Key variables to control the training process in cycling

CYCLING RESEARCH CENTER

www.cycling-research.com

Mikel Zabala / Manuel Mateo-March
University of Granada
Movistar Cycling Team

UNIVERSIDAD DE GRANADA

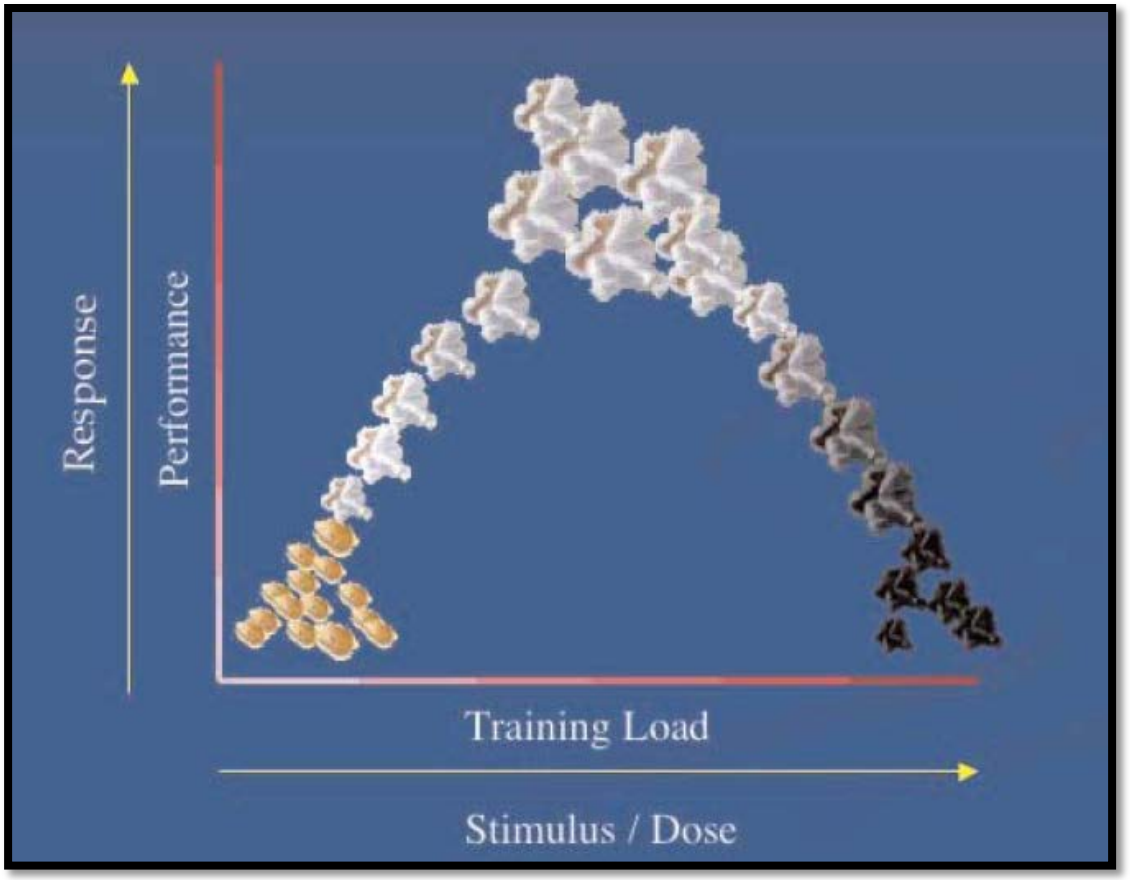
MOVISTAR TEAM

mikelz@ugr.es / TW: @zabalamikel / Instagram: @mikelzabala111

Is training like cooking? Is it an art?

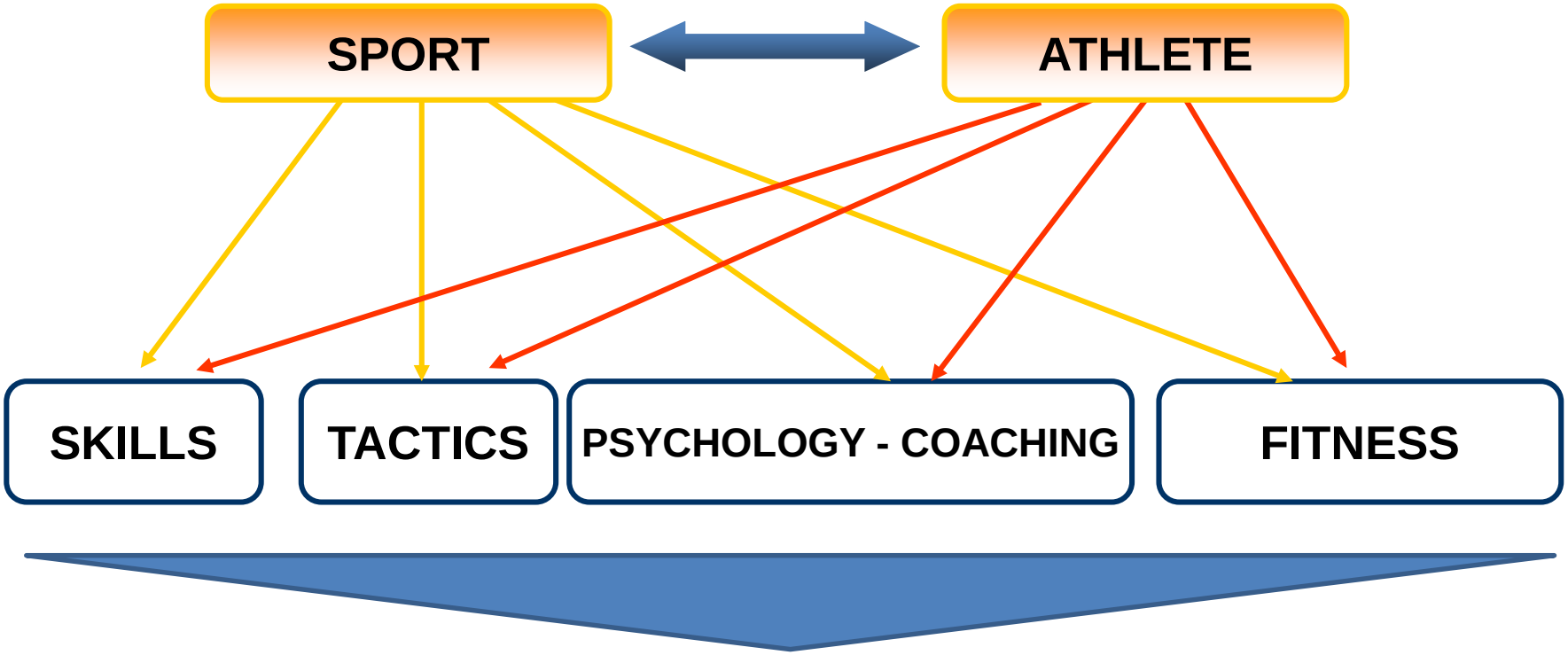
Experience, talent, inspiration…

LIKE POPCORN… MORE WATTS & MORE TIME…



STIMULUS Vs RESPONSE (LIM, 2008)

WHAT WE NEED TO CONTROL TO GET THE BEST "POPCORN"?



SPECIFIC AND INDIVIDUAL CONTEXT

(material, ergogenic aids…)

A lot of variables; too many?

Paralysis by analysis? (Passfield & Hopker)

A lot of variables, too many?

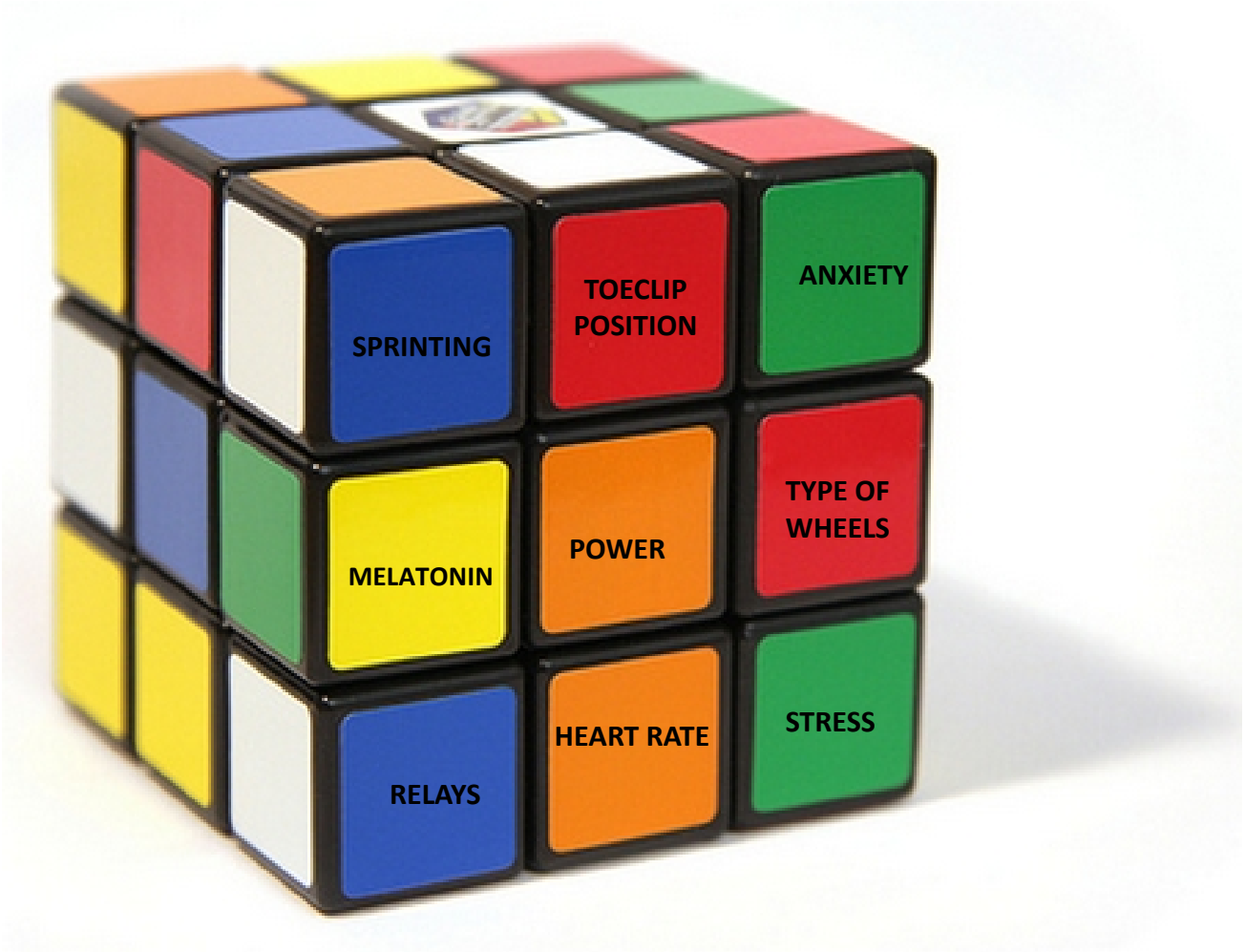
Selection is the key

WHAT TO ASSESS?

VARIABLES

STIMULI VARIABLES	RESPONDENT VARIABLES
-TIME	-BLOOD AND /OR URINE PARAMETERS
-DISTANCE	-WEIGTH, BOSY COMPOSITION
-VELOCITY	-SLEEP, HANGER, PERCEIVED EFFORT AND RECOVERY
-POWER	-HEART RATE DYNAMICS (REST, EXERCISE, HRV)
-SUMMATIVE ASCENT (METERS) AND ASCENT VELOCITY (m/h)	-PERFORMANCE IN TESTS AND COMPS.
-WORKING DENSITY	-LACTATE, MUSCLE OXYGEN (?)
(WORK/RECOVERY)	-HYDRATION STATUS
-NUMBER AND TYPE OF COMPETITIONS	-PSYCHOLOGICAL VARIABLES
-…	-…

INTEGRATED TRAINING
Rubik's Cube, collaborative challenge



INTEGRATED TRAINING
Rubik's Cube, collaborative challenge

"The first biomechanist is the mechanic". Everybody must feel that is important…

Training Principles (Ronnestad and Zabala, 2017)

The combination of training duration, intensity, and frequency is considered seriously. Training needs to be systematic and orderly. For this purpose, several training concepts or training principles need to be considered:

- Timing: all the events scheduled for specific moments
- Overload: a stressful stimulus that takes the cyclist out of comfort status
- Adaptation: proper recovery from overload to produce better status or adaptation
- Individuality: different treatments and considerations for each cyclist
- Specificity: training for cycling, not, for example, rowing
- Reversibility: recognition that all gains can be lost if training stops
- Load–recovery balance: finding the overload that can be converted into desired adaptations by means of appropriate recovery, recognizing that the more a cyclist trains, the more recovery is needed, although each person is different
- Pedagogic principle: understanding of the plan by both the athlete and the coach or any other agent involved in the training process; collaborative learning by athletes and their coaches, sharing the coaching process and building all the related steps together

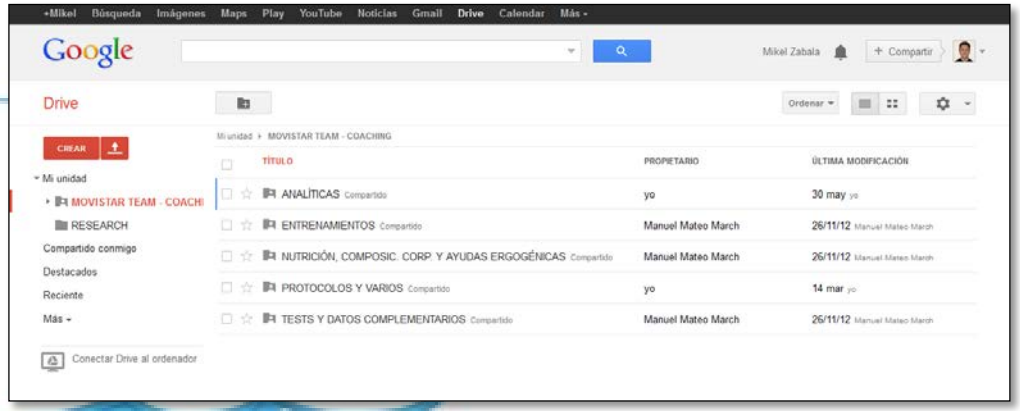
…and principles of training must be based on “Cycling 2.0” phylosophy:

- The need to seek improvement and perform better by means of ethical behavior
- Constant attitude of curiosity, learning, and teaching
- Collaborative teamwork
- Multidirectional communication
- Participation in the training plan and process in which the athlete is the main actor
- Awareness of the latest advances and technologies in the field; trust in real science
- Knowledge and understanding of what is being done; awareness of what is going on and why
- Systematic, controlled, and regular work
- Fair play and clean practices without doping

(Zabala & Atkinson, 2012)

INTEGRATED TRAINING

Real time knowledge in the cloud



Different levels of use based on “FUNCTIONAL THRESHOLD DATA”

It’s not a Football team…

FIRST: BASIC ASPECTS TO KNOW FROM OUR CYCLIST

- ✓ PERSONAL DATA
- ✓ FAMILY ILLNESSES, INJURIES, PAINS, ALLERGIES…
- ✓ NUTRITIONAL HABITS AND ERGOGENIC AIDS
- ✓ REST-RECOVERY HABITS SLEEP QUANTITY-QUALITY, PHYSIOTHERAPIST, HOURS STAND UP…

…BASIC ASPECTS TO KNOW FROM OUR CYCLIST

- ✓ TRAINING HABITS
  - ✓ Years practicing cycling and others
  - ✓ Kilometers per week and hours per week
  - ✓ Kilometers and hours per month, per year…
  - ✓ How many and which kind of workouts in different microcycles
  - ✓ How many competitions and when
  - ✓ Which kind of rest-recovery and for how long (during season and after)
  - ✓ …

…BASIC ASPECTS TO KNOW FROM OUR CYCLIST

✓ TRAINING HABITS

- When do you perform better and why?
- When do you perform the worse and why?
- To be in your best shape, how many weeks/months you need?

How would you define yourself as a rider?

	Very low	Low	Normal	High	Very high
Powerful					X
Diesel			X		
Technic				X	
Smart					X

…BASIC ASPECTS TO KNOW FROM OUR CYCLIST

- ✓ TRAINING HABITS

  Which aspect would you like to improve first?

  Do you think you have improved in any aspect?

  Do you think you have impaired any aspect?

  Are you studying any language (or other)?

STABLISHING THE GOALS (SMART)

- ✓ Define your goals for the next season (Specific, Measurable, Achievable, Regularly viewed, Timed):

