Powering Podiums

Powering Progression Through Data Solutions

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Lead, Biomechanics & Performance Analysis

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Data Solutions Process

Sports

Management

Descriptive

Analytics

Raw Data

Data Processing

Validation

Reporting

Results

Modelling

Visualization

Inferential

Types of Data

- GPS/IMU tracking device (ie Catapult, Metawear, Garmin, Suunto, Polar, …)
  - Accelerometer, gyroscope, magnetometer, GPS, HR, time, …
    - Acceleration, degrees of rotation, heading, altitude, position (longitude/latitude)
    - Speed, distance, spin/turn rate, cadence, player load, …
- Performance testing
  - Race results, strength, speed, endurance, neuromuscular, physiological,…
- Technical/tactical
  - Video coding, game box scores
- Medical
  - Injury, sickness
- Nutrition
  - Caloric intake
- Mental / Psychological
- Wellness
  - Sleep (quality & duration), muscle pain, muscle soreness, motivation, ….

Data Processing

- Data wrangling
  - Cleaning
    - Formatting
  - Connecting different datasets
  - Calculating sport-specific metrics
    - Training Load
    - Performance
      - Physiological markers (VO2max, lactate threshold,…)
      - Force Velocity profile (strength, speed, power, force,…)
      - Race results
    - Wellness

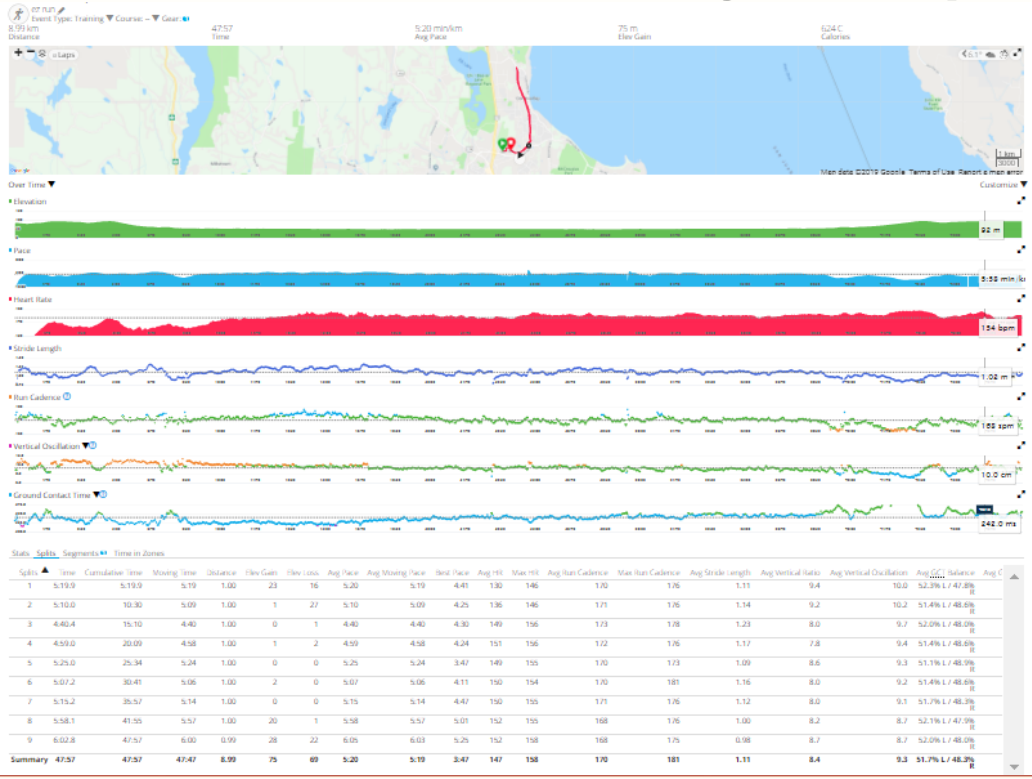
Training Load

- External
  - Time
  - Speed
  - Power

  → Total
  → Average
  → Max
  → Spent at different zones
  → …

- Internal
  - sRPE — $TL = sRPE \cdot time$ (Foster JSCR 2001)
  - HR — $TL = time \cdot \Delta HR \cdot factor$ (Banister AJSM 1975)
  - T2minute — $TL = \sum_1^n M_{factor} \cdot sRPE_{factor} \cdot sRPE_i$ (Tran JSS 2014)

