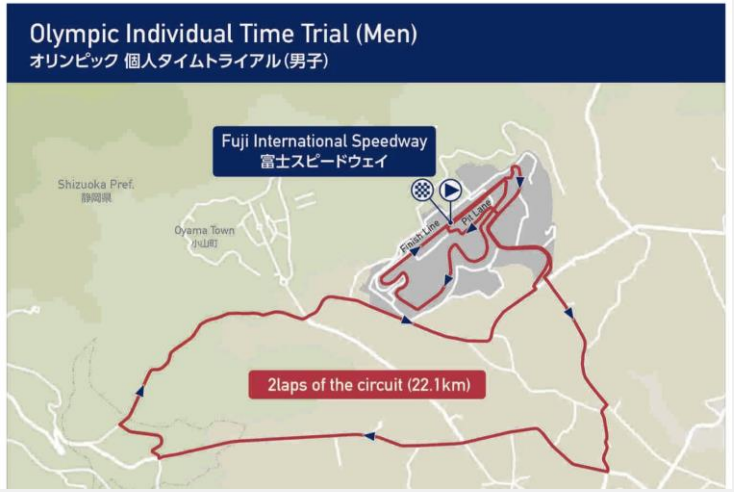
W/Kg	FTP	Athlete	5 seconds	30 seconds	1 minute	2 minute	5 minute	10 minute	20 minute	30 minute	1 hour	1.5 hour	2 hour	4 hour	60 Min NP	**Achievements**
4.0	300	1	516%	313%	214%	159%	128%	113%	108%	105%	100%	95%	88%	73%	325	Masters track national medalist
4.4	350	2	556%	324%	232%	177%	145%	130%	117%	111%	101%	95%	88%	79%	395	6X World Champion
3.3	215	3	495%	333%	233%	184%	140%	124%	112%	110%	100%	97%	95%	75%	260	10+ Time Female Track National Champion
5.2	345	4	335%	249%	185%	156%	140%	130%	121%	109%	100%	89%	86%	79%	365	Multiple Grand Tour Top 10 Finishes
	Group Avg %FTP		**476%**	**305%**	**216%**	**169%**	**138%**	**124%**	**114%**	**109%**	**100%**	**94%**	**89%**	**77%**		
	% of World best FTP		393%		180%		119%				100%					
	World Best W/kg		25.18		11.50		7.60				6.40					

- 4 Different Cyclists
  - Masters Road/Track Cyclist
  - Jr/U23/Elite World Champion TT/Track
  - Elite Female Track Cyclist (top 10 world champs)
  - Grand Tour GC Rider

2. DETERMINE EVENT SPECIFIC DEMANDS

DETERMINE EVENT SPECIFIC DEMANDS

- Elevation Profile
  - Climb/Descent
- Corners/Turns/Descents
  - Road surface
  - Acceleration demands
  - Technical challenge
- Climate/Conditions
  - Elevation
  - Heat/Humidity
  - Wind
- Estimated power plan
  - Harmonic mean
    - Go faster in slowest portions of the course



Example: we travel 10 km at 60 km/h, than another 10 km at 20 km/h, what is our average speed?

$$\text{Harmonic mean} = 2/(\tfrac{1}{60} + \tfrac{1}{20}) = \mathbf{30\ km/h}$$

Check: the 10 km at 60 km/h takes 10 minutes, the 10 km at 20 km/h takes 30 minutes, so the total 20 km takes 40 minutes, which is 30 km per hour