1. Result-based goals

   Get a top-3 in Paris

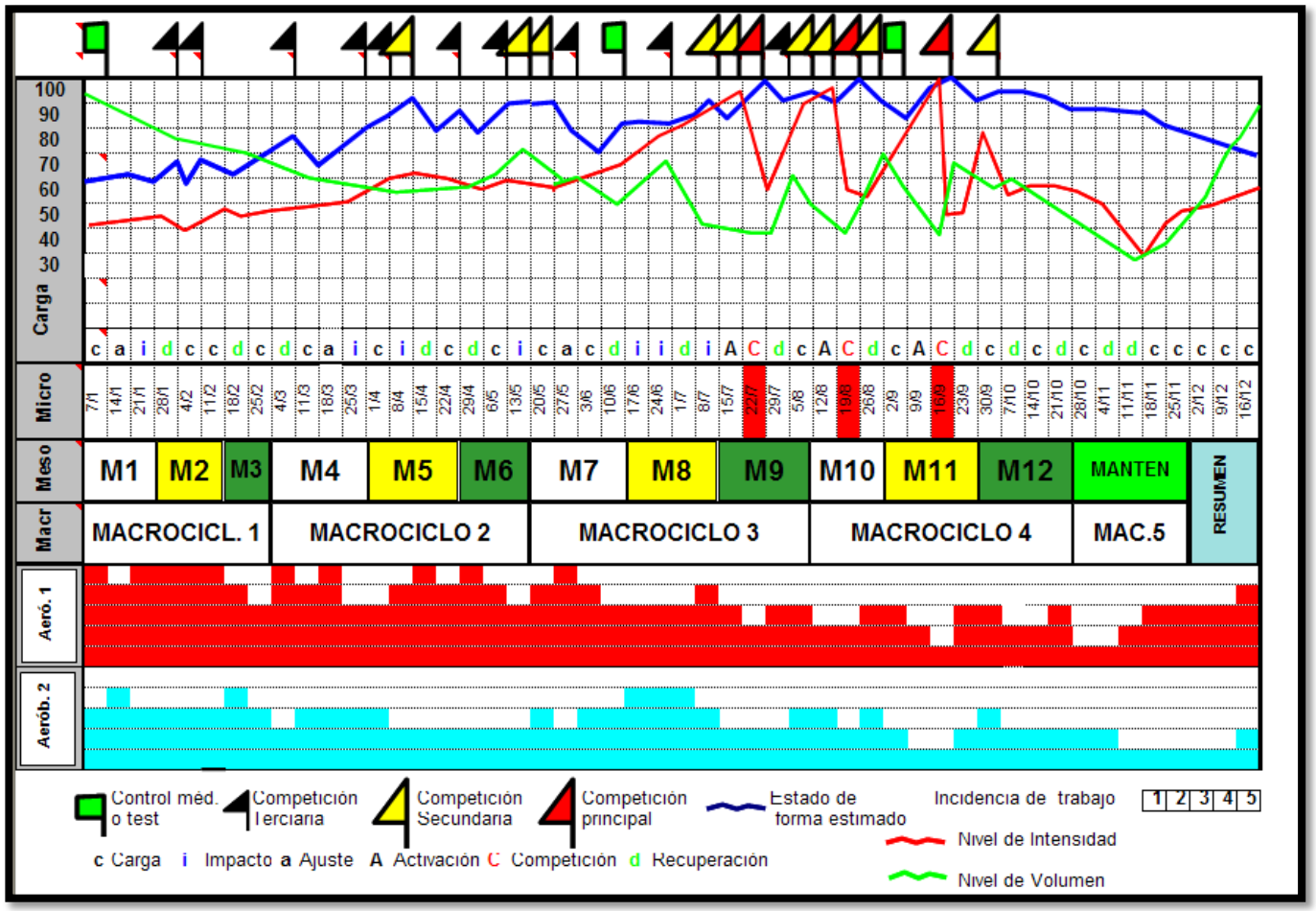
2. Process-based goals

   Ride efficient in the peloton

PLANNING THE SEASON

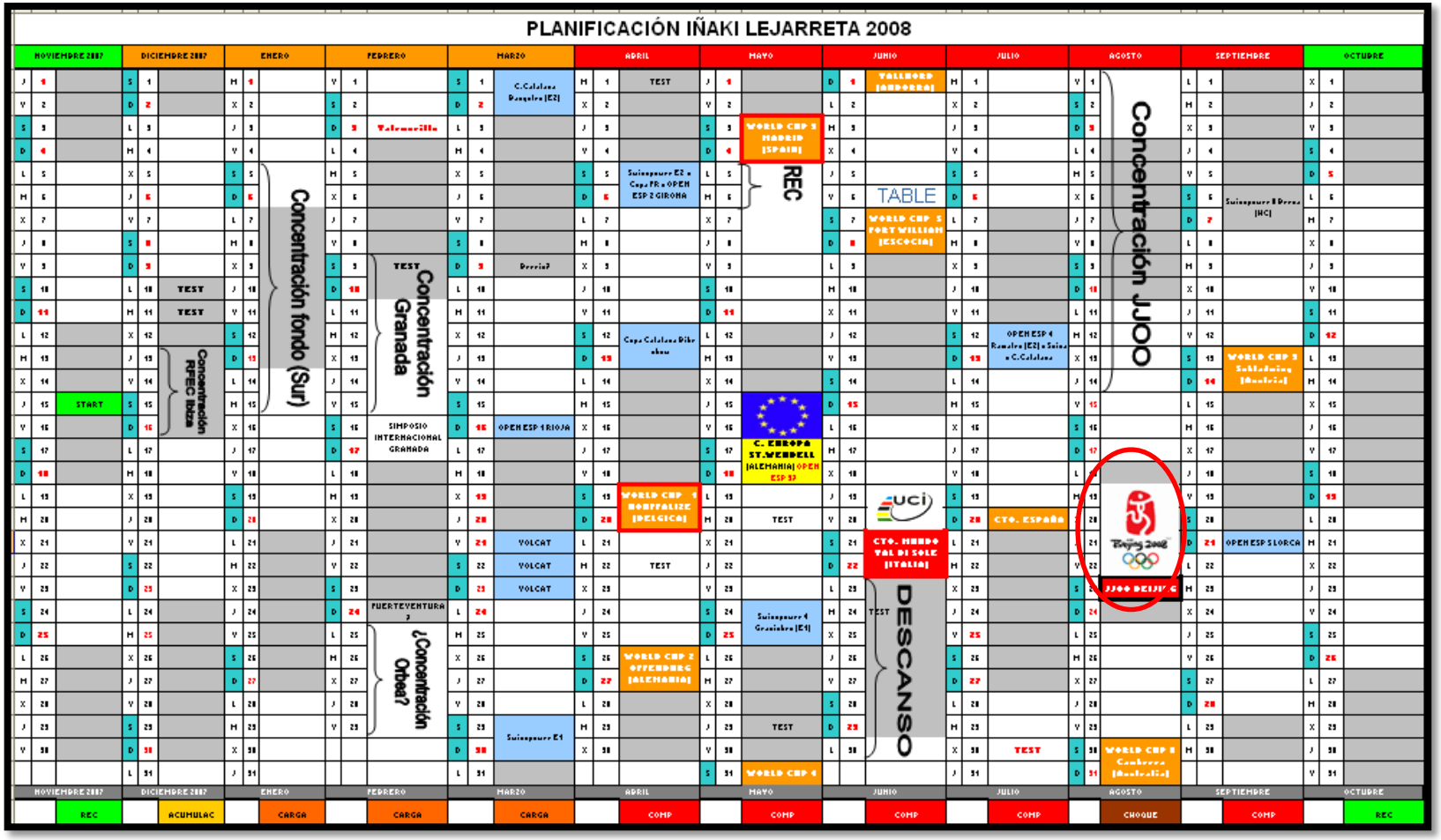
IT IS JUST “PAPER”, BUT…

PLANNING THE SEASON

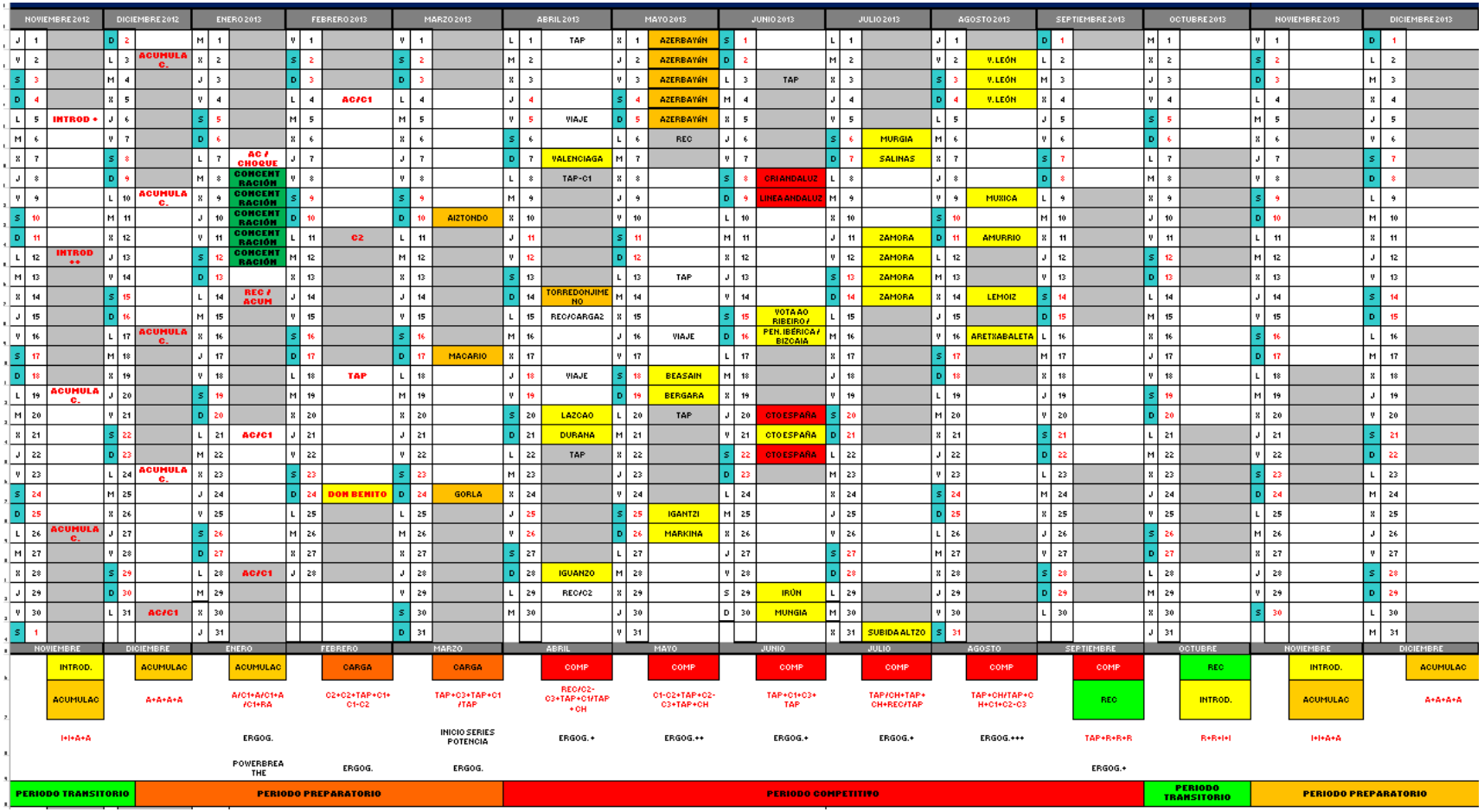


PLANNING THE SEASON

2008 BEIJING



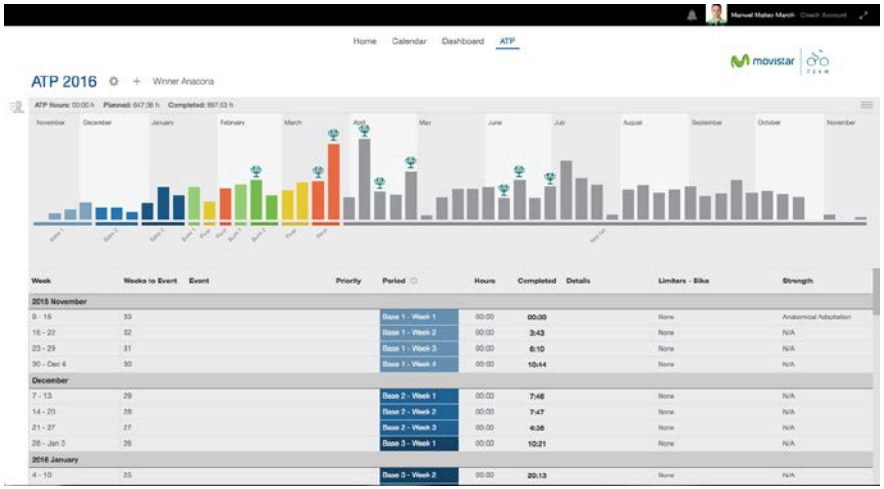
PLANNING THE SEASON



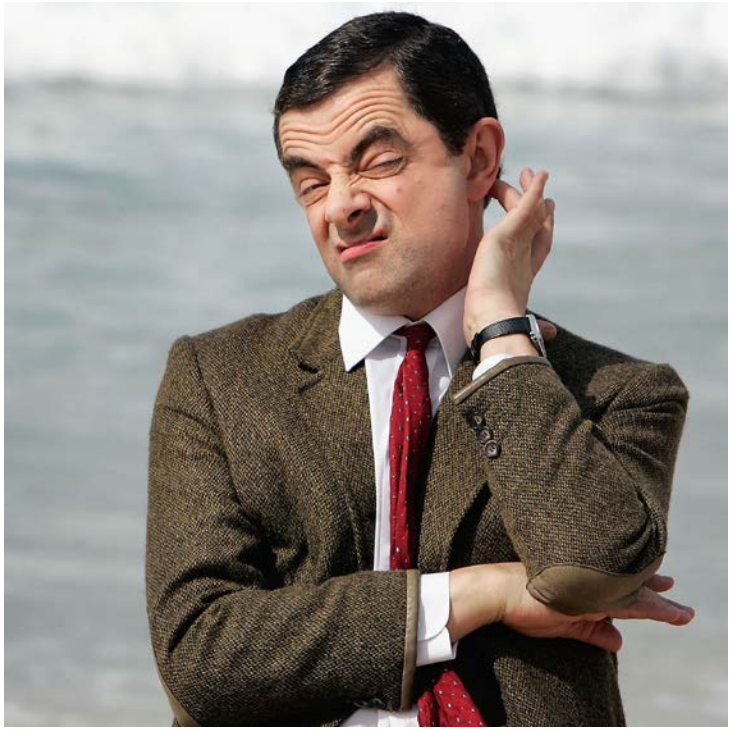
PLANNING THE SEASON

FLEXIBLE PLAN ACCORDING TO:

- Competitions
- Team's interests
- Personal interests
- Illnesses
- Injuries
- Fitness-shape
- Load-recovery capacity
- Personal issues
- …



…AND WHAT IS NEEDED TO DEVELOP THE PLAN DAY TO DAY?



LET’S SEE SOME SPECIFIC ASPECTS THAT ARE NEEDED

SPECIFIC GLOSARY (I)

MEAN POWER, NORMALIZED POWER, FATIGUE INDEX…

CP: Critical Power. A power that theoretically can be maintained for a indefinitely long time without fatigue.

FTP : Functional Threshold Power. The highest power that a rider can maintain in a quasi-steady state without fatiguing for approximately one hour

TSS: Training Stress Score®. A quantification of the training session that takes into account the duration and intensity of the training based on the power data. It's intended to estimate the training load and physiological stress created by that session

ATL: Acute Training Load®. The dose of training that you accumulated over a short period of time, from 3 to 10 days in general. It relates to your fatigue.

CTL: Chronic Training Load®. The the dose of training you accumulated over a longer period of time, from a couple of months to years. It relates to your fitness.

W' o W'bal: Formerly known as Anaerobic Work Capacity (AWC). A fixed amount of work, expressed in kJ, that you can do above Critical Power.

TAU: your rate of replenishing your W' stores.

SPECIFIC GLOSARY (II)

RR: Ramp Rate. The ramp rate of your Chronic Training Load (CTL). Joel Friel considers that a CTL ramp rate of 5 to 8 points per week is about right for most.

TSB: Training Stress Balance®. It’s the result of subtracting today’s Acute Training Load (“fatigue”) from today’s Chronic Training Load (“fitness”). In general terms, if it's negative, you're fatigued, and if it's positive you're fresh. It relates to your form or freshness.

Training Impulse: A method to quantify training load. It takes into consideration the intensity of exercise as calculated by the heart rate (HR) and the duration of exercise (Strava's Suffer Score is a modified TRIMP score).

SmO2: the abbreviation for Muscle Oxygen Saturation, that is, the percentage of hemoglobin that is carrying oxygen within the muscle tissue. Essentially you’re looking at how your body, specifically your muscles, responds to exertion over time. It's measured by some devices like MOxy Muscle Oxygen Monitor and BXSinsight

tHb: total hemoglobin. It's part of your SmO2% measurement, and in simple terms it represents the existing volume of blood, where measured.

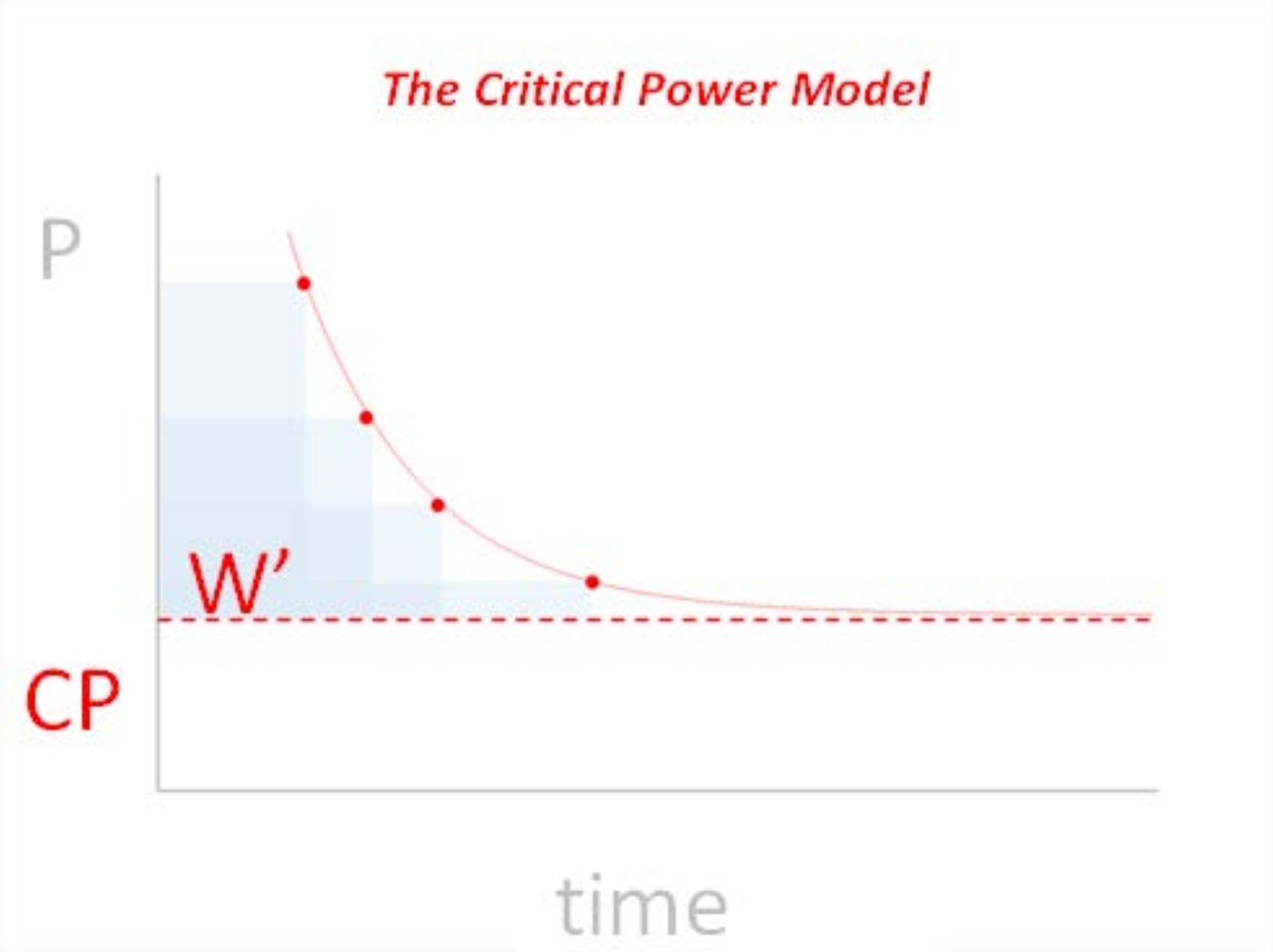
SPECIFIC GLOSARY (III)

Aerobic Decoupling: When power output and heart rate are no longer parallel in a workout where one variable remains steady while the other drifts, the relationship is said to have "decoupled" (e.g. when power remains constant but heart rate goes up, or when heart rate remains constant and power drops). Excessive decoupling (much higher than 5%) would indicate a lack of aerobic endurance fitness

Super OP: Tracking of blood pressure and HR every morning.

HRV: Heart Rate Variability. RMSSD, HF to measure recovery status.

CP AND W' RELATIONSHIP



W', W'bal, TAU & INTENSITY RELATIONSHIP

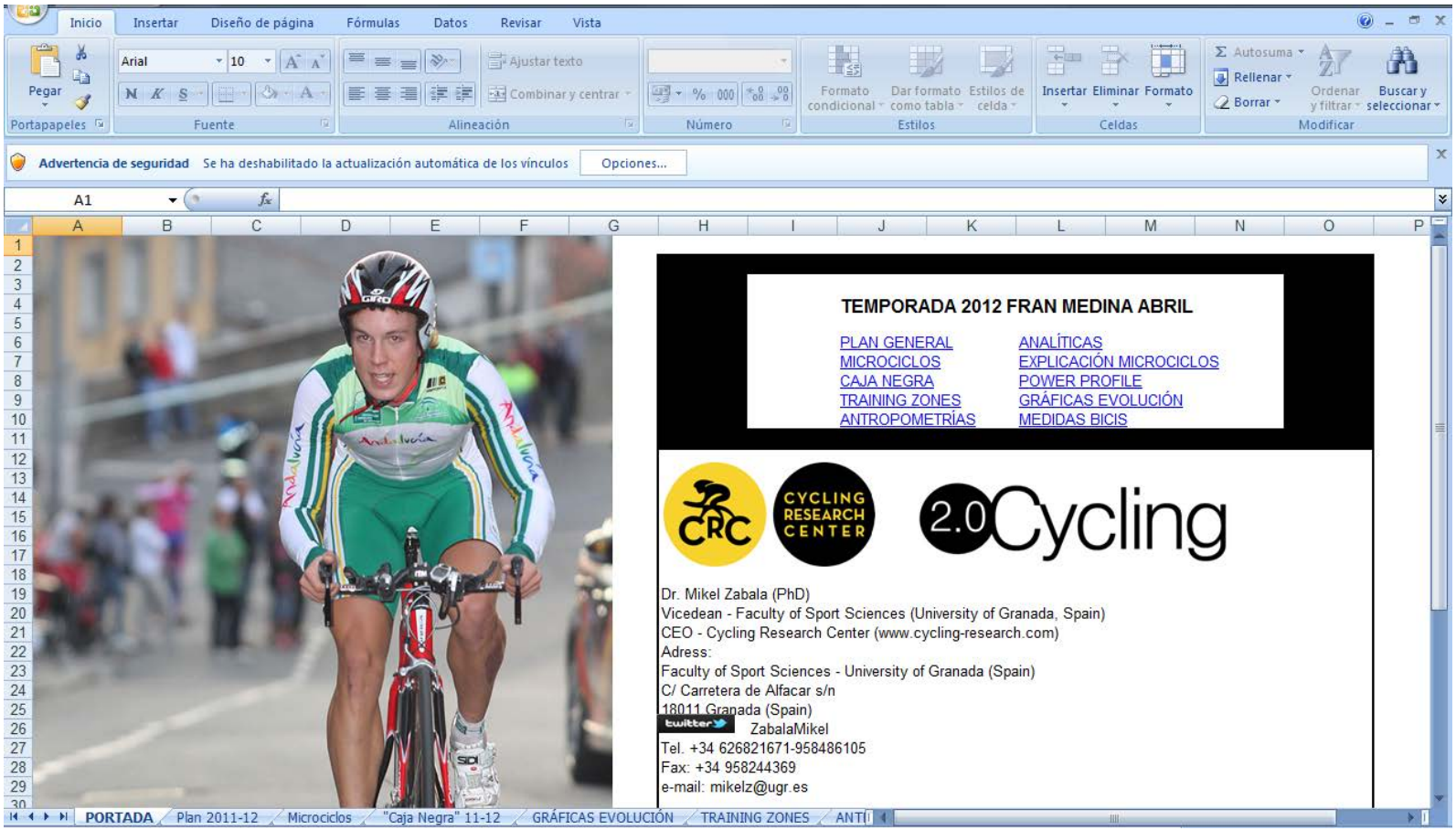
CONCEPTUAL CONTROVERSY

Skiba/Literature	Coggan/TrainingPeaks
Variability Index	Variability Index
Relative Intensity	Intensity Factor
xPower	Normalised Power
BikeScore	Training Stress Score
Critical Power	Functional Threshold Power
W’	Functional Reserve Capacity
W’bal	dFRC

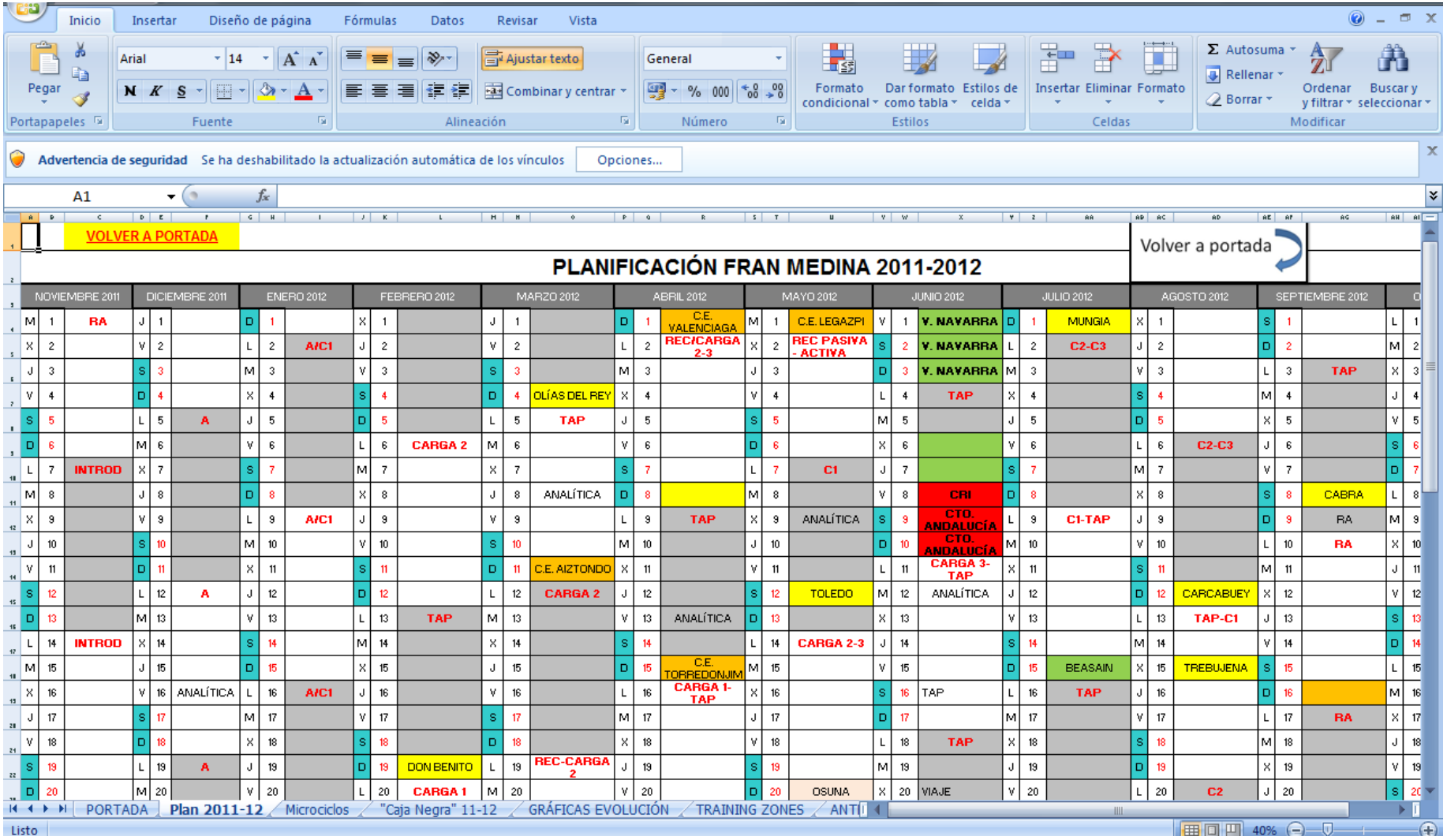
HOW CAN WE WORK? TOOLS TO FACILITATE PERFORMANCE ANALYSIS

FIRST WE USED EXCEL: "THE BLACK BOX" OF THE AEROPLANE

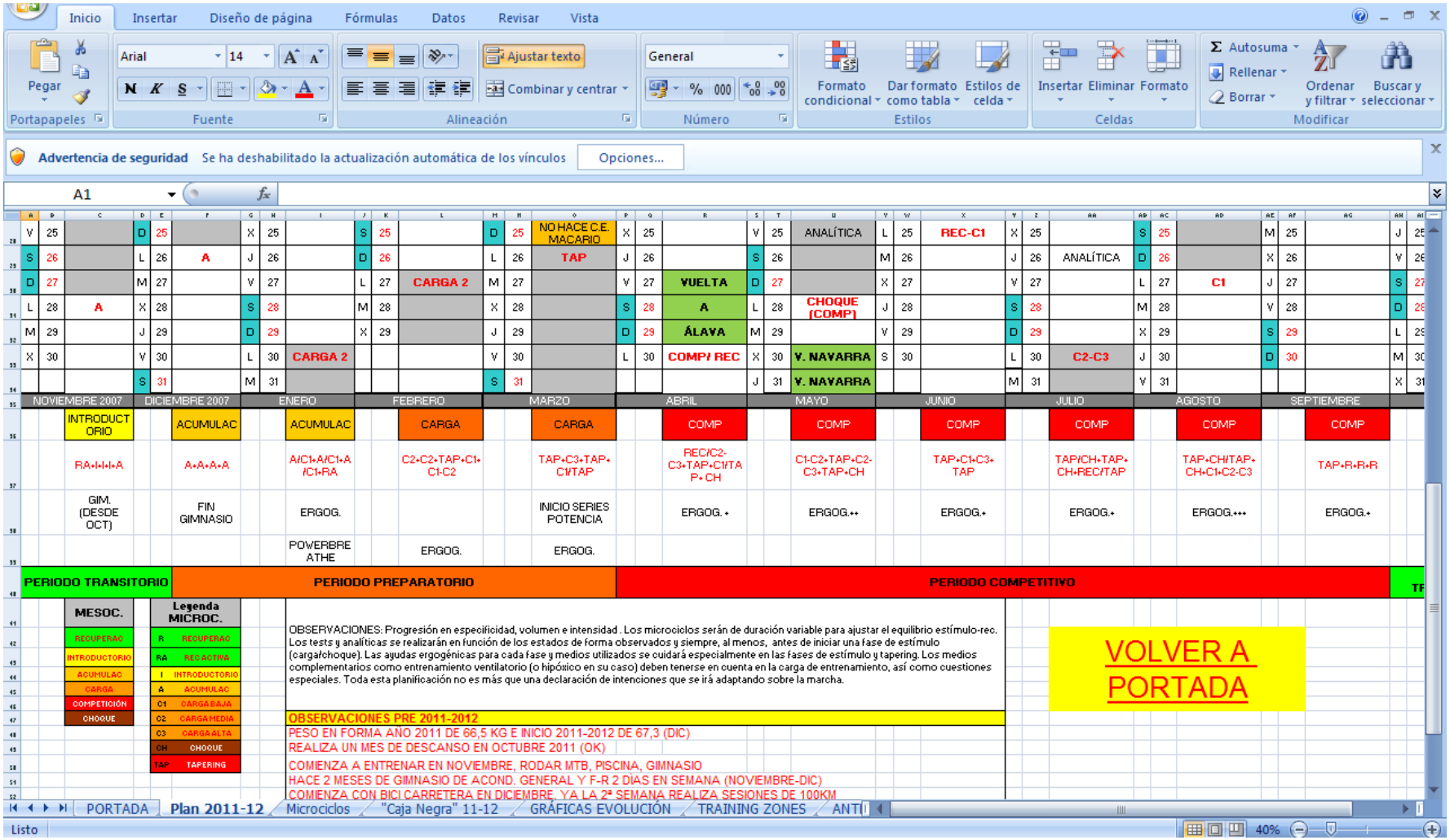
INTEGRATION OF DAILY DATA
REMEMBER THE INDIVIDUAL DATA THRESHOLD



“THE BLACK BOX” OF THE AEROPLANE



“THE BLACK BOX” OF THE AEROPLANE



Inicio | Insertar | Diseño de página | Fórmulas | Datos | Revisar | Vista

Advertencia de seguridad Se ha deshabilitado la actualización automática de los vínculos Opciones...