External Training Load (Garmin)

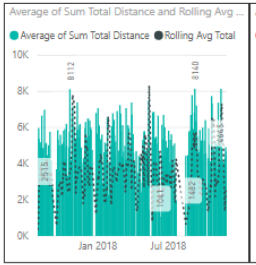


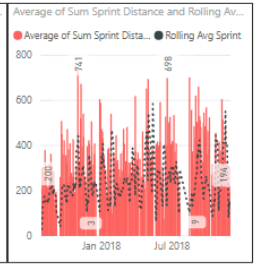
External Training Load (Catapult)

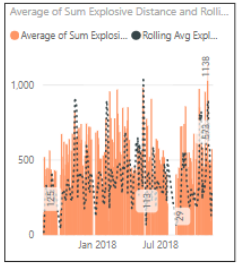
Drill Date Key
8/1/2017 11/26/2018

The top half of the page highlights loading trends over time. The bottom half displays training session summaries by drill as a total and by drill by athlete.

To use this page: Please use the slider to manipulate the range of dates shown in the three graphs. The drill date selection box is linked with the tables below.







Drill Date Key
11/26/2018
11/25/2018
11/24/2018
11/23/2018
11/22/2018
11/21/2018
11/20/2018
11/19/2018
11/16/2018
11/15/2018
11/14/2018
11/13/2018
11/12/2018
11/9/2018
11/8/2018
11/7/2018
11/6/2018

Drill Title	Average Total Distance	Average M/Min	Max Speed	Average Number of Sprints	Average Sprint Distance	Average Explosive Distance	Drill Time (mins)
Skills - 7v7 (Set Piece)	2,029.65	57.14	8.26	8.67	121.51	280.86	36.67
Skills - Square/Wrap	815.32	53.40	7.47	2.17	20.69	81.25	15.25
Skills - Team Warm-up	999.67	51.84	6.21	0.58	4.37	177.89	19.30
Skills - Warm-up Indi	800.58	54.05	7.66	2.58	46.95	32.84	15.73
Total	**4,645.22**	**216.42**	**8.26**	**14.00**	**193.52**	**572.83**	**86.95**

Drill Title	Player Display Name	Distance Total	Distance Per Min	Max of Max Speed	Sprints	Sprinting	Explosive Distance
Skills - 7v7 (Set Piece)	Bianca Farella	1772.31	54.30	7.51	7	106.36	234.82
	Breanne Nicholas	2259.18	61.60	7.46	13	167.77	386.81
	Britt Benn	1872.60	51.06	6.83	7	53.38	239.96
	Caroline Crossley	2359.79	64.34	7.99	8	119.19	257.48
	Charity Williams	1874.95	51.12	8.26	8	163.39	290.65
	Emma Chown	2616.04	71.33	6.98	11	137.63	407.19
	Ghislaine Landry	1607.75	51.55	7.28	9	120.16	244.59
	Julia Greenshields	1956.81	58.19	8.24	7	119.78	208.88
	Kaili Lukan	1915.30	55.21	7.67	11	146.83	298.80
	Kayla Moleschi	2039.79	55.62	7.04	6	103.14	279.35

Modi... Full
R... Full

Daily Training Summary | 7v7 Workrates | 7v7 Athlete Data | Athlete Data by Drill | GPS Loading Graphs | Max Speed Summary (Cam) | +

(Amarah Epp-Stobbe)

Internal Training Load

- sRPE
  - $TL = sRPE \cdot time$

Training Mode	Weighting Factor
Specific conditioning game	1
Conditioning & modified conditioning	1
Cross-training: run	1.3
mobility	0.7
Skills & modified skills	1
Weights & modified weights	1.2
Speed & modified speed	0.9
Recovery	0.5