3. DEVELOP THE TRAINING PLAN

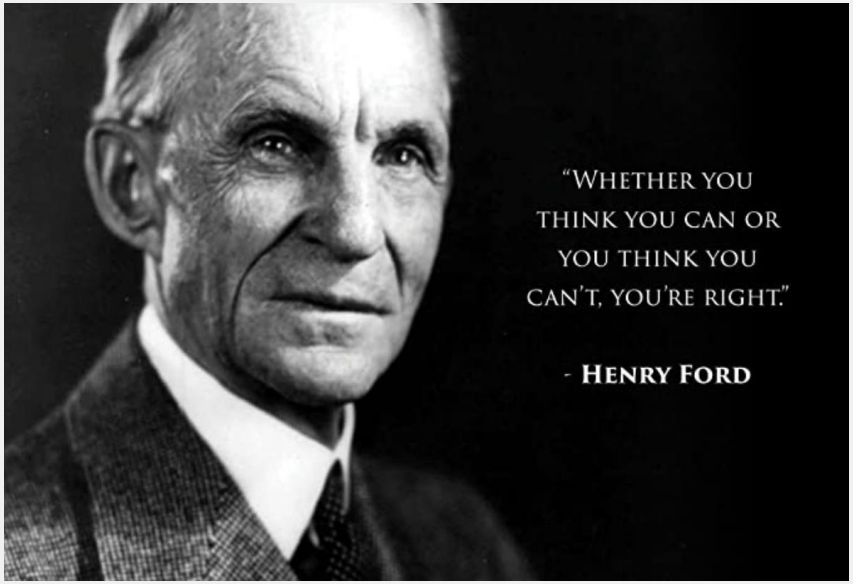
DATA INFORMED TRAINING PLAN

- Based on athlete's current ability/capacity and course specific demands lay out high level training plan (training/recovery periods)
- Training Plan Considerations
  - Impact of training certain aspects relative to potential gains in performance
    - 10 hours of fitness specific training for 1% gain in FTP, or 5 hours of skills training to improve cornering speed by 5% + 5 hours training for .8% FTP gain?
      - Opportunity to increase speed in low speed sections of course
  - Ensure that the athletes strengths are weaponized
    - Don't rest on your laurels…
  - What length of time can athlete maintain training focus?
    - 6 Days/ 6 Weeks / 6 Months?
- "**To improve is to change; to be perfect is to change often**." Winston Churchill

4. BIG C = CONFIDENCE

DEVELOPING & ENHANCING CONFIDENCE

- Be sure to ask athlete what they believe they need to accomplish in training to be confidence before event
  - Balance of enough of what they want to do, with what you believe they need to do from your assessment to help them succeed/reach their goals
  - What you say, and how you say it matters.
- Equipment/Position/Materials Confidence
  - Test, test, test…know what works
  - 48 Hours Prior
    - What wheels/skinsuit/etc. confirmed
  - 24 Hours Prior
    - Option A/B – tires/pressures planned
  - Reduce questions & decisions