NOVIEMBRE 2007	DICIEMBRE 2007	ENERO	FEBRERO	MARZO	ABRIL	MAYO	JUNIO	JULIO	AGOSTO	SEPTIEMBRE
INTRODUCTORIO	ACUMULAC	ACUMULAC	CARGA	CARGA	COMP	COMP	COMP	COMP	COMP	COMP
RA+I+I+I+A	A+A+A+A	A/C1+A/C1+A/C1+RA	C2+C2+TAP+C1+C1-C2	TAP+C3+TAP+C1/TAP	REC/C2-C3+TAP+C1/TAP+CH	C1-C2+TAP+C2-C3+TAP+CH	TAP+C1+C3+TAP	TAP/CH+TAP+CH+REC/TAP	TAP+CH/TAP+CH+C1+C2-C3	TAP+R+R+R
GIM. (DESDE OCT)	FIN GIMNASIO	ERGOG.		INICIO SERIES POTENCIA	ERGOG.+	ERGOG.++	ERGOG.+	ERGOG.+	ERGOG.+++	ERGOG.+
		POWERBRE ATHE	ERGOG.	ERGOG.						

PERIODO TRANSITORIO | PERIODO PREPARATORIO | PERIODO COMPETITIVO | TR

MESOC.
RECUPERAC
INTRODUCTORIO
ACUMULAC
CARGA
COMPETICIÓN
CHOQUE

Legenda MICROC.	
R	RECUPERAC
RA	RECACTIVA
I	INTRODUCTORIO
A	ACUMULAC
C1	CARGA BAJA
C2	CARGA MEDIA
C3	CARGA ALTA
CH	CHOQUE
TAP	TAPERING

OBSERVACIONES: Progresión en especificidad, volumen e intensidad . Los microciclos serán de duración variable para ajustar el equilibrio estímulo-rec. Los tests y analíticas se realizarán en función de los estados de forma observados y siempre, al menos, antes de iniciar una fase de estímulo (carga/choque). Las ayudas ergogénicas para cada fase y medios utilizados se cuidará especialmente en las fases de estímulo y tapering. Los medios complementarios como entrenamiento ventilatorio (o hipóxico en su caso) deben tenerse en cuenta en la carga de entrenamiento, así como cuestiones especiales. Toda esta planificación no es más que una declaración de intenciones que se irá adaptando sobre la marcha.

OBSERVACIONES PRE 2011-2012

PESO EN FORMA AÑO 2011 DE 66,5 KG E INICIO 2011-2012 DE 67,3 (DIC)

REALIZA UN MES DE DESCANSO EN OCTUBRE 2011 (OK)

COMIENZA A ENTRENAR EN NOVIEMBRE, RODAR MTB, PISCINA, GIMNASIO

HACE 2 MESES DE GIMNASIO DE ACOND. GENERAL Y F-R 2 DÍAS EN SEMANA (NOVIEMBRE-DIC)

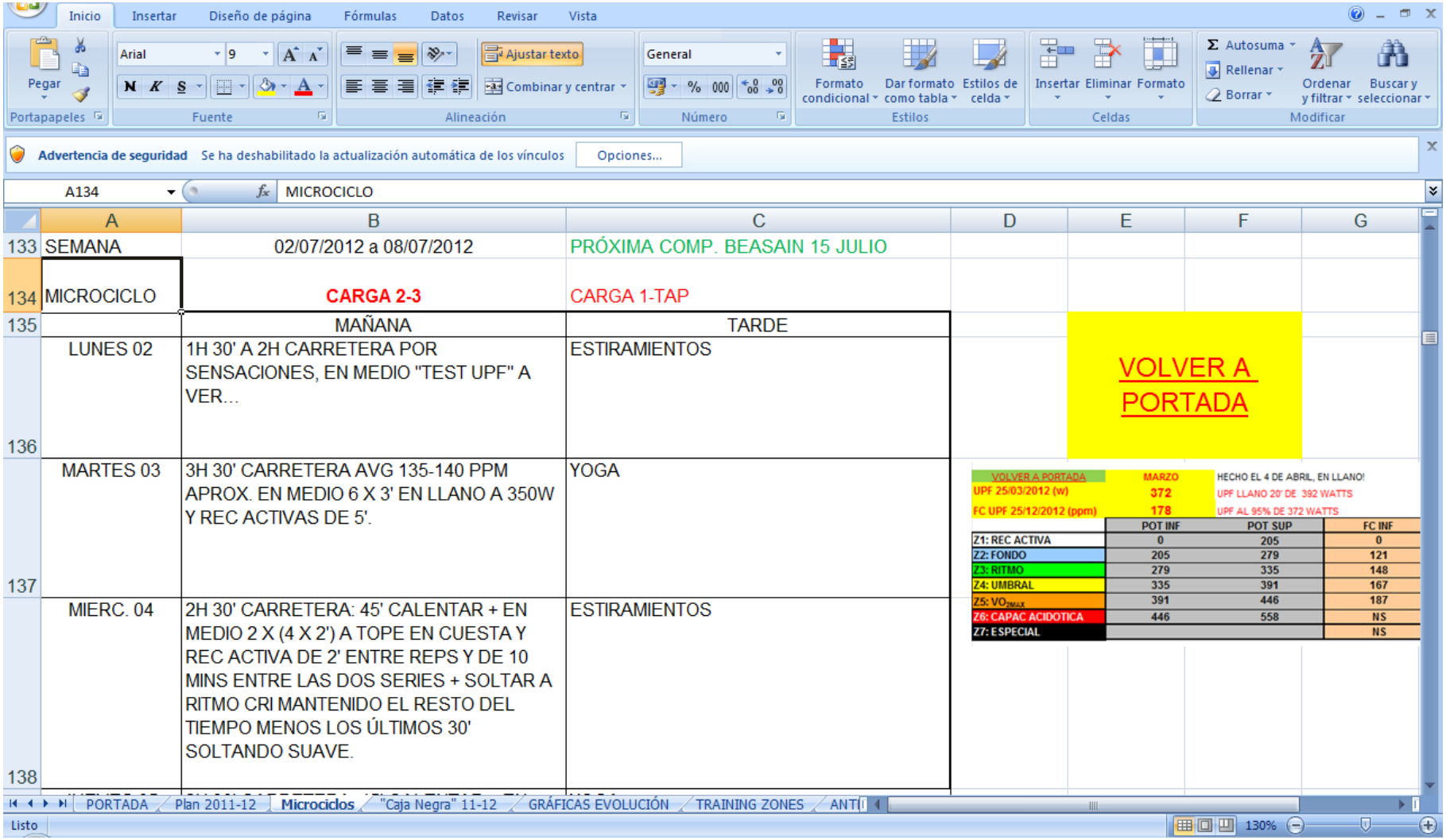
COMIENZA CON BICI CARRETERA EN DICIEMBRE, YA LA 2ª SEMANA REALIZA SESIONES DE 100KM

VOLVER A PORTADA

PORTADA | Plan 2011-12 | Microciclos | "Caja Negra" 11-12 | GRÁFICAS EVOLUCIÓN | TRAINING ZONES | ANTI

Listo 40%

“THE BLACK BOX” OF THE AEROPLANE



Inicio | Insertar | Diseño de página | Fórmulas | Datos | Revisar | Vista

Advertencia de seguridad Se ha deshabilitado la actualización automática de los vínculos Opciones...

A134: MICROCICLO

	A	B	C
133	SEMANA	02/07/2012 a 08/07/2012	PRÓXIMA COMP. BEASAIN 15 JULIO
134	MICROCICLO	CARGA 2-3	CARGA 1-TAP
135		MAÑANA	TARDE
136	LUNES 02	1H 30' A 2H CARRETERA POR SENSACIONES, EN MEDIO "TEST UPF" A VER...	ESTIRAMIENTOS
137	MARTES 03	3H 30' CARRETERA AVG 135-140 PPM APROX. EN MEDIO 6 X 3' EN LLANO A 350W Y REC ACTIVAS DE 5'.	YOGA
138	MIERC. 04	2H 30' CARRETERA: 45' CALENTAR + EN MEDIO 2 X (4 X 2') A TOPE EN CUESTA Y REC ACTIVA DE 2' ENTRE REPS Y DE 10 MINS ENTRE LAS DOS SERIES + SOLTAR A RITMO CRI MANTENIDO EL RESTO DEL TIEMPO MENOS LOS ÚLTIMOS 30' SOLTANDO SUAVE.	ESTIRAMIENTOS

VOLVER A PORTADA

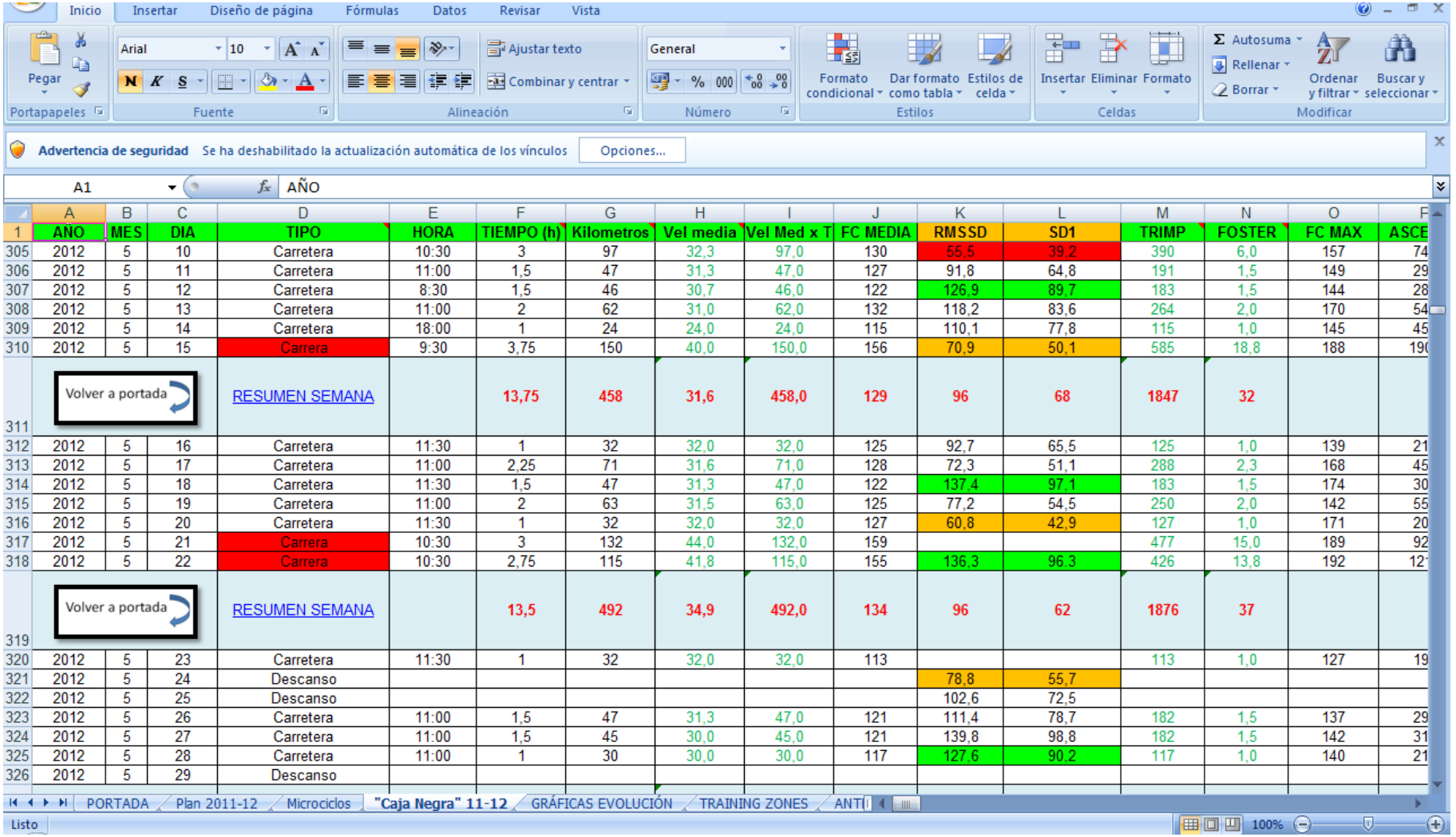
VOLVER A PORTADA	MARZO	HECHO EL 4 DE ABRIL, EN LLANO!
UPF 25/03/2012 (w)	372	UPF LLANO 20' DE 392 WATTS
FC UPF 25/12/2012 (ppm)	178	UPF AL 95% DE 372 WATTS

	POT INF	POT SUP	FC INF
Z1: REC ACTIVA	0	205	0
Z2: FONDO	205	279	121
Z3: RITMO	279	335	148
Z4: UMBRAL	335	391	167
Z5: VO_{2MAX}	391	446	187
Z6: CAPAC ACIDOTICA	446	558	NS
Z7: ESPECIAL			NS

PORTADA | Plan 2011-12 | Microciclos | "Caja Negra" 11-12 | GRÁFICAS EVOLUCIÓN | TRAINING ZONES | ANTI

Listo 130%

“THE BLACK BOX” OF THE AEROPLANE



Inicio | Insertar | Diseño de página | Fórmulas | Datos | Revisar | Vista

Advertencia de seguridad Se ha deshabilitado la actualización automática de los vínculos Opciones...

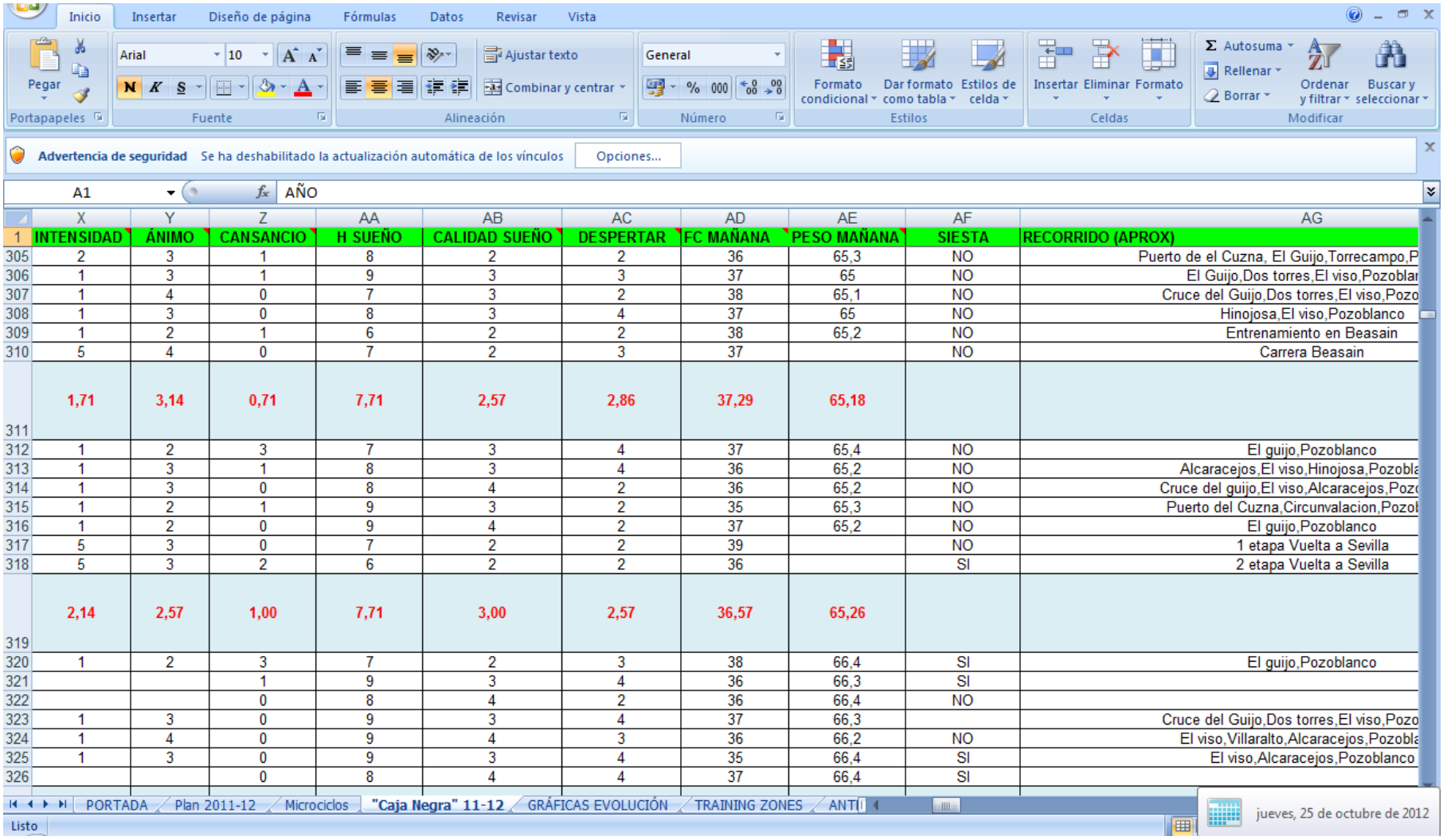
A1 AÑO

	AÑO	MES	DIA	TIPO	HORA	TIEMPO (h)	Kilometros	Vel media	Vel Med x T	FC MEDIA	RMSSD	SD1	TRIMP	FOSTER	FC MAX	ASCE
305	2012	5	10	Carretera	10:30	3	97	32,3	97,0	130	55,5	39,2	390	6,0	157	74
306	2012	5	11	Carretera	11:00	1,5	47	31,3	47,0	127	91,8	64,8	191	1,5	149	29
307	2012	5	12	Carretera	8:30	1,5	46	30,7	46,0	122	126,9	89,7	183	1,5	144	28
308	2012	5	13	Carretera	11:00	2	62	31,0	62,0	132	118,2	83,6	264	2,0	170	54
309	2012	5	14	Carretera	18:00	1	24	24,0	24,0	115	110,1	77,8	115	1,0	145	45
310	2012	5	15	Carrera	9:30	3,75	150	40,0	150,0	156	70,9	50,1	585	18,8	188	19
311	Volver a portada			RESUMEN SEMANA		13,75	458	31,6	458,0	129	96	68	1847	32		
312	2012	5	16	Carretera	11:30	1	32	32,0	32,0	125	92,7	65,5	125	1,0	139	21
313	2012	5	17	Carretera	11:00	2,25	71	31,6	71,0	128	72,3	51,1	288	2,3	168	45
314	2012	5	18	Carretera	11:30	1,5	47	31,3	47,0	122	137,4	97,1	183	1,5	174	30
315	2012	5	19	Carretera	11:00	2	63	31,5	63,0	125	77,2	54,5	250	2,0	142	55
316	2012	5	20	Carretera	11:30	1	32	32,0	32,0	127	60,8	42,9	127	1,0	171	20
317	2012	5	21	Carrera	10:30	3	132	44,0	132,0	159			477	15,0	189	92
318	2012	5	22	Carrera	10:30	2,75	115	41,8	115,0	155	136,3	96,3	426	13,8	192	12
319	Volver a portada			RESUMEN SEMANA		13,5	492	34,9	492,0	134	96	62	1876	37		
320	2012	5	23	Carretera	11:30	1	32	32,0	32,0	113			113	1,0	127	19
321	2012	5	24	Descanso							78,8	55,7				
322	2012	5	25	Descanso							102,6	72,5				
323	2012	5	26	Carretera	11:00	1,5	47	31,3	47,0	121	111,4	78,7	182	1,5	137	29
324	2012	5	27	Carretera	11:00	1,5	45	30,0	45,0	121	139,8	98,8	182	1,5	142	31
325	2012	5	28	Carretera	11:00	1	30	30,0	30,0	117	127,6	90,2	117	1,0	140	21
326	2012	5	29	Descanso												

PORTADA | Plan 2011-12 | Microciclos | "Caja Negra" 11-12 | GRÁFICAS EVOLUCIÓN | TRAINING ZONES | ANTI

Listo 100%

"THE BLACK BOX" OF THE AEROPLANE



Inicio | Insertar | Diseño de página | Fórmulas | Datos | Revisar | Vista

Advertencia de seguridad Se ha deshabilitado la actualización automática de los vínculos Opciones...