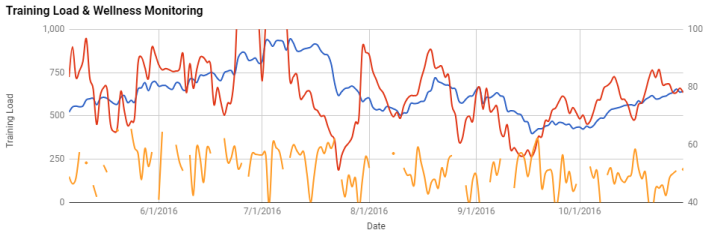
Training Intensity (RPE)	Weighting Factor
1	.5
2	.95
3	1
4	1.15
5	1.35
6	1.6
7	2.1
8	3
9	5
10	9

- sRPE (weighted)
  - $TL = \sum_1^n M_{factor} \cdot sRPE_{factor} \cdot sRPE_i$

Date		sleep	weight (lbs)	swim			bike			run			others			TOTAL		wellness	Training Load
				distance (km)	time (min)	RPE	distance (km)	time (min)	RPE	distance (km)	time (min)	RPE	activity	time (min)	RPE	(min)	load		
Dec 2018		7.9	173.3	21.2	725.0	4.7	41.0	595.0	4.9	123.7	828.0	4.6		185.0	4.7	2,133.0	15,372		
January		7.9	174.9	21.3	720.0	4.2		665.0	4.2	103.5	536.0	4.3		120.0	4.0	2,041.0	11,317		
February		7.5	175.5	11.5	390.0	4.4	50.0	610.0	4.7	95.0	499.0	4.4		1,130.0	2.6	2,629.0	12,718		
March																			
April																			
May																			
June																			
July																			
August																			
September																			
October																			
November																			
December																			
TOTAL		7.7	174.5	54.0	1,835.0	4.4	91.0	1,870.0	4.6	322.2	1,863.0	4.4		1,435.0	3.8	6,803.0	39,408		
11/26/2018	Mon	7	171	1.5	55	8.0		45	8.5							100.0	2,468		1.00
11/27/2018	Tue	8	174											60	7.5	60.0	900		1.00
11/28/2018	Wed	8	173					50	8.5	10	60.00	8.5				110.0	2,805		1.00
11/29/2018	Thu	7.5	173					60	9.0							60.0	2,700		1.00
11/30/2018	Fri	7.5	174	2	70	8.5										70.0	1,785		1.00
12/1/2018	Sat	9	173	0.8	45	5.0										45.0	304		1.00
12/2/2018	Sun	9								18	75.00	8.5				75.0	1,913		1.00
total		8.00	173.00	4.3	170	7.2		155	8.7	28	135.00	8.5		60	7.5	520.0	12,874		
12/3/2018	Mon	7	172	1.8	65	7.0		45	8.0							110.0	1,990	#DIV/0!	0.95
12/4/2018	Tue	7	173											60	7.0	60.0	840	0.71	1.01
12/5/2018	Wed	8	174							12	65.00	3.0				65.0	263	-0.58	0.88
12/6/2018	Thu	8	173	2	70	7.0										70.0	980	1.31	0.75
12/7/2018	Fri	5	174					65	6.0							65.0	780	-1.48	0.68
12/8/2018	Sat	8	173							18	85.00	6.0				85.0	1,020	0.99	0.77
12/9/2018	Sun	8.6	173													0.0	0	-1.44	0.63
total		7.38	173.14	3.8	135	7.0		110	7.0	28	150.00	4.5		60	7.0	455.0	5,873		
12/10/2018	Mon	6	174							10.3	57.00	5.0				57.0	385	-1.36	0.48
12/11/2018	Tue	6	174					75	5.0							75.0	508	-0.77	0.46
12/12/2018	Wed	9	173													0.0	0	0.25	0.45
12/13/2018	Thu	7	174													0.0	0	-1.22	0.35
12/14/2018	Fri	5.6	173							12.5	53.00	3.0				53.0	215	-1.93	0.29
12/15/2018	Sat	10.5	174	2	65	5.0										65.0	439	2.31	0.22

Wellness

- Questionnaires
  - Scale 1-7
  - Overall wellness score



- Monitoring methods
  - Historic figure
  - Z-score
    - Overall score
    - Individual question