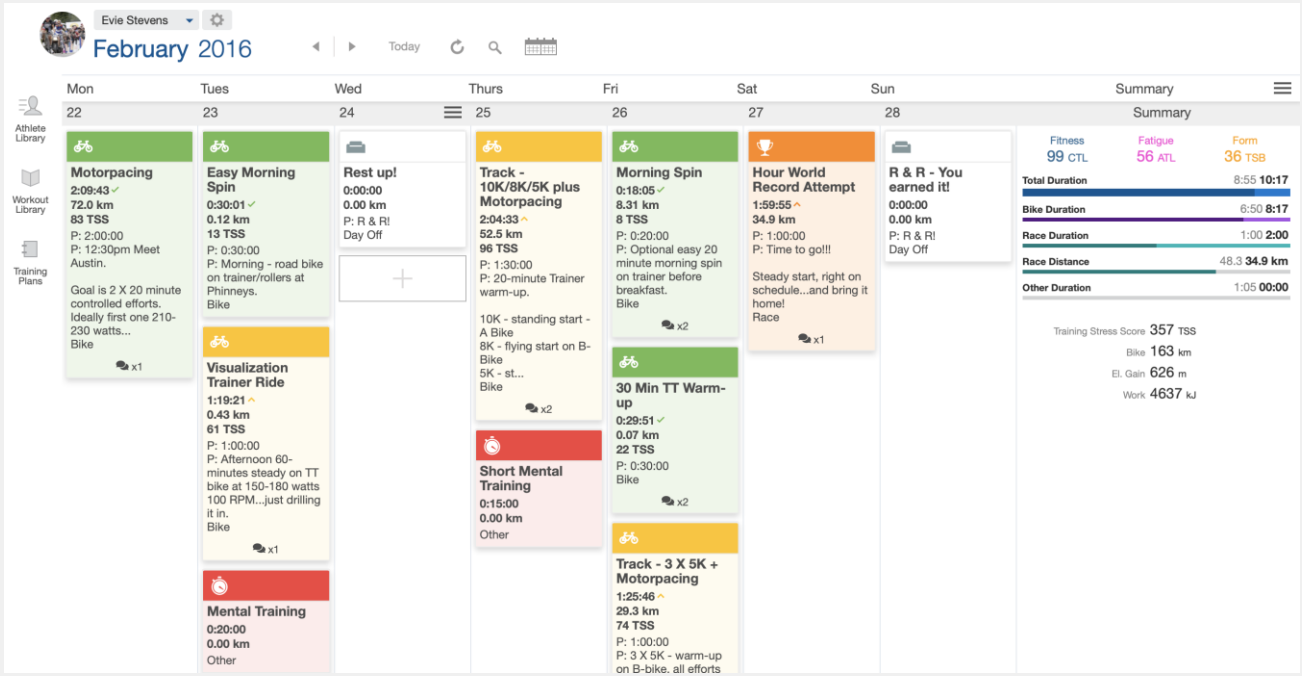


5. SEQUENCING & TAPERING

SEQUENCING AND TAPERING

- Develop a routine for the days leading to competition
  - Practice when rest days occur and what pre-event training sessions look like during recovery weeks.
  - Based on feedback, adjust routine for next opportunity to trial learnings

- Consistency = good; Rigidity – not so good
  - Adaptability



6. REHEARSALS AND REPLICATIONS

REHEARSALS AND REPLICATIONS

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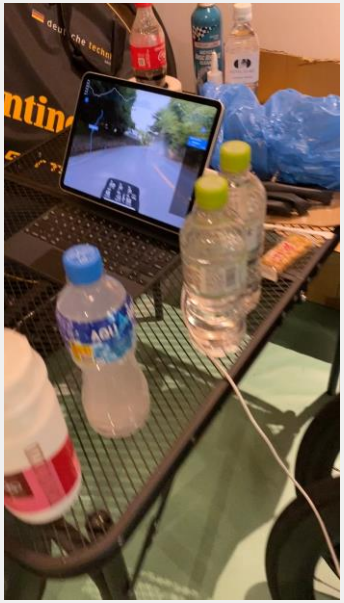
- Low Priority Events
  - Opportunity to test tapering, equipment, pacing, and mental preparation strategies
  - Beware of using too many “throw away” races…can ingrain bad habits

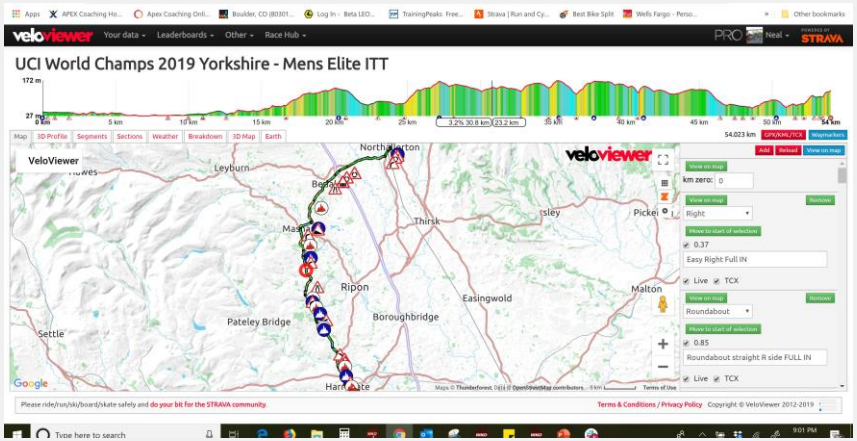
- Replications
  - Simulate the event by adding situations or conditions similar to event
    - Heat/humidity, Time of day, Pacing, etc.
    - Video/Smart trainer/Apps
    - Broken TT: 50/30/20%



7. RACE DAY PROCESS

PROCESS, PROCESS, PROCESS

- Race Day Schedule
  - Detailed, no-stress
- Pre-Race Communications
  - "Do you need anything?"
    - ~~"How do you feel?"~~
      - No need to add doubt
- During Race Comms
  - Athlete preference
  - Planned words/cues
  - Process/actionable
    - No judgements
    - 7s from silver, not 5th…