A1 AÑO

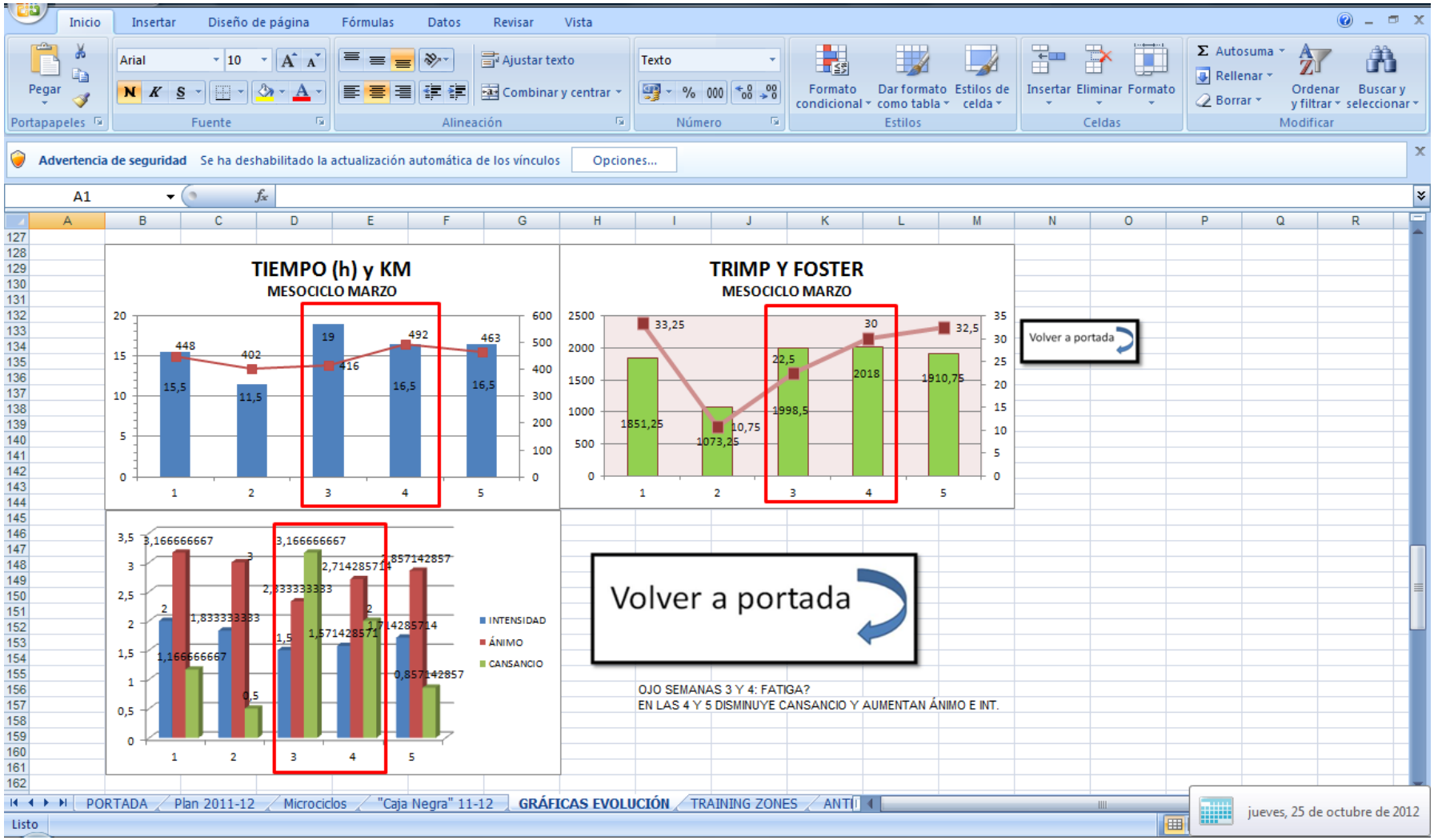
	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
1	INTENSIDAD	ÁNIMO	CANSANCIO	H SUEÑO	CALIDAD SUEÑO	DESPERTAR	FC MAÑANA	PESO MAÑANA	SIESTA	RECORRIDO (APROX)
305	2	3	1	8	2	2	36	65,3	NO	Puerto de el Cuzna, El Guijo,Torrecampo,P
306	1	3	1	9	3	3	37	65	NO	El Guijo,Dos torres,El viso,Pozoblar
307	1	4	0	7	3	2	38	65,1	NO	Cruce del Guijo,Dos torres,El viso,Pozo
308	1	3	0	8	3	4	37	65	NO	Hinojosa,El viso,Pozoblanco
309	1	2	1	6	2	2	38	65,2	NO	Entrenamiento en Beasain
310	5	4	0	7	2	3	37		NO	Carrera Beasain
311	1,71	3,14	0,71	7,71	2,57	2,86	37,29	65,18		
312	1	2	3	7	3	4	37	65,4	NO	El guijo,Pozoblanco
313	1	3	1	8	3	4	36	65,2	NO	Alcaracejos,El viso,Hinojosa,Pozobla
314	1	3	0	8	4	2	36	65,2	NO	Cruce del guijo,El viso,Alcaracejos,Pozo
315	1	2	1	9	3	2	35	65,3	NO	Puerto del Cuzna,Circunvalacion,Pozob
316	1	2	0	9	4	2	37	65,2	NO	El guijo,Pozoblanco
317	5	3	0	7	2	2	39		NO	1 etapa Vuelta a Sevilla
318	5	3	2	6	2	2	36		SI	2 etapa Vuelta a Sevilla
319	2,14	2,57	1,00	7,71	3,00	2,57	36,57	65,26		
320	1	2	3	7	2	3	38	66,4	SI	El guijo,Pozoblanco
321			1	9	3	4	36	66,3	SI	
322			0	8	4	2	36	66,4	NO	
323	1	3	0	9	3	4	37	66,3		Cruce del Guijo,Dos torres,El viso,Pozo
324	1	4	0	9	4	3	36	66,2	NO	El viso,Villaralto,Alcaracejos,Pozobla
325	1	3	0	9	3	4	35	66,4	SI	El viso,Alcaracejos,Pozoblanco
326			0	8	4	4	37	66,4	SI	

PORTADA | Plan 2011-12 | Microciclos | "Caja Negra" 11-12 | GRÁFICAS EVOLUCIÓN | TRAINING ZONES | ANTI

Listo

jueves, 25 de octubre de 2012

“THE BLACK BOX” OF THE AEROPLANE



“THE BLACK BOX” OF THE AEROPLANE

ZONA	%UPF W	RPE CR10	PRO % FC UPF		DESCRIPCIÓN
Z1: REC ACTIVA	<55	<2	<68		RODAJE FÁCIL, CAD LIGERA, DESARROLLOS LIGEROS, SOLTAR, CONVERSACIÓN
Z2: FONDO	56-75	2-3	69-83		LARGA DISTANCIA, RITMO GENERAL BAJO, “MARCHETA”, PUEDO HABLAR
Z3: RITMO	76-90	3-4	84-94		FARTLEK, CONCENTRADO, RITMO, CAMBIOS RITMO, NO APETECE CHARLAR PERO PUEDO HABLAR
Z4: UMBRAL	91-105	4-5	95-105		“IR CON ELGANCHO”, NO PUEDO HABLAR CÓMODO
Z5: VO_{2max}	106-120	6-7	>106		INTERVALOS DE 3’ A 8’, NO PUEDO HABLAR
Z6: CAPAC ACIDOTICA	121-150	>7	NS		INTERVALOS DE 30” A 3’, NO PUEDO HABLAR, “SABOR A SANGRE”
Z7: ESPECIAL	NS	NS	NS		SERIES DE POTENCIA MAX, ARRANCADAS SALIDA PARADA “A ROMPER”, CADENCIA MUY BAJA

VOLVER A PORTADA

DICIEMBRE

UPF xx/xx/xxxx (w)

FC UPF xx/xx/xxxx (ppm)

	POT INF	POT SUP	FC INF	FC SUP
Z1: REC ACTIVA	0	0	0	0
Z2: FONDO	0	0	0	0
Z3: RITMO	0	0	0	0
Z4: UMBRAL	0	0	0	0
Z5: VO_{2max}	0	0	0	MAX
Z6: CAPAC ACIDOTICA	0	0	NS	NS
Z7: ESPECIAL			NS	NS

VOLVER A PORTADA

ENERO

UPF 22/01/2012 (w) 346

FC UPF 22/01/2012 (ppm 175

Obervaciones:

Sesión equipo Juniors 364 WATTS EN 20' NIVEL PRO NAC.

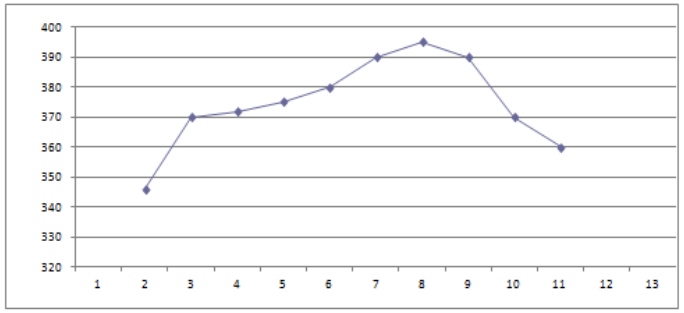
380 TEST 1CABRA

	POT INF	POT SUP	FC INF	FC SUP
Z1: REC ACTIVA	0	190	47	119
Z2: FONDO	190	260	119	145
Z3: RITMO	260	311	145	165
Z4: UMBRAL	311	363	165	184
Z5: VO_{2max}	363	415	184	MAX
Z6: CAPAC ACIDOTICA	415	519	NS	NS

OBSERVACIONES PRE 2011-2012

VOLVER A PORTADA

EVOLUCIÓN UPF A LO LARGO DE LA TEMPORADA

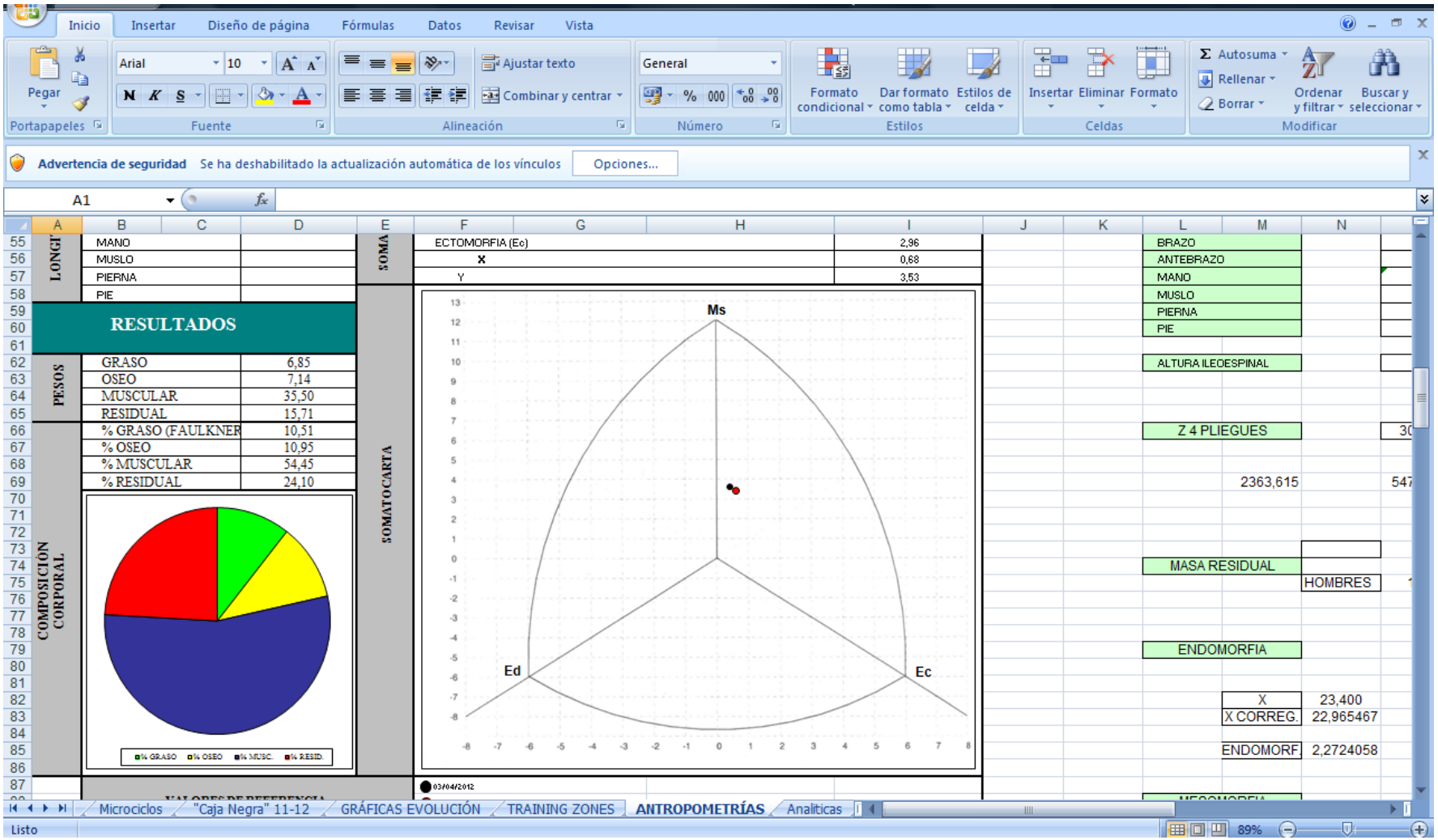


PORTADA | Plan 2011-12 | Microciclos | "Caja Negra" 11-12 | GRÁFICAS EVOLUCIÓN | TRAINING ZONES | ANTI

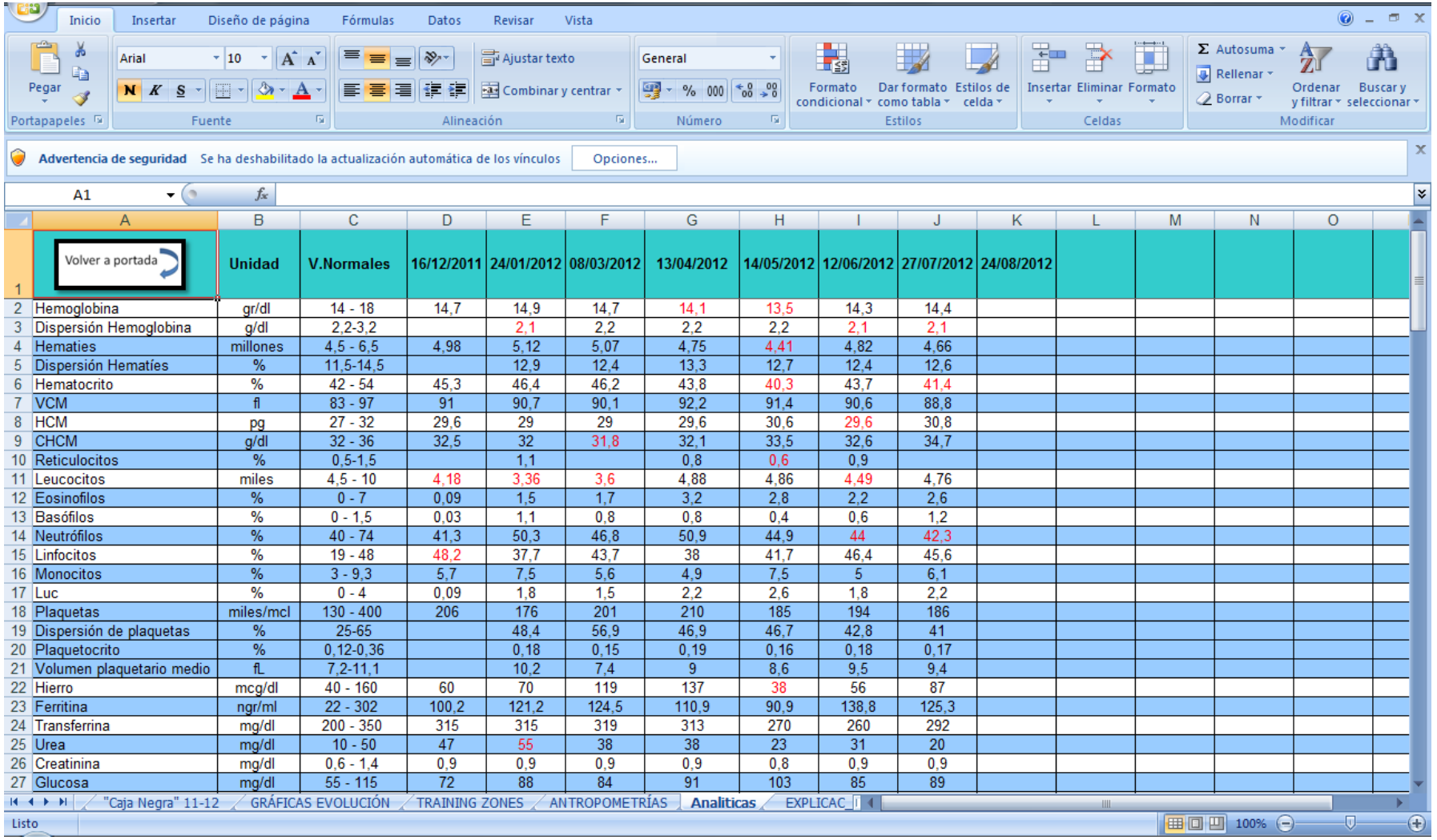
Listo

70%

“THE BLACK BOX” OF THE AEROPLANE



“THE BLACK BOX” OF THE AEROPLANE



Inicio | Insertar | Diseño de página | Fórmulas | Datos | Revisar | Vista

Advertencia de seguridad Se ha deshabilitado la actualización automática de los vínculos Opciones...

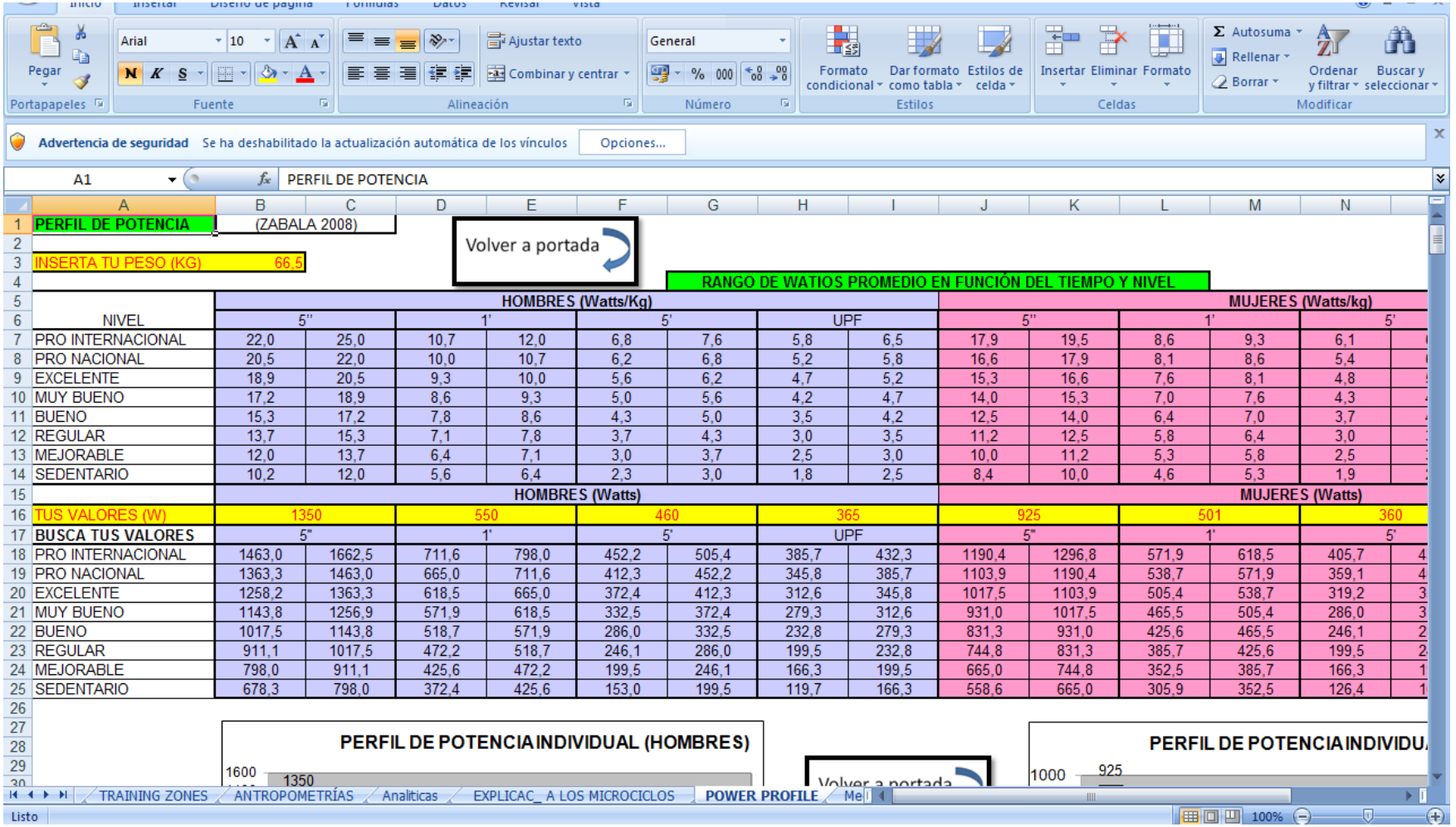
A1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Volver a portada	Unidad	V.Normales	16/12/2011	24/01/2012	08/03/2012	13/04/2012	14/05/2012	12/06/2012	27/07/2012	24/08/2012				
2	Hemoglobina	gr/dl	14 - 18	14,7	14,9	14,7	14,1	13,5	14,3	14,4					
3	Dispersión Hemoglobina	g/dl	2,2-3,2		2,1	2,2	2,2	2,2	2,1	2,1					
4	Hematies	millones	4,5 - 6,5	4,98	5,12	5,07	4,75	4,41	4,82	4,66					
5	Dispersión Hematíes	%	11,5-14,5		12,9	12,4	13,3	12,7	12,4	12,6					
6	Hematocrito	%	42 - 54	45,3	46,4	46,2	43,8	40,3	43,7	41,4					
7	VCM	fl	83 - 97	91	90,7	90,1	92,2	91,4	90,6	88,8					
8	HCM	pg	27 - 32	29,6	29	29	29,6	30,6	29,6	30,8					
9	CHCM	g/dl	32 - 36	32,5	32	31,8	32,1	33,5	32,6	34,7					
10	Reticulocitos	%	0,5-1,5		1,1		0,8	0,6	0,9						
11	Leucocitos	miles	4,5 - 10	4,18	3,36	3,6	4,88	4,86	4,49	4,76					
12	Eosinofilos	%	0 - 7	0,09	1,5	1,7	3,2	2,8	2,2	2,6					
13	Basófilos	%	0 - 1,5	0,03	1,1	0,8	0,8	0,4	0,6	1,2					
14	Neutrófilos	%	40 - 74	41,3	50,3	46,8	50,9	44,9	44	42,3					
15	Linfocitos	%	19 - 48	48,2	37,7	43,7	38	41,7	46,4	45,6					
16	Monocitos	%	3 - 9,3	5,7	7,5	5,6	4,9	7,5	5	6,1					
17	Luc	%	0 - 4	0,09	1,8	1,5	2,2	2,6	1,8	2,2					
18	Plaquetas	miles/mcl	130 - 400	206	176	201	210	185	194	186					
19	Dispersión de plaquetas	%	25-65		48,4	56,9	46,9	46,7	42,8	41					
20	Plaquetocrito	%	0,12-0,36		0,18	0,15	0,19	0,16	0,18	0,17					
21	Volumen plaquetario medio	fL	7,2-11,1		10,2	7,4	9	8,6	9,5	9,4					
22	Hierro	mcg/dl	40 - 160	60	70	119	137	38	56	87					
23	Ferritina	ngr/ml	22 - 302	100,2	121,2	124,5	110,9	90,9	138,8	125,3					
24	Transferrina	mg/dl	200 - 350	315	315	319	313	270	260	292					
25	Urea	mg/dl	10 - 50	47	55	38	38	23	31	20					
26	Creatinina	mg/dl	0,6 - 1,4	0,9	0,9	0,9	0,9	0,8	0,9	0,9					
27	Glucosa	mg/dl	55 - 115	72	88	84	91	103	85	89					

"Caja Negra" 11-12 | GRÁFICAS EVOLUCIÓN | TRAINING ZONES | ANTROPOMETRÍAS | Analiticas | EXPLICAC

Listo 100%

“THE BLACK BOX” OF THE AEROPLANE



Advertencia de seguridad Se ha deshabilitado la actualización automática de los vínculos Opciones...