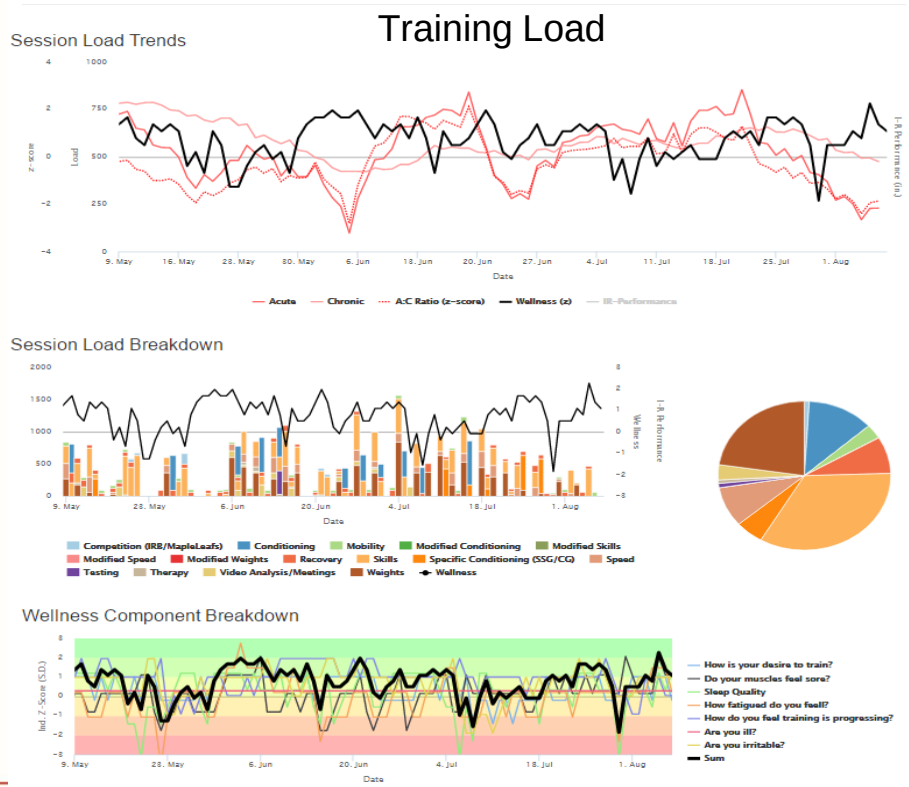
Date		wellness	Training Load	soreness	sleep quality	fatigue	pain	motivation	stress	sickness
1/21/2019	Mon	-1.24	0.96	7	6	7	7	6.5	7	3
1/22/2019	Tue	-0.18	0.70	7.5	6	7	7	6.5	7	3
1/23/2019	Wed	0.95	0.65	7.5	7.5	7	7	7	7	3
1/24/2019	Thu	-0.16	0.70	7.5	6.5	7	7	7	7	3
1/25/2019	Fri	-0.94	0.56	7.5	6	7	7	7	7	3
1/26/2019	Sat	0.94	0.43	7	7	7	7	7	7	3
1/27/2019	Sun	0.45	0.55	6.5	7.5	7	7	7	7	3
total										
1/28/2019	Mon	-0.40	0.75	6.5	7	6.5	7	7	7	3
1/29/2019	Tue	-2.60	0.79	6.5	6	7	7	6	7	2
1/30/2019	Wed	-0.95	0.69	6.5	7	5.5	7	5	7	2
1/31/2019	Thu	-0.39	0.62	7	7	6	7	5	7	2
2/1/2019	Fri	-0.86	0.66	7	7	6	7	6	7	2
2/2/2019	Sat	-2.98	0.70	7	5	6	6	6	7	2
2/3/2019	Sun	0.89	0.68	7	7	7	7	7	7	2.5
total										
2/4/2019	Mon	-0.78	0.72	7	7	5	7	7	7	3
2/5/2019	Tue	-1.41	0.64	6.5	6	6	7	7	7	3
2/6/2019	Wed	-1.31	0.75	6.5	6	6	7	7	7	3
2/7/2019	Thu	-1.42	0.76	6.5	6	6	7	7	7	3