2019 Yorkshire TT Cues

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	A	B	C
1	**Distance from Start (km)**	**Course (Heads Up)**	**Key Words (Psych Talk)**
2			
3			
4	0.0		Go time. Engage flight mode.
5	1k		Focus on the fundamentals.
6	1.8	Right Turn (inside roundabout)	
7	8.5	Roudabout - Straight Through, Left Side	
8			Calm and controlled. Nailling it.
9	10.0	Left - Right, Full Gas	
10			Patience, head & hands, controlled.
11	11.0	*Diagonal* Train Tracks	
12	12.2	Stay to right side, Drop down to train lines.	
13			Great start mate, controlled and measured. Precise!!
14	12.6	Train Tracks	
15	12.8	Left turn - all good	
16	12.9	Left-Right - Full Gas	
17			Awesome mate, control you, power from the hips.
18			
19	15.5	Punch over this short kicker.	
20			Relaxed is powerful.
21	16.6	Start of 1.5km climb, steeper at bottom and top.	
22			Keep swimming.
23	**16.7**	**Time Check #1**	

8. POST EVENT ANALYSIS

THE GOOD, THE BAD, AND THE UGLY

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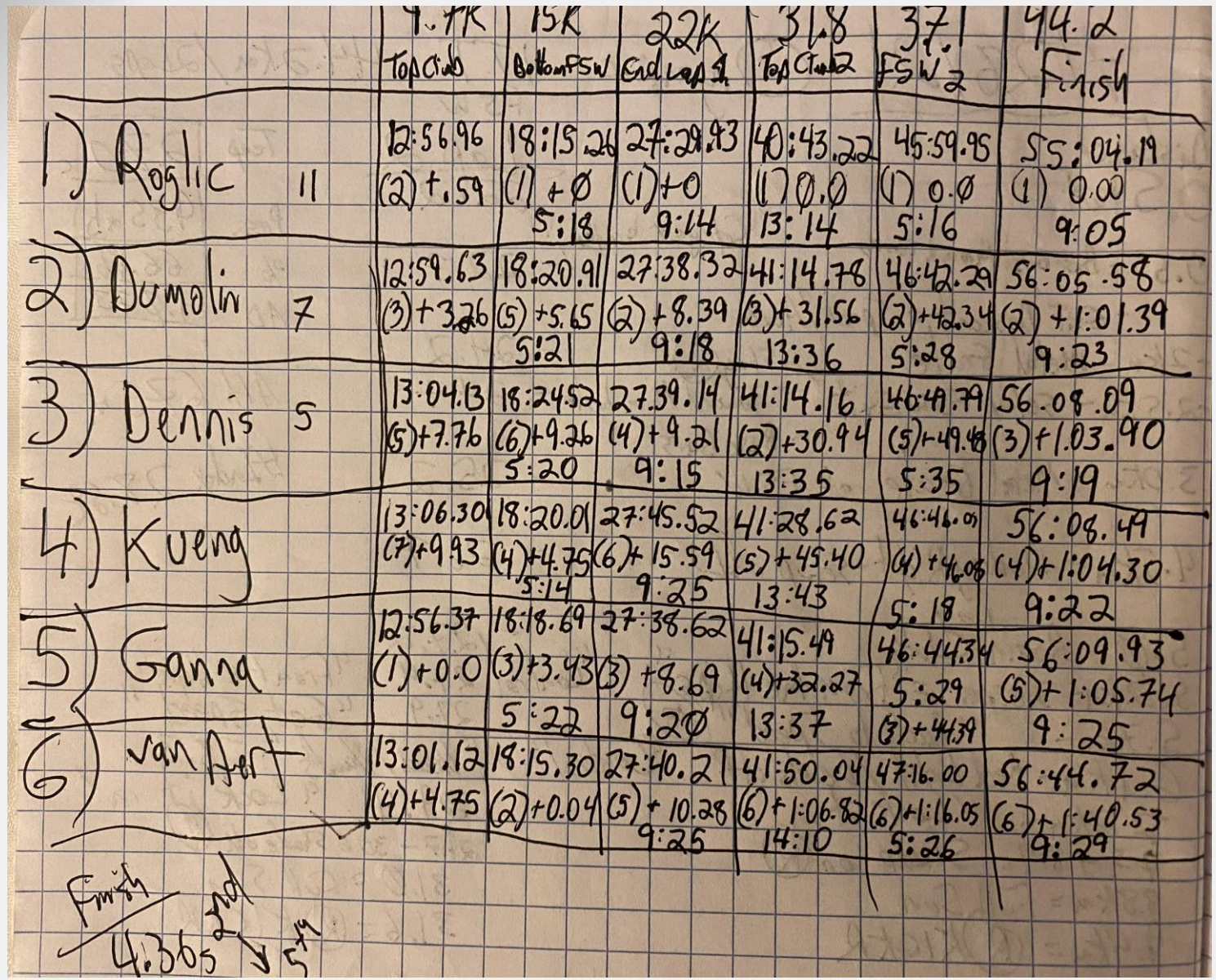
- **"The single biggest problem in communication is the illusion that it has taken place."**
  – George Bernard Shaw