A1 PERFIL DE POTENCIA

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	PERFIL DE POTENCIA	(ZABALA 2008)												
2														
3	INSERTA TU PESO (KG)	66,5												
4														
5		HOMBRES (Watts/Kg)								MUJERES (Watts/kg)				
6	NIVEL	5''		1'		5'		UPF		5''		1'		5'
7	PRO INTERNACIONAL	22,0	25,0	10,7	12,0	6,8	7,6	5,8	6,5	17,9	19,5	8,6	9,3	6,1
8	PRO NACIONAL	20,5	22,0	10,0	10,7	6,2	6,8	5,2	5,8	16,6	17,9	8,1	8,6	5,4
9	EXCELENTE	18,9	20,5	9,3	10,0	5,6	6,2	4,7	5,2	15,3	16,6	7,6	8,1	4,8
10	MUY BUENO	17,2	18,9	8,6	9,3	5,0	5,6	4,2	4,7	14,0	15,3	7,0	7,6	4,3
11	BUENO	15,3	17,2	7,8	8,6	4,3	5,0	3,5	4,2	12,5	14,0	6,4	7,0	3,7
12	REGULAR	13,7	15,3	7,1	7,8	3,7	4,3	3,0	3,5	11,2	12,5	5,8	6,4	3,0
13	MEJORABLE	12,0	13,7	6,4	7,1	3,0	3,7	2,5	3,0	10,0	11,2	5,3	5,8	2,5
14	SEDENTARIO	10,2	12,0	5,6	6,4	2,3	3,0	1,8	2,5	8,4	10,0	4,6	5,3	1,9
15		HOMBRES (Watts)								MUJERES (Watts)				
16	TUS VALORES (W)	1350		550		460		365		925		501		360
17	BUSCA TUS VALORES	5"		1'		5'		UPF		5"		1'		5'
18	PRO INTERNACIONAL	1463,0	1662,5	711,6	798,0	452,2	505,4	385,7	432,3	1190,4	1296,8	571,9	618,5	405,7
19	PRO NACIONAL	1363,3	1463,0	665,0	711,6	412,3	452,2	345,8	385,7	1103,9	1190,4	538,7	571,9	359,1
20	EXCELENTE	1258,2	1363,3	618,5	665,0	372,4	412,3	312,6	345,8	1017,5	1103,9	505,4	538,7	319,2
21	MUY BUENO	1143,8	1256,9	571,9	618,5	332,5	372,4	279,3	312,6	931,0	1017,5	465,5	505,4	286,0
22	BUENO	1017,5	1143,8	518,7	571,9	286,0	332,5	232,8	279,3	831,3	931,0	425,6	465,5	246,1
23	REGULAR	911,1	1017,5	472,2	518,7	246,1	286,0	199,5	232,8	744,8	831,3	385,7	425,6	199,5
24	MEJORABLE	798,0	911,1	425,6	472,2	199,5	246,1	166,3	199,5	665,0	744,8	352,5	385,7	166,3
25	SEDENTARIO	678,3	798,0	372,4	425,6	153,0	199,5	119,7	166,3	558,6	665,0	305,9	352,5	126,4

Volver a portada

RANGO DE WATIOS PROMEDIO EN FUNCIÓN DEL TIEMPO Y NIVEL

PERFIL DE POTENCIA INDIVIDUAL (HOMBRES)

1600 1350

PERFIL DE POTENCIA INDIVIDU

1000 925

Volver a portada

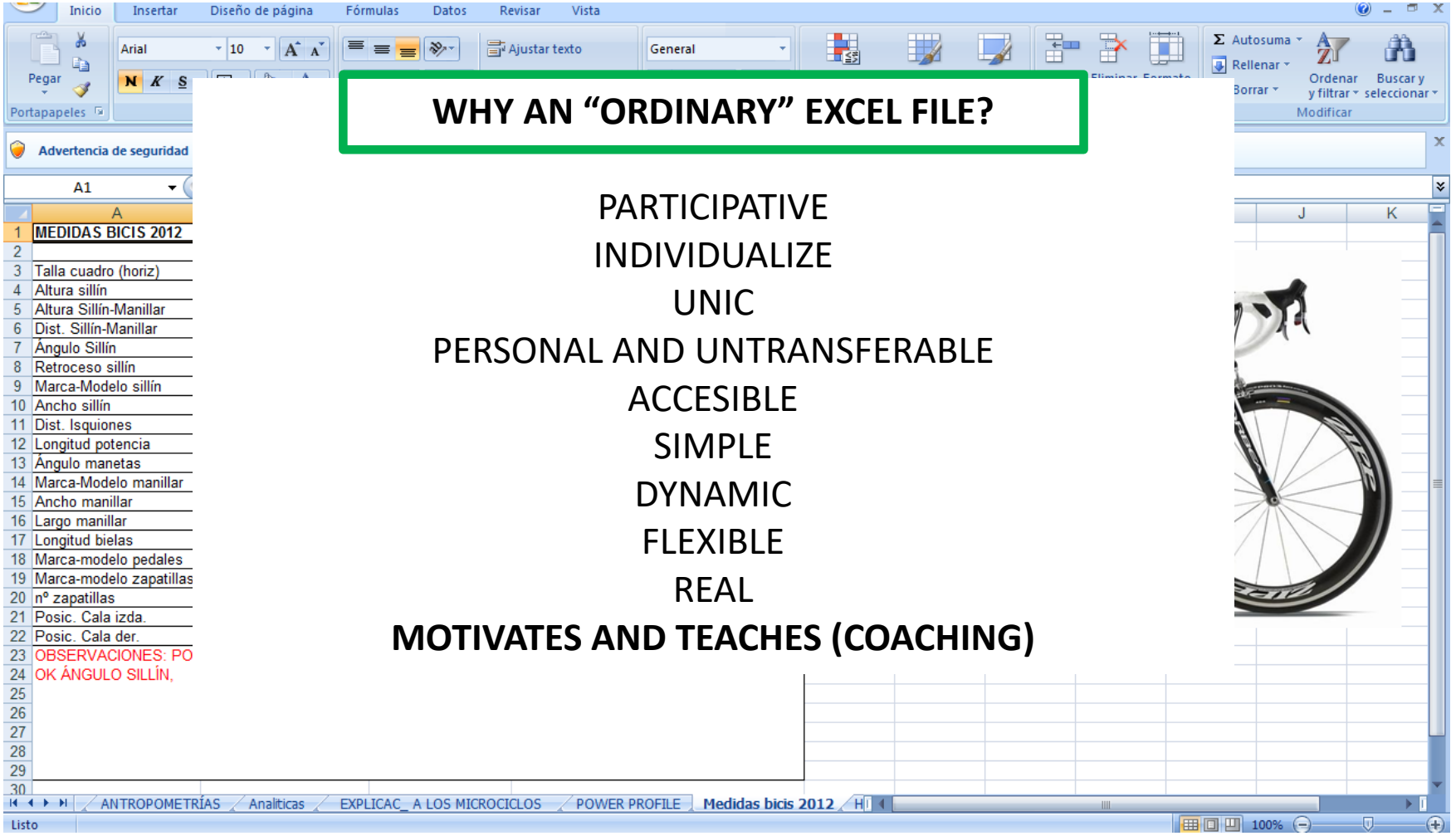
TRAINING ZONES | ANTROPOMETRÍAS | Analiticas | EXPLICAC_ A LOS MICROCICLOS | POWER PROFILE | Me

Listo 100%

“THE BLACK BOX” OF THE AEROPLANE

	A	B	C	D
1	MEDIDAS BICIS 2012			VOLVER A PORTADA
2		Orbea 2012	Cervélo R5 2011	Isaac Crono 2011-2012
3	Talla cuadro (horiz)	53	54	54
4	Altura sillín	72,2	72,2	72,3
5	Altura Sillín-Manillar	5,3	5,3	9,8 / 5,9
6	Dist. Sillín-Manillar	55,4	55,4	53,3 (a potencia) / 75,2 (a agarre de mano)
7	Ángulo Sillín	0,4	0,4	0,4
8	Retroceso sillín	6,8	6,8	3,4
9	Marca-Modelo sillín	Rotor S3X Road	Rotor S3X Road	Fizik Arione
10	Ancho sillín	143	130	130
11	Dist. Isquiones	13	13	13
12	Longitud potencia	110	110	120
13	Ángulo manetas	OK	OK	OK
14	Marca-Modelo manillar	Bontrager VR	Bontrager VR	Oval alu
15	Ancho manillar	42	42	40 tot / 21 apoyabrazos / 9,3 agarre manos
16	Largo manillar	OK	OK	OK
17	Longitud bielas	172,5	172,5	172,5
18	Marca-modelo pedales	LOOK KÉO	LOOK KÉO	LOOK KÉO
19	Marca-modelo zapatillas	BONT VAYPOR	BONT VAYPOR	BONT VAYPOR
20	nº zapatillas	43	43	43
21	Posic. Cala izda.	OK	OK	OK
22	Posic. Cala der.	OK	OK	OK
23	OBSERVACIONES: PONER SILLÍN DE 140, OK LONG BIELAS, OK ANCHO MANILLAR, OK ÁNGULO MANETAS,			
24	OK ÁNGULO SILLÍN,			

"THE BLACK BOX" OF THE AEROPLANE

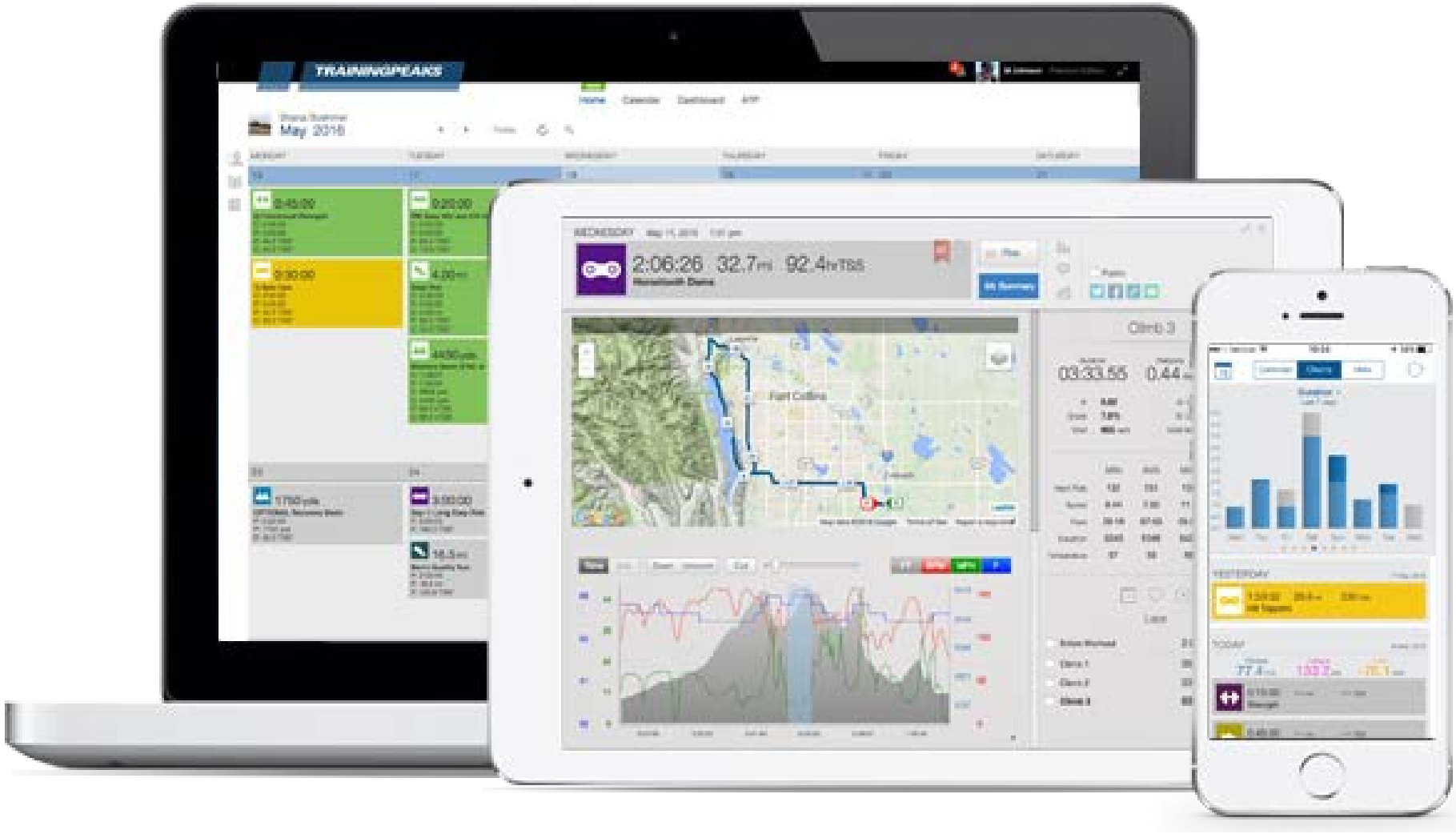


WHY AN "ORDINARY" EXCEL FILE?

PARTICIPATIVE
INDIVIDUALIZE
UNIC
PERSONAL AND UNTRANSFERABLE
ACCESIBLE
SIMPLE
DYNAMIC
FLEXIBLE
REAL

MOTIVATES AND TEACHES (COACHING)

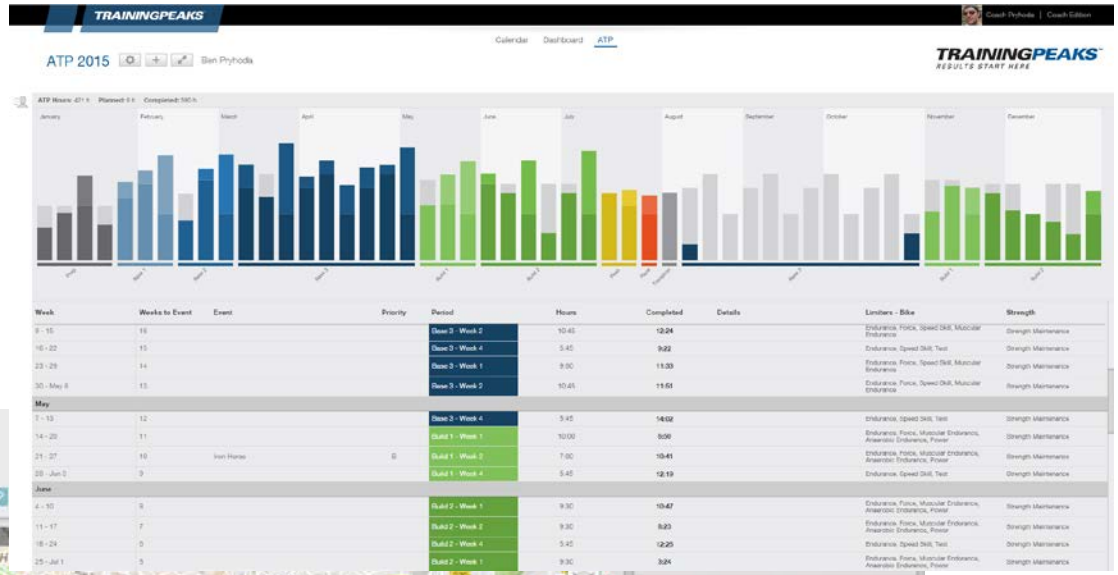
NOWADAYS… HOW CAN WE WORK? TOOLS TO FACILITATE PERFORMANCE ANALYSIS

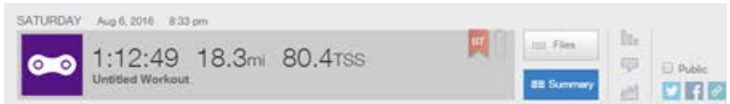


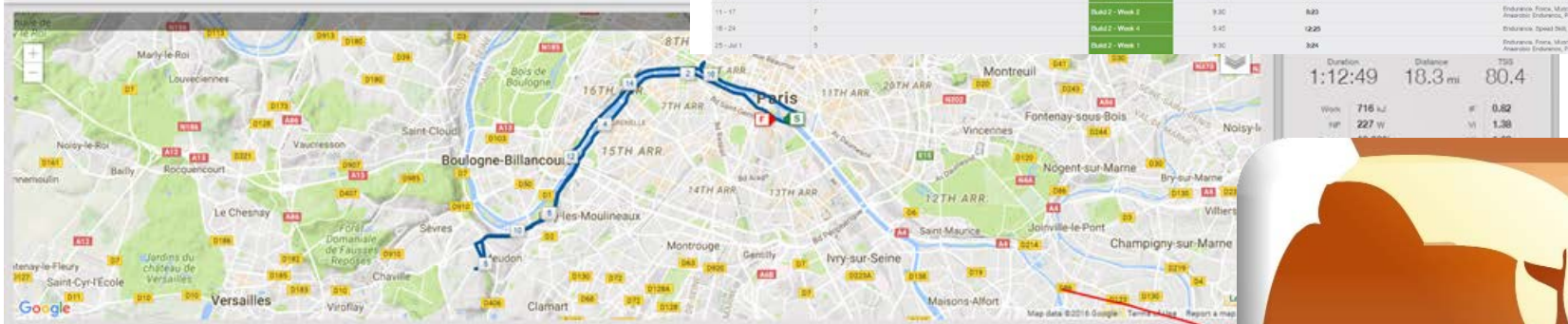
Coaches' tools…

TRAINING PEAKS

WKO

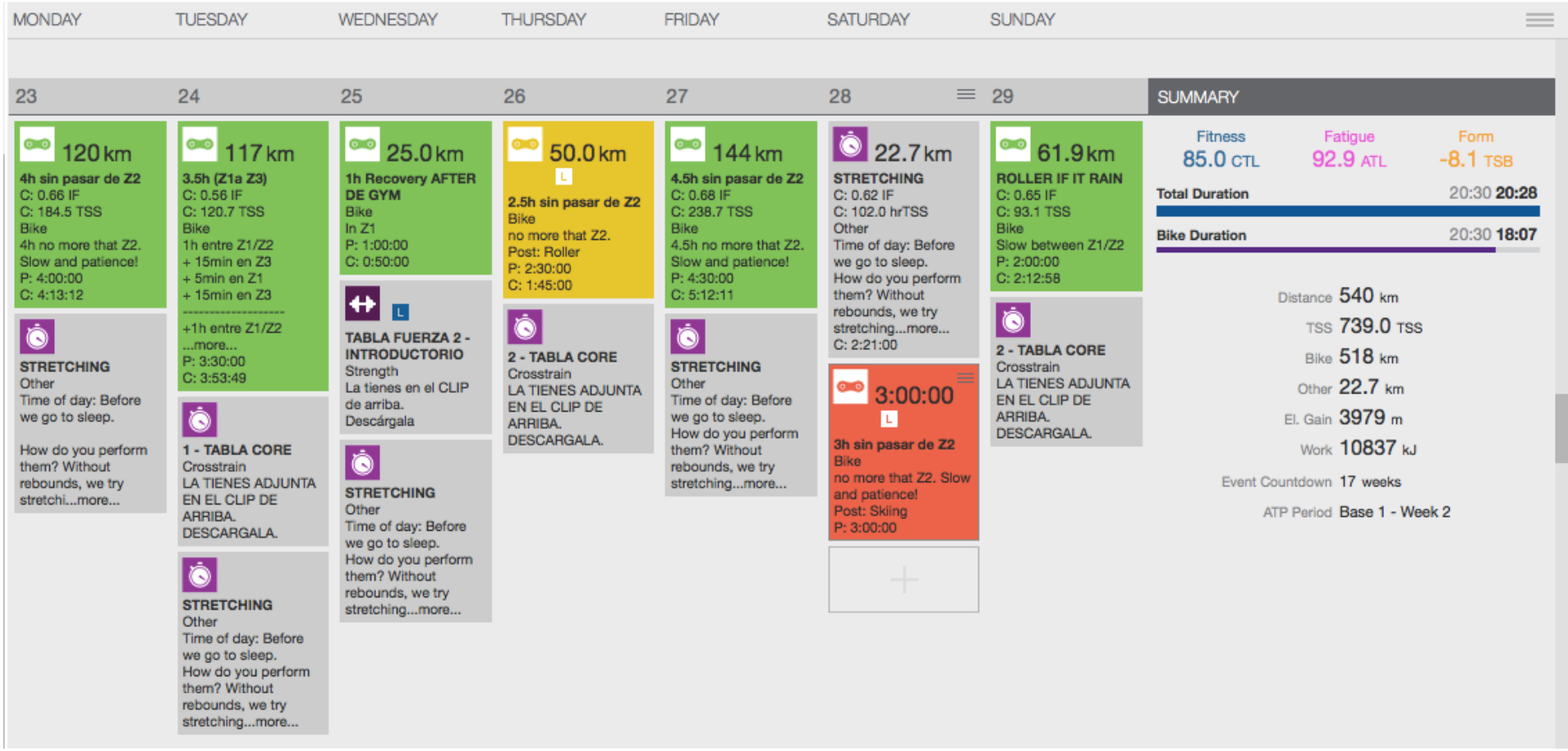






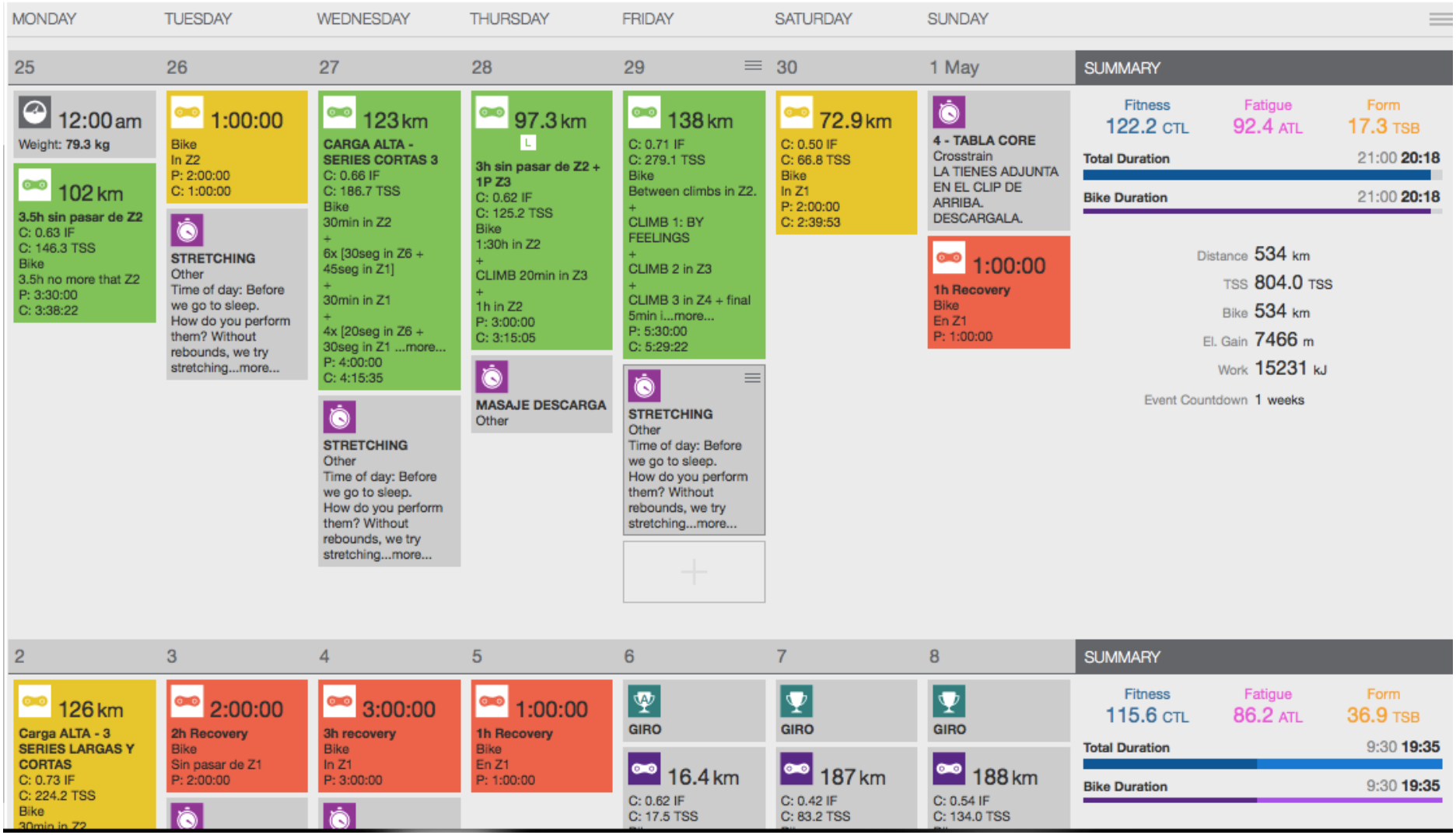
EXAMPLES

✓ PRE-SEASON



EXAMPLES

✓ SEASON



DATA ANALYSIS

Fleche Wallone

DATA ANALYSIS

Fleche Wallone

Totals		Avg		Max		Metrics	
Duration:	5:16:45	Cyclist's weight (kg):	64.00	Speed (km/h):	83.9	xPower (Watts):	150
Time pedalling:	5:14:07	Speed (km/h):	39.4	Power (vatios):	977	Relative intensity:	0.375
Distance (km):	206.10	power (watts):	117	HR (ppm):	0	BikeScore™:	148
Work (kJ):	4422	HR (ppm):	0	Cadence (rpm):	250	Daniels Score:	21
Work W' (kJ):	273	Cadence (rpm):	87	Max W' used (%):	106	Equivalent Daniels power (vatios):	179
Altitude gain (meters):	3999.269	Temperature (C):	6.4	Temp (C):	16.0	TRIMP:	0
						Aerobic decoupling (%):	0.0
						NP (watts):	156
						Power (watts):	117
						Power no ceros (vatios):	279

DATA ANALYSIS

Fleche Wallone

Power Zones

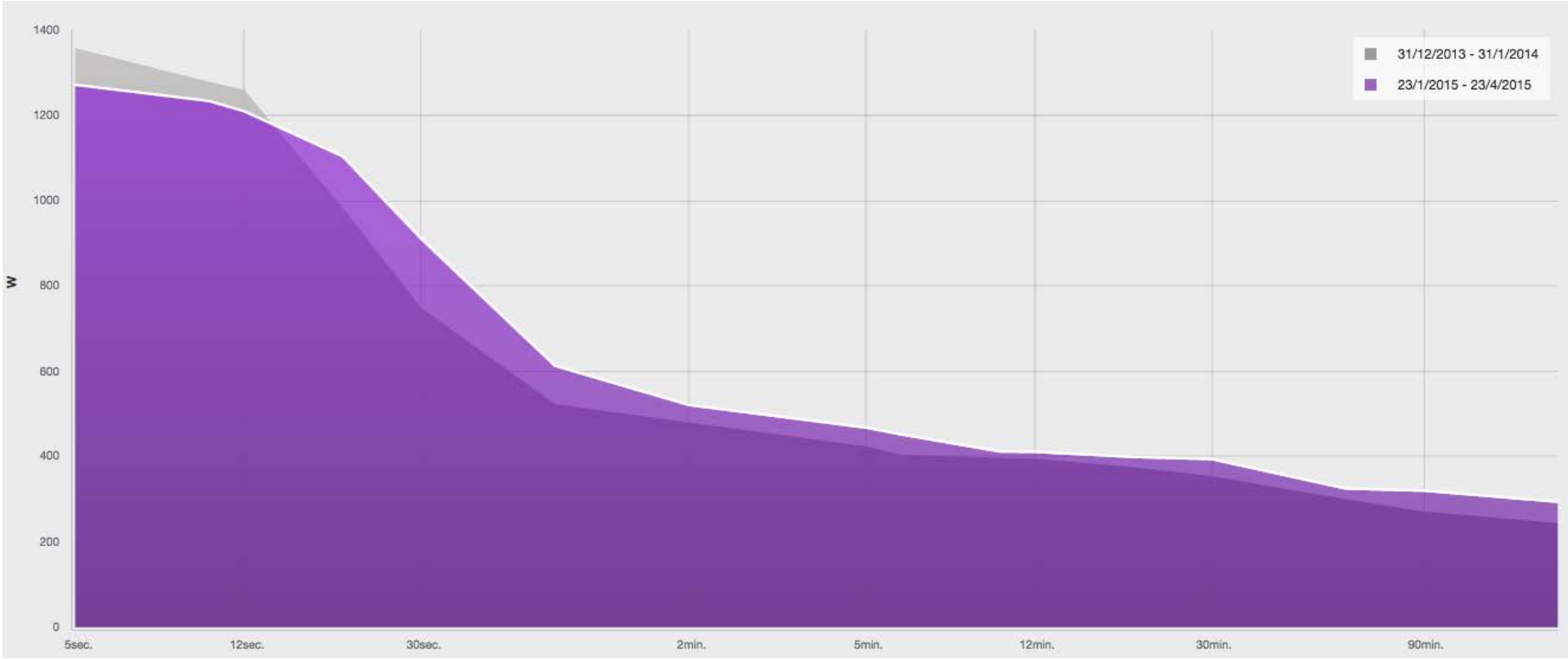
CP (watts): 400

Zone	Description	Lower (watts)	Upper (watts)	Time
Z1	Recuperación Activa	0	220	7:37:05
Z2	Resistencia	220	300	56:15:00
Z3	Tempo	300	360	44:22:00
Z4	Umbral	360	420	31:19:00
Z5	VO2Max	420	480	19:11
Z6	Anaeróbico	480	600	14:17
Z7	Neuromuscular	600	MAX	5:58

POWER PROFILE

Best W values in 5’’, 1’ y 5, and 20’ (60’), CRITICAL POWER

Many times best values are taken from competitions. Profile Will be updated.



POWER PROFILE

PERFORMANCE MANAGER

BASED ON IMPULSE-RESPONSE MODEL…

WKO+:
TRAINING STRESS BALANCE (TSB) = CHRONIC TRAINING LOAD (CTL) – ACUTE TRAINING LOAD (ATL)

CTL & ATL ARE CALCULATED BY MEANS OS TSS, USING LONG ANS SHORT PERIODS OF TIME, RECTIVELY

IMPACT OF THE PAST 42 DAYS (?) AND 7 DAYS, FOR CL AND ATL RESPECTIVELY

-CTL: HOW YOU HAVE WORKED THE PAST MONTH

-ATL: HOW YOU HAVE WORKED THE PAST DAYS

HIGH VALUE: A LOT OF WORK, YOU MAY NEED REST

YOUR FITNESS STATUS DEPENDS ON THIS RELATIONSHIP

WKO+ DOES NOT PRETEND TO PREDICT FUTURE, IT JUST SHOWS FITNESS STATUS INDIVIDUALLY TO BE RELATED WITH PERFORMANCE

IT IS A PERFORMANCE MANAGER, NOT A PREDICTOR OF PERFORMANCE, BUT USING CONTINUOSLY MAY BE USEFUL TO PREDICT PERFORMANCE

e.g. HIGH ATL COULD BE RELATED TO OVERREACHING; CONSTANT CTL FOR A LONG TIME IS RELATED TO A WORK STAGNATION

THIS MAY BE USED INDIVIDUALLY!

OTHER IDEAS:

1. **NORMALIZED HEART RATE**
2. **“Z INDEX”**

18th annual Congress of the
EUROPEAN COLLEGE OF SPORT SCIENCE
UNIFYING SPORT SCIENCE
26th - 29th June 2013, Barcelona - Spain
Hosted by the National Institute of Physical Education of Catalonia (INEFC)

NORMALIZED HEART RATE: A NEW CONCEPT TO BETTER SUMMARIZE EXERCISE INTENSITY AFTER TRAINING SESSIONS

Zabala, M.[1,2] Morente-Sánchez, J.[1]& Mateo-March, M.[2,3]

[1] *Faculty of Sport Sciences, University of Granada (Spain)*
[2] *Spanish Cycling Federation, Madrid (Spain)*
[3] *University Miguel Hernández, Elche (Spain)*

Introduction

Heart Rate is a one of the most common used variables to describe exercise intensity, while some other variables have been used as e.g. time/distance, watts, etc. Some years ago a new concept was developed to better describe what happened after a cycling workout: the so-called Normalized Power [1], which pretends to better describe the variation in wattage during a workout to get a more representative value of the session rather than the average value that can not reflect any variation itself. So, e.g. the same value of 150 ppm does not mean the same objective or work developed, because it could be reached after continuous constant intensity (low variation), or after interval-series training (high variation). So, the aim of the study was to propose the use of normalized Heart Rate (HR_{α}) instead of the average HR (HR_{avg}) to better describe exercise intensity as a summary of a training session.

Methods

Twelve under-23 elite road cyclists (mean age: 19.67±1.12 years) participated in the study. Training was monitored during 20±2 training sessions measuring HR (Polar RS800). Then HR_{α} was calculated following 4 steps: 1) to get an average mobile value of 30 seconds from the original HR data in a new column, 2) to raise to the power of four of the previous column in a new one, 3) to get the average value of the previous column, and 4) to get the fourth root of the previous value. Descriptive and correlation statistics was carried out.

Results

Values of HR_{avg} and HR_{α} were calculated for each session that were divided into a) Continuous, and b) interval-series sessions. The respective values for HR_{avg} and HR_{α} were 138.4±10.8 vs. 143±10.2 ppm for a), and 139.5±33.3 vs. 150±11.3 ppm for b). The correlations between HR_{avg} and HR_{α} were r=0.89 in a), and r=0.50 for b), but there was no correlation when relating HR_{avg} and HR_{α} of all the sessions -a) and b)-.

Discussion

HR_{avg} does not discriminate how we have reached this value after a training session, so if we cannot see all the HR data we cannot know accurately which kind of exercise intensity has been developed. The same value of HR_{avg} can be reached by means of completely different training stimulus. On the other hand, HR_{α} shows another aspect that represents much better the type of exercise developed. This is why in a) the differences between HR_{avg} and HR_{α} are small and there is a significant correlation, while in b) the difference between HR_{avg} and HR_{α} is important and the correlation is low. So, we suggest the use of HR_{α} as a better summary of training intensity and, more important, to use this value instead of HR_{avg} to get the training load using TRIMP.

References

1. Allen H & Coggan A. 2006 Velopress.

18th annual Congress of the
EUROPEAN COLLEGE OF SPORT SCIENCE
UNIFYING SPORT SCIENCE
26th - 29th June 2013, Barcelona - Spain
Hosted by the National Institute of Physical Education of Catalonia (INEFC)

A NEW WAY TO QUANTIFY TRAINING LOAD IN SPORT: THE "Z-INDEX"

Zabala, M.[1,2] & Morente-Sánchez, J.[1]

[1] *Faculty of Sport Sciences, University of Granada (Spain)*
[2] *Spanish Cycling Federation, Madrid (Spain)*

Introduction

Training load is an important issue related to adequately apply the optimum stimulus to get the best work-recovery relationship to improve performance. In some middle-long distance sports like cycling or running, some indexes in relation to the time spent working are used as Heart Rate (TRIMP) [1], RPE (Foster) [2], relative Power output in cycling (TSS -Training Stress Score-) [3], or Time/km in running (multiplying them by time in minutes or seconds). The aim of this study was to integrate those indexes that describe the same event from different but complementary perspectives (physiological, physical, and perceptual perspectives) to create a more complete index of training load.

Methods

Twelve under-23 elite road cyclists, and 14 recreational triathletes, (mean age: 19.67±1.12 years, and 27.67±3.12 years, respectively) participated in the study. Training was monitored during a total of 20±2 training sessions measuring TRIMP, Foster, and TSS or time/km x min. Then a new score was got weighting each value in a scale from 0-10 (Log10) and then getting the average of the indexes multiplied by 10 to get a final score in %: for cyclists, the so-called "Z-Index"=[(log10 of TRIMP + log10 of Foster + log10 of TSS)/3*10], and for runners, "Z-Index"=[(log10 of TRIMP + log10 of Foster + log10 of (Time/km x min))/3*10]. Descriptive and correlation statistics was carried out.

Results

Values in % of daily, weekly or monthly training loads were calculated in relation to the training plan and sessions. The relation of the subjective plan and the later training load showed that sometimes the proposed training load was less or more than the one measured after the workouts (10 to 20% difference, correlation of r=0,80**). When relating the different conventional indexes to the Z-index, significant and high correlations were found in cycling (r=0.75** for TRIMP, r=0.79** for Foster, r=0.81** for TSS), and running (r=0.80** for TRIMP, r=0.79** for Foster, r=0.80** for km/time x min). All the athletes stated that the new index was "easy, useful, and practical".

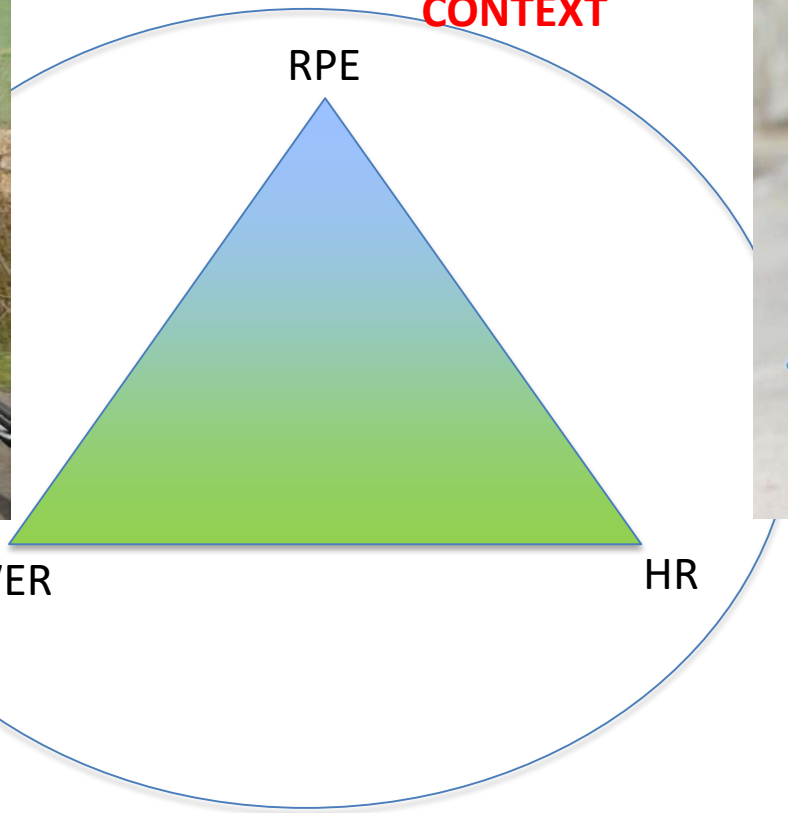
Discussion

Z-index is a very easy to understand value calculated taking into account the most feasible indexes that can be got from training using specific variables for each sport -cycling or running-and that could be used in Swimming adapting the formula from running but using the specific units (e.g. time in seconds / 25-50-100m). This index can be someway elitist, but there are many athletes nowadays that can afford GPS devices, powermeters, or just a chronometer. More research is needed to validate and develop the original formula.

References

1. Manzi V. et al. *Am J Physiol Heart Circ Physiol* 2009: 296, H1733–40.
2. Foster C. *Med Sci Sport Exerc* 1998 Jul 30(7): 1164-8.
3. Allen H & Coggan A. 2006 Velopress.

TODAY… THE TRIANGLE OF TRAINING LOAD AND FATIGUE



NEXT… MUSCLE OXYGEN & GLYCOGEN??? NIRS TECH

AVG-HR VS AVG-POW & AVG-POW VS NP

TRIMP VS TSS

		TMIN	TSEG	FCPRO	POTMED	POTNORM	WINT	POTMED_T	POTNORM_T	FI	IEEavg	IEEnorm
TMIN	Correlación de Pearson	1	1,000**	-,486**	-,213	,061	,986**	,907**	,894**	,059	,659**	,642**
	Sig. (bilateral)		,000	,002	,205	,720	,000	,000	,000	,730	,000	,000
	N	37	37	37	37	37	37	37	37	37	37	37
TSEG	Correlación de Pearson	1,000**	1	-,486**	-,213	,061	,986**	,907**	,894**	,059	,659**	,642**
	Sig. (bilateral)	,000		,002	,205	,720	,000	,000	,000	,730	,000	,000
	N	37	37	37	37	37	37	37	37	37	37	37
FCPRO	Correlación de Pearson	-,486**	-,486**	1	**,738****	**,444***	-,355*	-,234	-,275	**,445****	,016	-,031
	Sig. (bilateral)	,002	,002		,000	,006	,031	,163	,099	,006	,924	,853
	N	37	37	37	37	37	37	37	37	37	37	37
POTMED	Correlación de Pearson	-,213	-,213	,738**	1	**,879****	-,089	,177	,168	**,880****	**,521****	**,487****
	Sig. (bilateral)	,205	,205	,000		,000	,599	,296	,320	,000	,001	,002
	N	37	37	37	37	37	37	37	37	37	37	37
POTNORM	Correlación de Pearson	,061	,061	,444**	,879**	1	,159	,415*	,467**	1,000**	,744**	,756**
	Sig. (bilateral)	,720	,720	,006	,000		,349	,011	,004	,000	,000	,000
	N	37	37	37	37	37	37	37	37	37	37	37
TRIMP	Correlación de Pearson	,986**	,986**	**-,355***	-,089	,159	1	**,948****	**,925****	,156	**,732****	**,704****
	Sig. (bilateral)	,000	,000	,031	,599	,349		,000	,000	,356	,000	,000
	N	37	37	37	37	37	37	37	37	37	37	37
POTMED_T	Correlación de Pearson	,907**	,907**	-,234	,177	,415*	,948**	1	**,985****	,414*	**,902****	**,874****
	Sig. (bilateral)	,000	,000	,163	,296	,011	,000		,000	,011	,000	,000
	N	37	37	37	37	37	37	37	37	37	37	37
POTNORM_T	Correlación de Pearson	,894**	,894**	-,275	,168	,467**	,925**	,985**	1	**,466****	**,920****	**,915****
	Sig. (bilateral)	,000	,000	,099	,320	,004	,000	,000		,004	,000	,000
	N	37	37	37	37	37	37	37	37	37	37	37
FI	Correlación de Pearson	,059	,059	,445**	,880**	1,000**	,156	,414*	,466**	1	,743**	,756**
	Sig. (bilateral)	,730	,730	,006	,000	,000	,356	,011	,004		,000	,000
	N	37	37	37	37	37	37	37	37	37	37	37
IEEavg	Correlación de Pearson	,659**	,659**	,016	,521**	,744**	,732**	,902**	,920**	,743**	1	**,990****
	Sig. (bilateral)	,000	,000	,924	,001	,000	,000	,000	,000	,000		,000
	N	37	37	37	37	37	37	37	37	37	37	37
IEEnorm	Correlación de Pearson	,642**	,642**	-,031	,487**	,756**	,704**	,874**	,915**	,756**	,990**	1
	Sig. (bilateral)	,000	,000	,853	,002	,000	,000	,000	,000	,000	,000	
	N	37	37	37	37	37	37	37	37	37	37	37

**. La correlación es significativa al nivel 0,01 (bilateral).

TRIMP VS (AVG-POW X TIME) & TRIMP VS (NP X TIME)

Journal of Sports Sciences

ISSN: 0264-0414 (Print) 1466-447X (Online) Journal homepage: http://www.tandfonline.com/loi/rjsp20

Analysing a cycling grand tour: Can we monitor fatigue with intensity or load ratios?

Dajo Sanders, Mathieu Heijboer, Matthijs K. C. Hesselink, Tony Myers & Ibrahim Akubat

ABSTRACT

This study evaluated the changes in ratios of different intensity (rating of perceived exertion; RPE, heart rate; HR, power output; PO) and load measures (session-RPE; sRPE, individualized TRIMP; iTRIMP, Training Stress Score™; TSS) in professional cyclists. RPE, PO and HR data was collected from twelve professional cyclists (VO_{2max} 75 ± 6 ml·min·kg^{-1}) during a two-week baseline training period and during two cycling Grand Tours. Subjective:objective intensity (RPE:HR, RPE:PO) and load (sRPE:iTRIMP, sRPE:TSS) ratios and external:internal intensity (PO:HR) and load (TSS:iTRIMP) ratios were calculated for every session. Moderate to large increases in the RPE:HR, RPE:PO and sRPE:TSS ratios (d = 0.79–1.79) and small increases in the PO:HR and sRPE:iTRIMP ratio (d = 0.21–0.41) were observed during Grand Tours compared to baseline training data. Differences in the TSS:iTRIMP ratio were trivial to small (d = 0.03–0.27). Small to moderate week-to-week changes (d = 0.21–0.63) in the PO:HR, RPE:PO, RPE:HR, TSS:iTRIMP, sRPE:iTRIMP and sRPE:TSS were observed during the Grand Tour. Concluding, this study shows the value of using ratios of intensity and load measures in monitoring cyclists. Increases in ratios could reflect progressive fatigue that is not readily detected by changes in solitary intensity/load measures.

Journal of Sports Sciences

ISSN: 0264-0414 (Print) 1466-447X (Online) Journal homepage: http://www.tandfonline.com/loi/rjsp20

Analysing a cycling grand tour: Can we monitor fatigue with intensity or load ratios?