- **Analysis after an event helps inform future training & racing strategy**
  - "Liquid gold"
  - Objective analysis: Power/Pacing/Speed/Strategy
  - Post Race Summary Example Questions:
    - **Three positive things I can say about my performance in this competition:**
    - **During my preparation and during the race, the following key events occurred:**
    - **I could have improved my performance by:**

- **Feedback Loop**
  - Two-way communication – Listen AND speak
  - Identify opportunities for improvement (kaizen)
  - Celebrate victories and be supportive in failures (seeds for future)

ANALYSIS (CONTINUED)



		9.7K Top Climb	15K Bottom FSW	22K End Lap 1	31.8 Top Climb 2	37.1 FSW 2	44.2 Finish
1) Roglic	11	12:56.96 (2) +.59	18:15.26 (1) +0 5:18	27:29.83 (1) +0 9:14	40:43.22 (1) 0.0 13:14	45:59.95 (1) 0.0 5:16	55:04.19 (1) 0.00 9:05
2) Dumolin	7	12:59.63 (3) +3.26	18:20.91 (5) +5.65 5:21	27:38.32 (2) +8.39 9:18	41:14.78 (3) +31.56 13:36	46:42.29 (2) +42.34 5:28	56:05.58 (2) +1:01.39 9:23
3) Dennis	5	13:04.13 (5) +7.76	18:24.52 (6) +9.26 5:20	27:39.14 (4) +9.21 9:15	41:14.16 (2) +30.94 13:35	46:49.79 (5) +49.48 5:35	56:08.09 (3) +1:03.90 9:19
4) Kueng		13:06.30 (7) +9.93	18:20.01 (4) +4.75 5:14	27:45.52 (6) +15.59 9:25	41:28.62 (5) +45.40 13:43	46:46.08 (4) +46.08 5:18	56:08.49 (4) +1:04.30 9:22
5) Ganna		12:56.37 (1) +0.0	18:18.69 (3) +3.43 5:22	27:38.62 (3) +8.69 9:20	41:15.49 (4) +32.27 13:37	46:44.34 5:29 (3) +44.39	56:09.93 (5) +1:05.74 9:25
6) van Aert		13:01.12 (4) +4.75	18:15.30 (2) +0.04	27:40.2 (5) +10.28 9:25	41:50.04 (6) +1:06.82 14:10	47:16.00 (6) +1:16.05 5:26	56:44.72 (6) +1:40.53 9:29

Finish
4:36 2nd 5th

REVIEW: PUTTING IT ALL TOGETHER

- ❑ 1. Assess current capacities & abilities
- ❑ 2. Determine event specific demands
- ❑ 3. Develop informed training plan framework
- ❑ 4. Address & enhance Confidence
- ❑ 5. Practice sequencing & tapering
- ❑ 6. Schedule rehearsals & replications
- ❑ 7. Define race day process
- ❑ 8. Analyze opportunities for improvement


TOKYO 2020


N
0
km/h
TOKYO 2020
TOKYO 2020
TOKYO 2020
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QUESTIONS?

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