Dajo Sanders, Mathieu Heijboer, Matthijs K. C. Hesselink, Tony Myers & Ibrahim Akubat

"This study shows the potential of an external:internal intensity (PO:HR) ratio, ratios between perceptual and physiological indicators of intensity (RPE:HR) and load (sRPE:iTRIMP) and ratios between perceptual and external intensity (RPE:PO) and load (sRPE:TSS) to monitor the fatigue state of cyclists"

Cycling Power Lab | CONTROVERSIA EN INGLÉS - B

https://www.cyclingpowerlab.com 90% YCLING POWER LAB

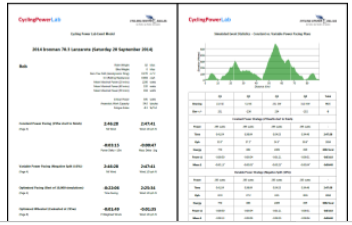
CyclingPowerLab Home Concepts Performance Modelling Gallery Blog Email Password Login Register

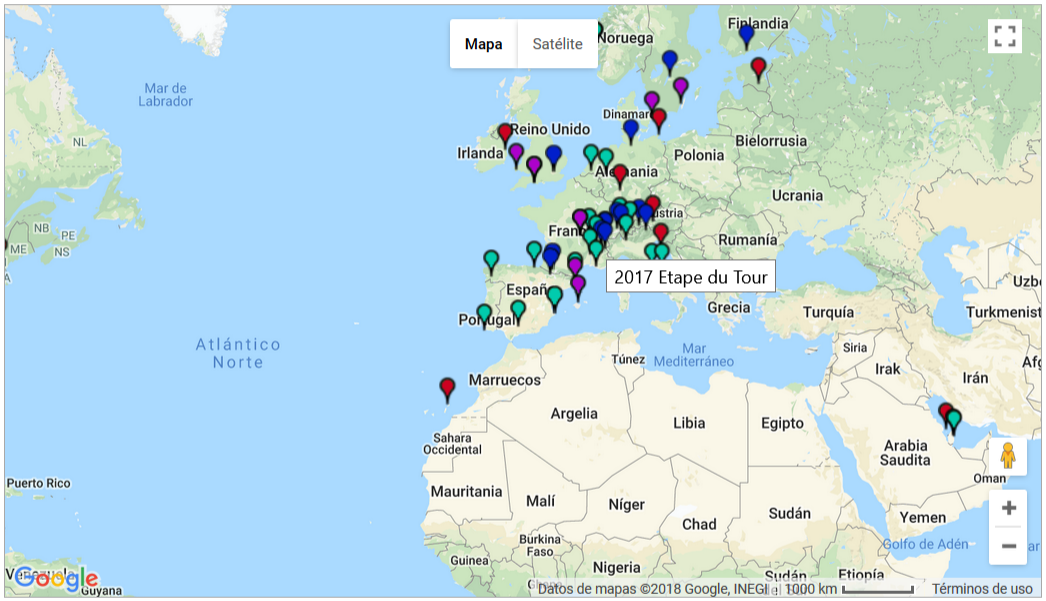
Cycling Power Lab lets coaches and athletes model ride performance in any bike race or triathlon

Our advanced ride analytics add real pre and post event intelligence to motivate your goals, optimise your racing, and empower your race analysis. All it takes is a power meter and the will to go faster.

Choose A Popular Event ...Or Create A New One

Simulate Performance With Pre-Event Modelling





70.3 Tri | Ironman Tri | Olympic Tri | Cyclo Sportive | Time Trial | World Tour

Forthcoming Events | **Past Events** | Create An Event

Name	Event Website	Date	Go To
2017 Worlds TT Elite Men	bergen2017.no	20/09/2017	Modelling
2017 Worlds TT Elite Women	bergen2017.no	19/09/2017	Modelling
2017 Tour de France Stage 20 TT	letour.fr	22/07/2017	Modelling
2017 Etape du Tour	letapedutour.com	16/07/2017	Modelling

SO:

WE CAN ACCESS A BIG AMOUNT OF DATA EASILY

WE CAN ANALYZE DATA IN A VERY PRECISE AND DEEP WAY

WE CAN RELATE TRAINING AND PERFORMANCE, EVEN PREDICTING PERFORMANCE IN THE FUTURE

WE WANT TO MAKE DATA-DRIVEN DECISSIONS RATHER THAN HEART-DRIVEN DECISSIONS

AND.. THIS IS WHY BIG-DATA ANALYSIS APPEARED FOR

Data Analysis in Professional road cycling

Why we promote a data-driven approach?

Competition's impact

- How many people went to see the "live" competition?
- What was the audience on TV?
- What happened in Social Media?

Team performance

- Design better tactical actions in competitions
- Monitor fatigue and optimize team work around the leaders

Individual performance

- Monitor training effectiveness
- (Re)Act on training variables and recovery needs
- Identify physical and mental weak points / strengths
- Forecast performance peaks and schedule intensity accordingly


People's mobility and digital activity
Feelings!
Where does data come from?
Weather Data
Sensors on bike
1775 JYR

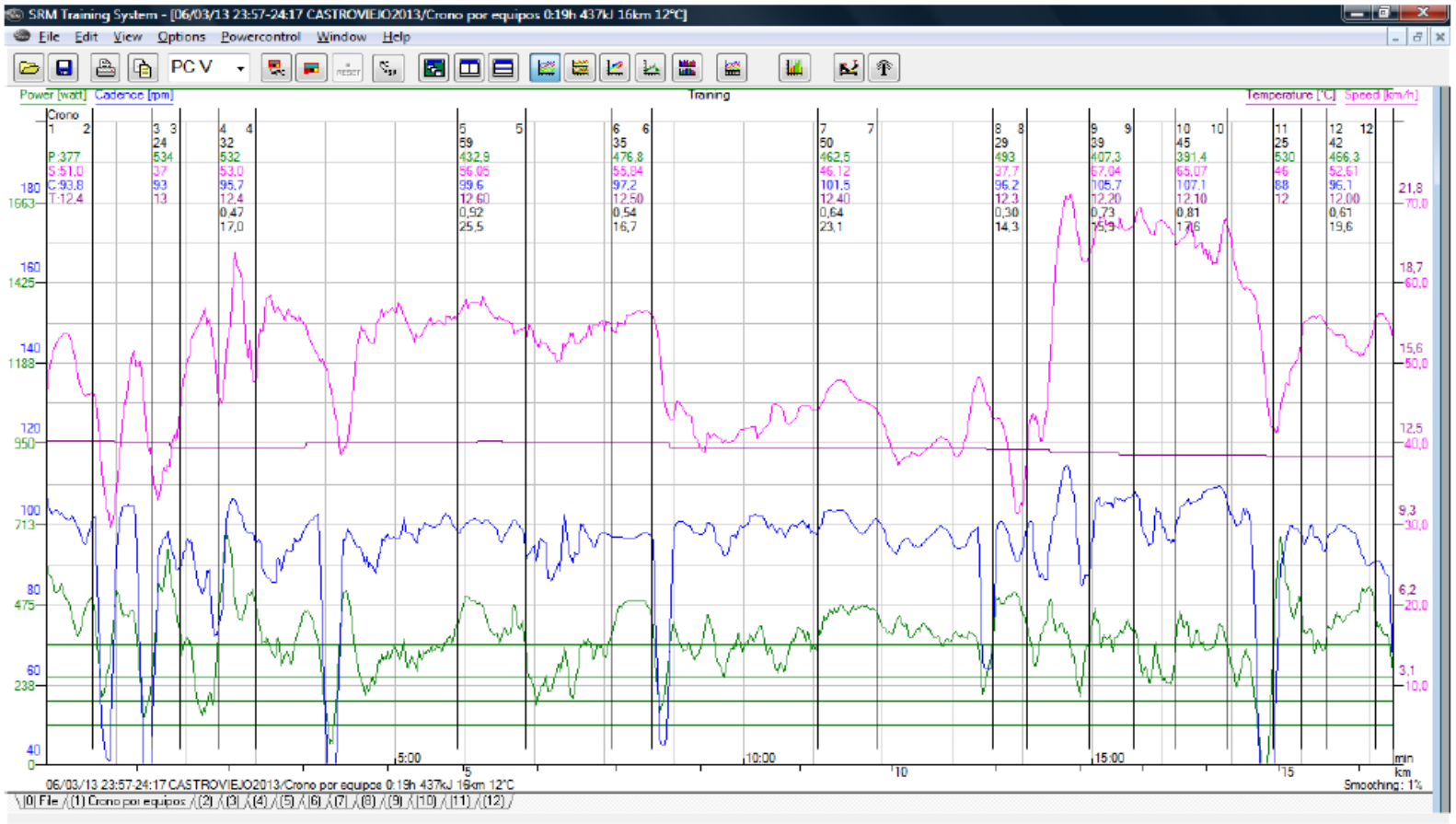
Sensors on Bike: A massive amount of Data

4 million pieces of info per cyclist in Tour de France

One **sample per second**, generated in **competion and training sessions**, including:

- Time
- GPS position, ramp, elevation
- Temp
- Cadence (rpm)
- Power (Watts).
- Speed.
- Left/Right balance
- Heart rate
- …and tens of new generated variables (NP, IF, TSS…)

We need actionable insights not complex charts



What explains performance?

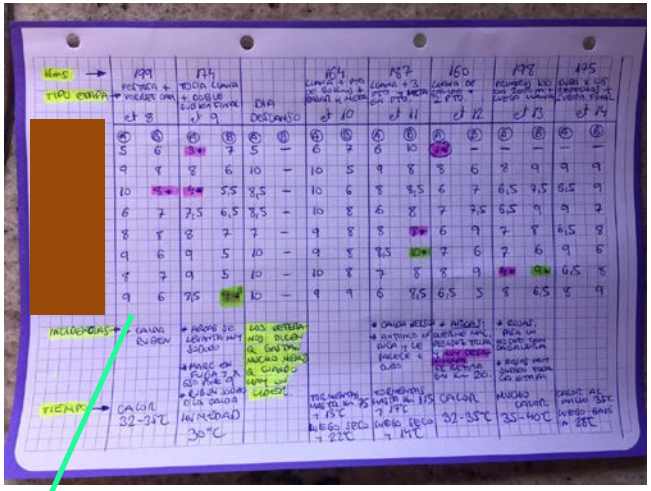
Intensity

Power/Speed

Heart Rate

+

Feelings (recovery/effort)



We ask cyclists to **rate their overall feelings** before and after the race so we feed this data into the model.

Once the dataset is built…

Intervalos

Interval Name	Duración	Distancia (km)	Trabajo (kJ)	Potencia Media (vatios)	xPower (vatios)	Potencia Máx (vatios)	Frec. Cardíaca Media (ppm)	95% Frec. Cardíaca (ppm)	Cadencia Media (rpm)	Velocidad Media (km/h)
1	22:56	7.09	173	144	165	366	110	128	71	24.7
2	02:25	1.10	18	121	117	202	106	111	78	27.4
3	10:46	5.47	91	141	148	309	108	115	79	30.5
4	03:32	2.58	91	431	398	543	159	169	94	43.9
5	02:30	1.40	26	176	177	400	136	169	80	33.7
6	05:08	3.79	129	418	398	518	165	171	100	44.3
7	02:54	1.50	26	150	132	414	133	169	84	31.1

We applied advanced analytics and created a proprietary infotool to easily navigate the data

19	07:19	3.69	62	142	196	425	123	171	73	30.3
20	00:18	0.19	13	705	289	1163	134	157	73	38.8
21	07:17	3.22	90	206	219	414	128	159	77	26.6
22	00:19	0.24	16	845	353	1281	135	159	87	45.1
23	54:54	23.17	677	209	236	496	122	145	75	25.8
24	20:48	6.79	510	408	404	502	169	176	82	19.6
25	21:08	12.05	117	96	141	379	112	139	72	35.5
26	10:08	5.78	211	348	340	583	156	161	98	34.2

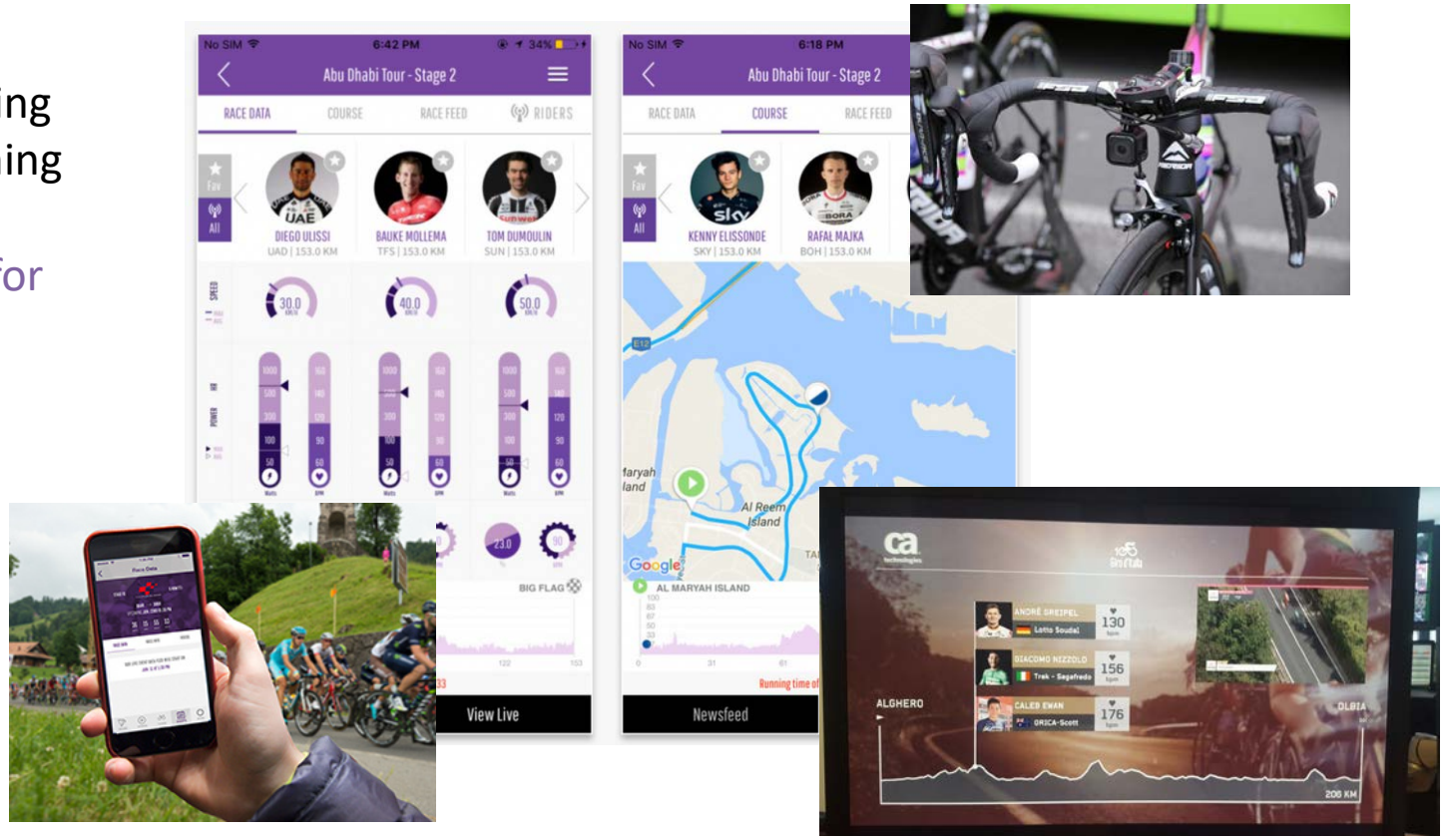
Why? If we already have software available…

- More advanced analytics. We can predict variables like fatigue or recovery more accurately
- Coaches give their input from sport sciences and training methods
- Designed specifically for the team, customized
- Feelings (RPE) included as a key complementary variable
- Simplicity. We use just what we need
- All the data from the team available in one tool
- Individualization: one athlete, personal data, graphs and feedback

Our “cocktail” of innovation

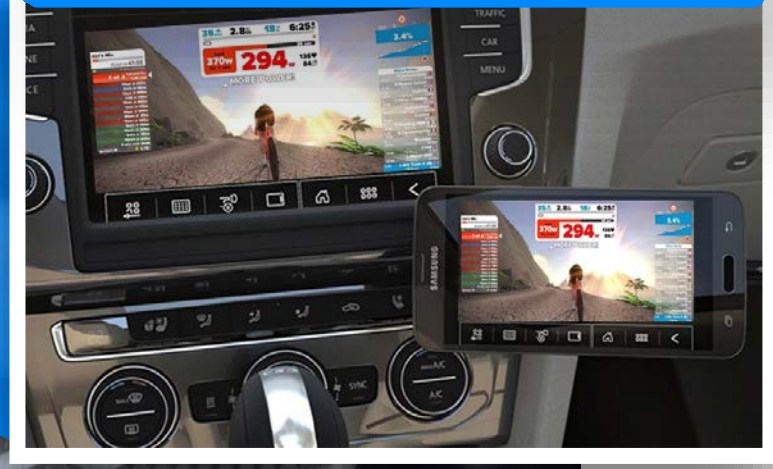
Getting closer to F1: Real-time analysis.

- Velon is pioneering real-time streaming (video & data)
- An opportunity for telcos?

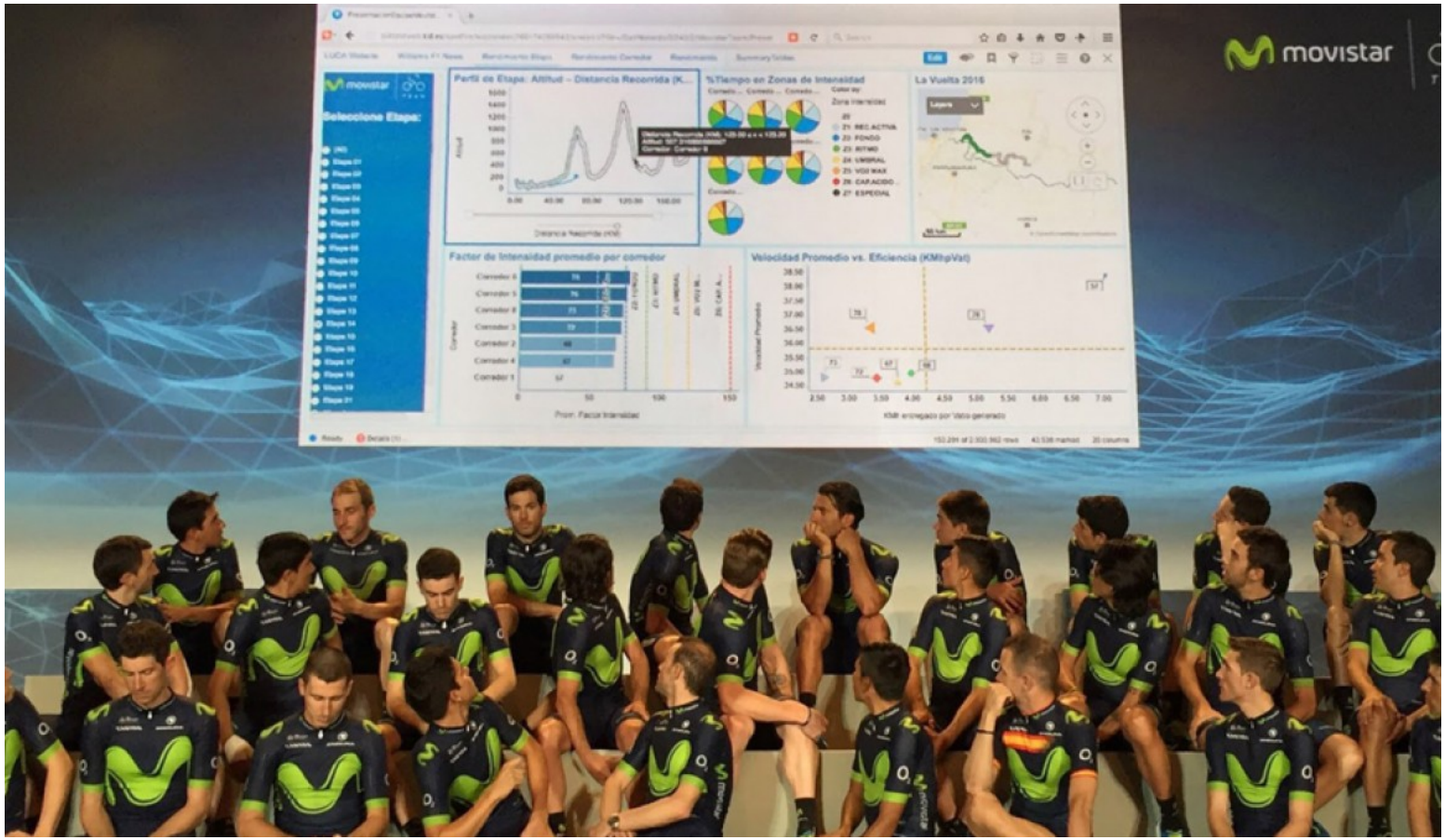


Getting closer to **F1**
Connectivity &
analysis
In real time

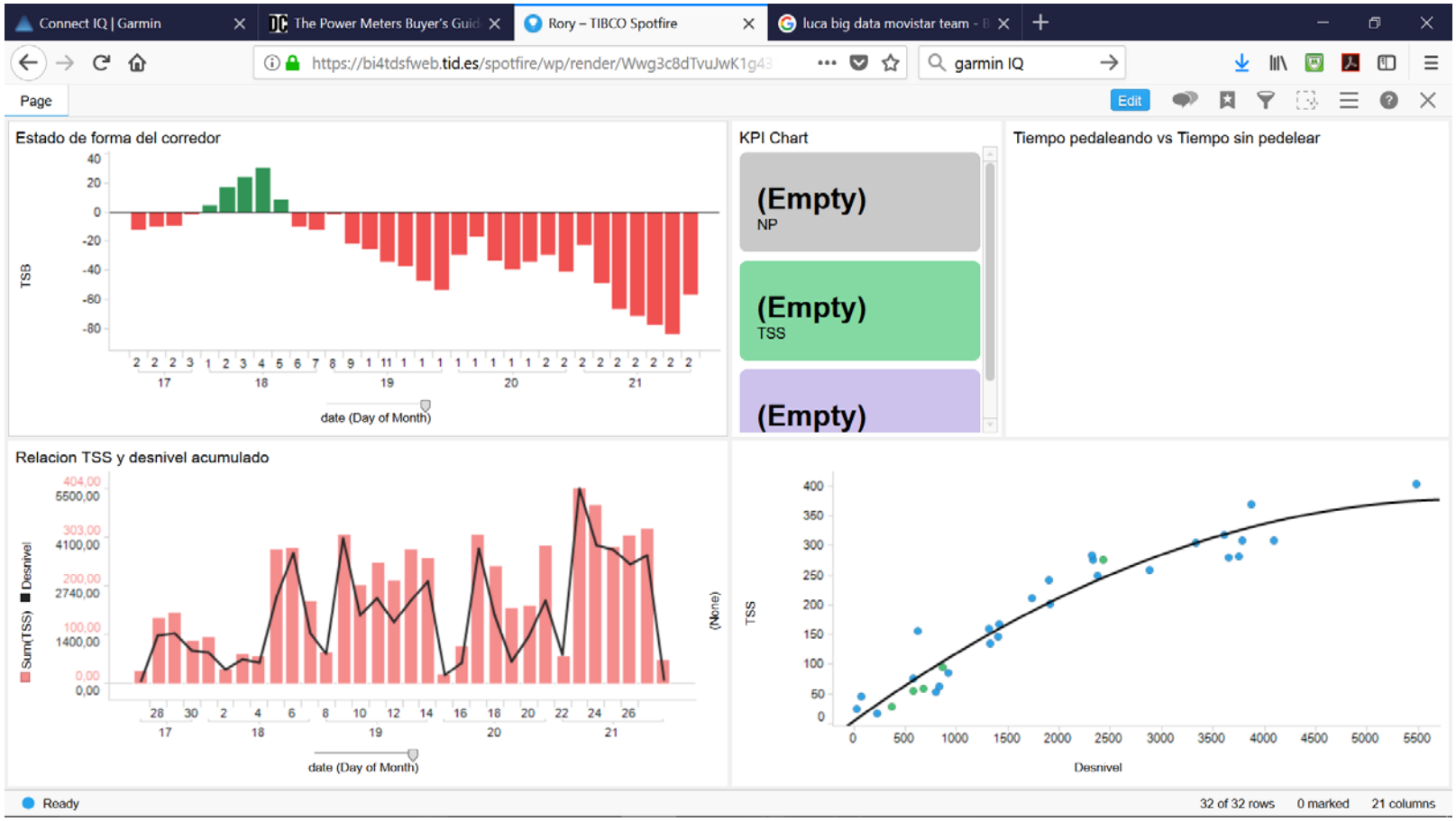
Useful information inside
Sport Director’s car



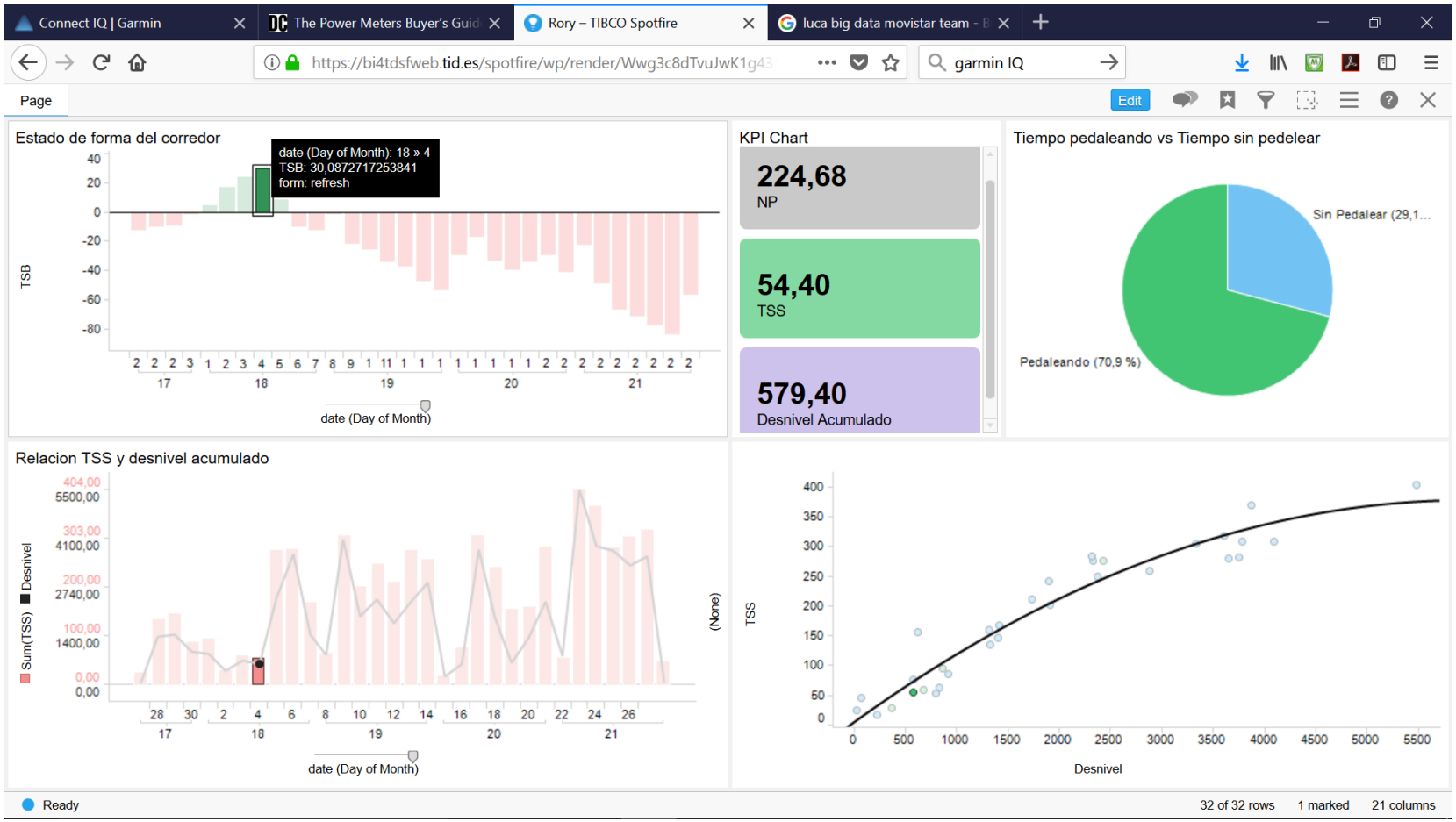
BIG DATA???


movistar
Seleccione Etapa:
Perfil de Etapa: Altitud – Distancia Recorrida (K...
%Tiempo en Zonas de Intensidad
La Vuelta 2016
Factor de Intensidad promedio por corredor
Velocidad Promedio vs. Eficiencia (KM/pVat)

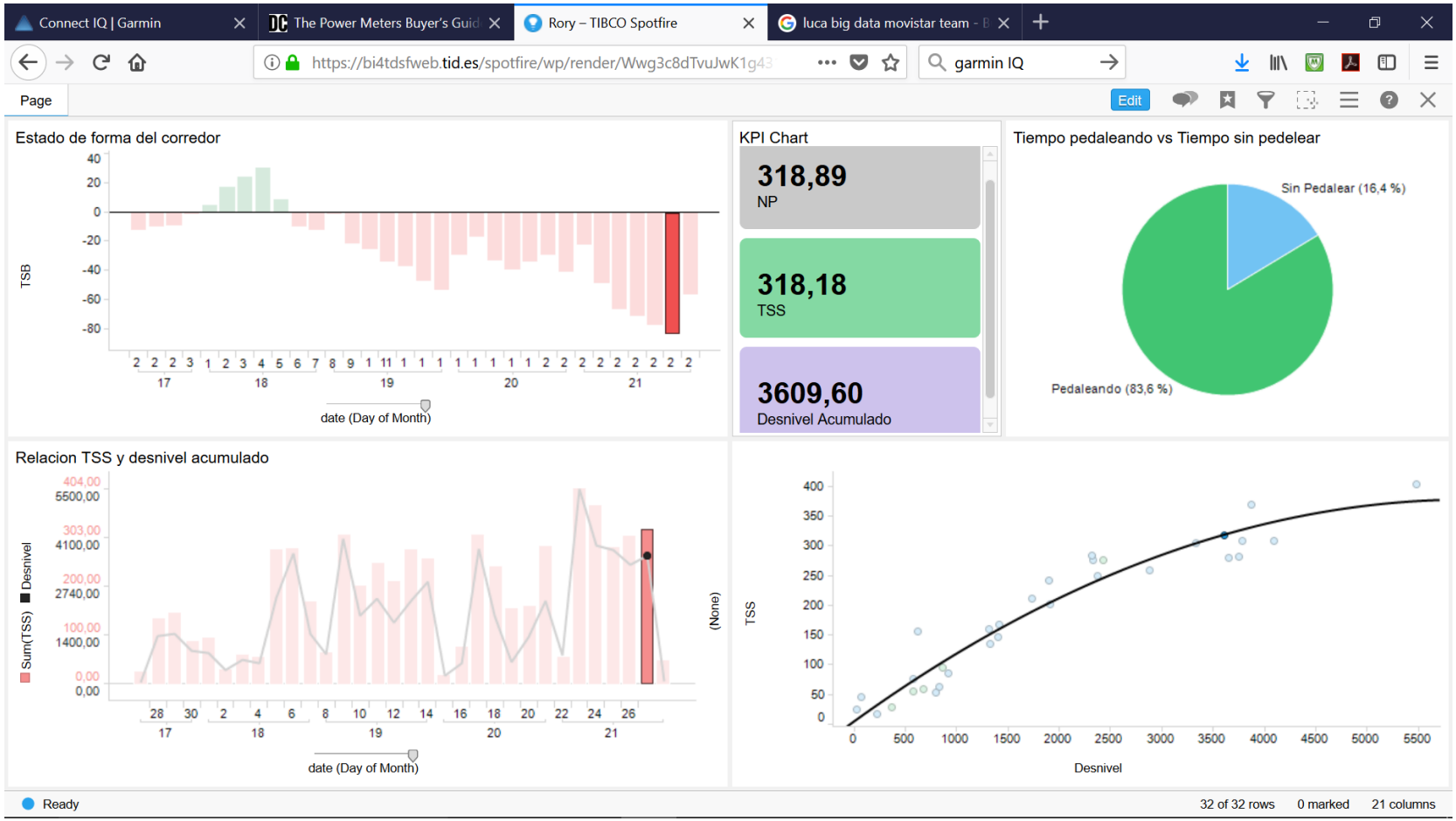
BIG DATA???


Connect IQ | Garmin
The Power Meters Buyer's Guid
Rory – TIBCO Spotfire
luca big data movistar team - B
https://bi4tdsfweb.tid.es/spotfire/wp/render/Wwg3c8dTvuJwK1g43
garmin IQ
Page
Edit
Estado de forma del corredor
TSB
date (Day of Month)
KPI Chart
(Empty)
NP
(Empty)
TSS
(Empty)
Tiempo pedaleando vs Tiempo sin pedelear
Relacion TSS y desnivel acumulado
Sum(TSS)
Desnivel
(None)
date (Day of Month)
TSS
Desnivel
Ready
32 of 32 rows
0 marked
21 columns

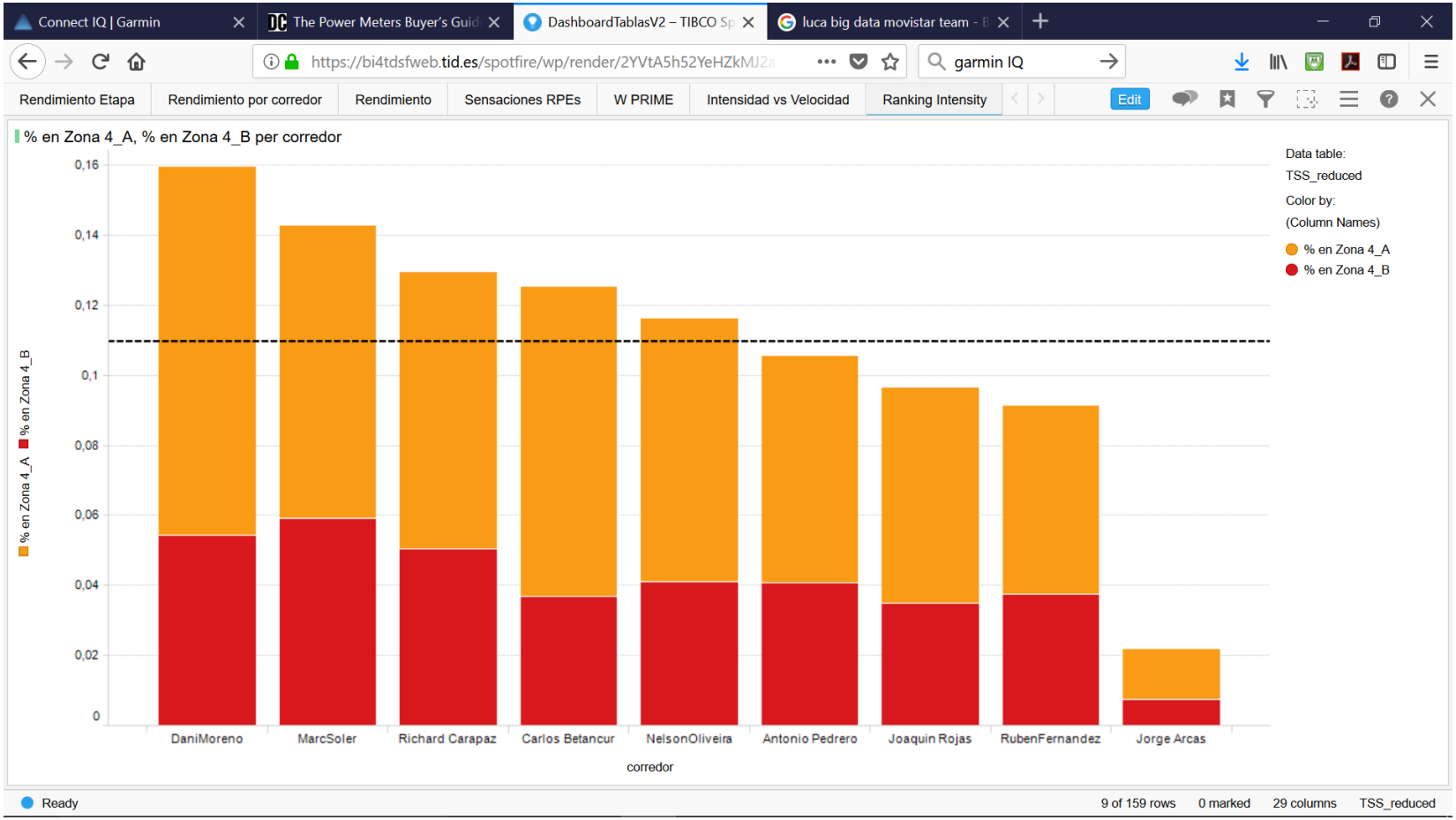
BIG DATA???


Connect IQ | Garmin
The Power Meters Buyer's Guid
Rory – TIBCO Spotfire
luca big data movistar team - B
https://bi4tdsfweb.tid.es/spotfire/wp/render/Wwg3c8dTvuJwK1g43
garmin IQ
Page
Edit
Estado de forma del corredor
date (Day of Month): 18 » 4
TSB: 30,0872717253841
form: refresh
TSB
date (Day of Month)
KPI Chart
224,68
NP
54,40
TSS
579,40
Desnivel Acumulado
Tiempo pedaleando vs Tiempo sin pedelear
Sin Pedalear (29,1...
Pedaleando (70,9 %)
Relacion TSS y desnivel acumulado
Sum(TSS)
Desnivel
(None)
date (Day of Month)
TSS
Desnivel
Ready
32 of 32 rows
1 marked
21 columns

BIG DATA???


Connect IQ | Garmin
The Power Meters Buyer's Guid
Rory – TIBCO Spotfire
luca big data movistar team - B
https://bi4tdsfweb.tid.es/spotfire/wp/render/Wwg3c8dTvuJwK1g43
garmin IQ
Page
Edit
Estado de forma del corredor
TSB
date (Day of Month)
KPI Chart
318,89
NP
318,18
TSS
3609,60
Desnivel Acumulado
Tiempo pedaleando vs Tiempo sin pedelear
Sin Pedalear (16,4 %)
Pedaleando (83,6 %)
Relacion TSS y desnivel acumulado
Sum(TSS)
Desnivel
(None)
date (Day of Month)
TSS
Desnivel
Ready
32 of 32 rows
0 marked
21 columns

BIG DATA???


Connect IQ | Garmin
The Power Meters Buyer's Guid
DashboardTablasV2 – TIBCO Sp
luca big data movistar team - B
https://bi4tdsfweb.tid.es/spotfire/wp/render/2YVtA5h52YeHZkMJ2a
garmin IQ
Rendimiento Etapa
Rendimiento por corredor
Rendimiento
Sensaciones RPEs
W PRIME
Intensidad vs Velocidad
Ranking Intensity
Edit
% en Zona 4_A, % en Zona 4_B per corredor
Data table:
TSS_reduced
Color by:
(Column Names)
% en Zona 4_A
% en Zona 4_B
0,16
0,14
0,12
0,1
0,08
0,06
0,04
0,02
0
% en Zona 4_A, % en Zona 4_B
DaniMoreno
MarcSoler
Richard Carapaz
Carlos Betancur
NelsonOliveira
Antonio Pedrero
Joaquin Rojas
RubenFernandez
Jorge Arcas
corredor
Ready
9 of 159 rows
0 marked
29 columns
TSS_reduced

BUT… WE NEED CONTINUOUS MONITORING

WEEKLY CONTACT COACH-CYCLIST (OR DAILY WHEN NEEDED…)

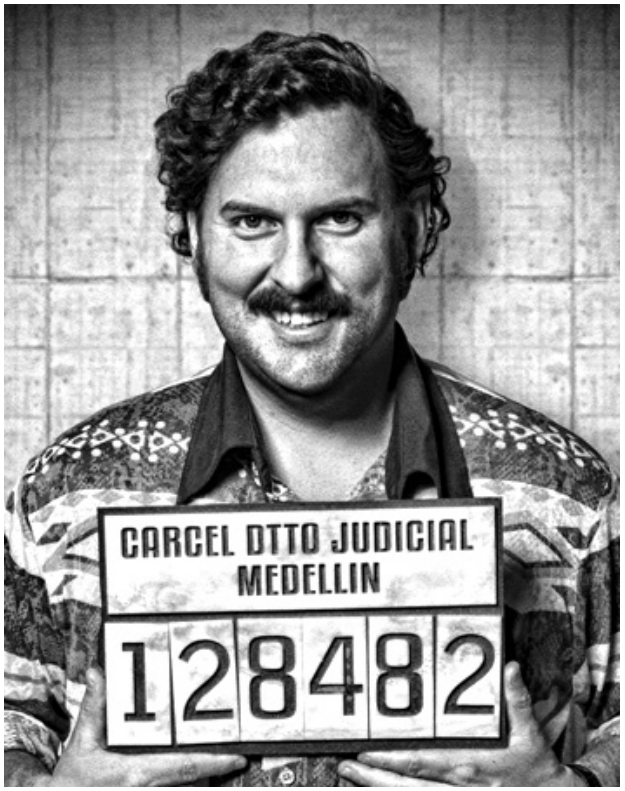
SKINFOLDS, WEIGTH IN THE COMPETITIONS AND CAMPS

WEEKLY CHAT COACHES-DIRECTOR OF PERFORMANCE (VIA SKYPE)

WEEKLY CHAT DIRECTOR OF PERFORMANCE-RACE MANAGERS-OWNER

ATTENDANCE TO SELECTED COMPETITIONS AND INDIVIDUAL TRAINING WORKOUTS WHEN POSSIBLE

THE RELATIONSHIP BETWEEN THE COACH AND THE CYCLISTS MUST BE BASED ON CONFIDENCE



And… remember: “That country which doesn’t know its past is condemned to repeat it”

DOPING AND ANTI-DOPING IN CYCLING

– *Written by Yorck Olaf Schumacher, Qatar*

> ***Since the introduction of the Athlete Biological Passport in 2008, both high and low reticulocyte patterns have virtually disappeared***

Sports Med (2013) 43:395–411
DOI 10.1007/s40279-013-0037-x

REVIEW ARTICLE

Doping in Sport: A Review of Elite Athletes' Attitudes, Beliefs, and Knowledge

Jaime Morente-Sánchez · Mikel Zabala

Published online: 27 March 2013

OPEN ACCESS Freely available online

PLOS ONE

Attitudes towards Doping and Related Experience in Spanish National Cycling Teams According to Different Olympic Disciplines

Jaime Morente-Sánchez[1,2], Manuel Mateo-March[2,3], Mikel Zabala[1,2]*

1 Faculty of Sport Sciences, University of Granada, Granada, Spain, **2** Spanish Cycling Federation, Madrid, Spain, **3** Miguel Hernández University, Elche, Spain

Abstract

Attitudes towards doping are considered an influence of doping intentions. The aims of the present study were 1) to discover and compare the attitudes towards doping among Spanish national team cyclists from different Olympic disciplines, as well as 2) to get some complementary information that could better explain the context. The sample was comprised of seventy-two cyclists: mean age 19.67±4.72 years; 70.8% males (n = 51); from the different Olympic disciplines of Mountain bike -MTB- (n = 18), Bicycle Moto Cross -BMX- (n = 12), Track -TRA- (n = 9) and Road -ROA- (n = 33). Descriptive design was carried out using a validated scale (PEAS). To complement this, a qualitative open-ended questionnaire was used. Overall mean score (17–102) was 36.12±9.39. For different groups, the data were: MTB: 30.28±6.92; BMX: 42.46±10.74; TRA: 43.22±12.00; ROA: 34.91±6.62, respectively. In relation to overall score, significant differences were observed between MTB and BMX ($p = 0.002$) and between MTB and TRA ($p = 0.003$). For the open-ended qualitative questionnaire, the most mentioned word associated with "doping" was "cheating" (48.83% of total sample), with "responsible agents of doping" the word "doctor" (52,77%), and with the "main reason for the initiation in doping" the words "sport achievement" (45.83%). The major proposed solution was "doing more doping controls" (43.05%). Moreover, 48.67% stated that there was "a different treatment between cycling and other sports". This study shows that Spanish national team cyclists from Olympic cycling disciplines, in general, are not tolerant in relation to doping. BMX and Track riders are a little more permissive towards the use of banned substances than MTB and Road. Results from the qualitative open-ended questionnaire showed interesting data in specific questions. These results empower the idea that, apart from maintaining doping controls and making them more efficient, anti-doping education programs are needed from the earliest ages.

Relationship Between Self-Reported Doping Behavior and Psychosocial Factors in Adult Amateur Cyclists

Mikel Zabala and Jaime Morente-Sánchez
University of Granada

Manuel Mateo-March
Spanish Cycling Federation and Miguel Hernandez University of Elche

Daniel Sanabria
University of Granada

This study addresses performance-enhancement drug (PED) consumption in amateur sport by investigating the relationship between psychosocial factors and PED use in amateur cyclists. Participants were asked whether they had ever taken PED. They were also asked whether they had any experience in competitive cycling, and the degree to which they participated in the event with a competitive aim. In addition, they completed the Performance Enhancement Attitude Scale, the Rosenberg self-esteem scale, and a bespoke self-efficacy questionnaire, and they rated the percentage of cyclists they believed took PED. Between-groups comparisons and two multiple regression analyses were performed. Overall, the results of our study point to adult amateur cyclists in general, and amateur cyclists with experience in competition in particular, as groups at risk for PED use. This study highlights the value of measuring psychosocial variables as a tool to assess PED use, a current issue at both sport performance and health levels.

Keywords: performance-enhancing drugs; cycling; prevention; attitudes; self-esteem; self-efficacy; projected use; sport competition.

Also, a coach must live the training process with the cyclist

And if you live it you can enjoy it, and so you can be closer to the professional excellence!

So, is training like cooking? Is it an art?

Experience, talent, inspiration… based on science and data-driven decissions: SCIENTIFIC COOKING-ART!?

SPECIFIC AND INDIVIDUAL CONTEXT

(material, ergogenic aids…)

We are more and more professionals, WORKING HARD AND WELL!!! THANKS!



KERRISON, SANDERS, MATEO-MARCH, DELAHAIJE, VILA… and many MORE!

THANKS VERY MUCH FOR YOUR ATTENTION!

CYCLING RESEARCH CENTER

www.cycling-research.com

Mikel Zabala / Manuel Mateo-March
University of Granada
Movistar Cycling Team

UNIVERSIDAD DE GRANADA

MOVISTAR TEAM

mikelz@ugr.es / TW: @zabalamikel / Instagram: @mikelzabala111