Reporting

Reporting

Wellness

Training Load



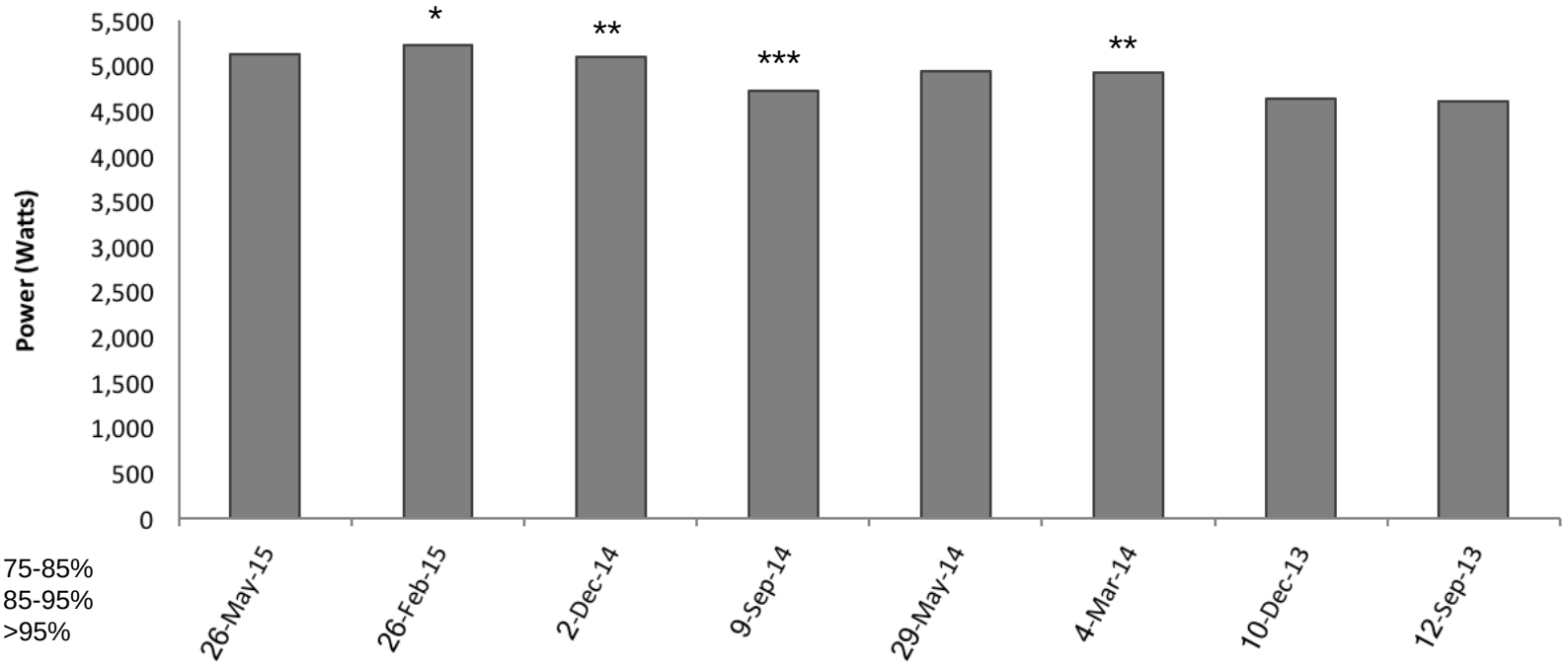
(Dana Agar-Newman)

- What is the minimum worthwhile change?

- How certain are you with the change?

Descriptive Report

Vertical Jump Power

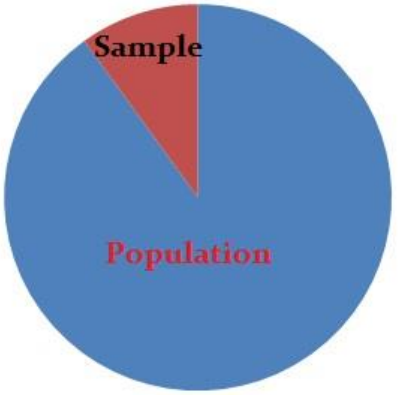


* 75-85%
** 85-95%
*** >95%

Descriptive vs Inferential Statistics

- Descriptive
  - Describes the main features of a data set
  - Simple summaries about the sample and measures of a single variable

- Inferential
  - Techniques that can be used to draw conclusion from a set of sample data drawn from the population
    - Frequentist
    - Bayesian
    - Magnitude-based inference



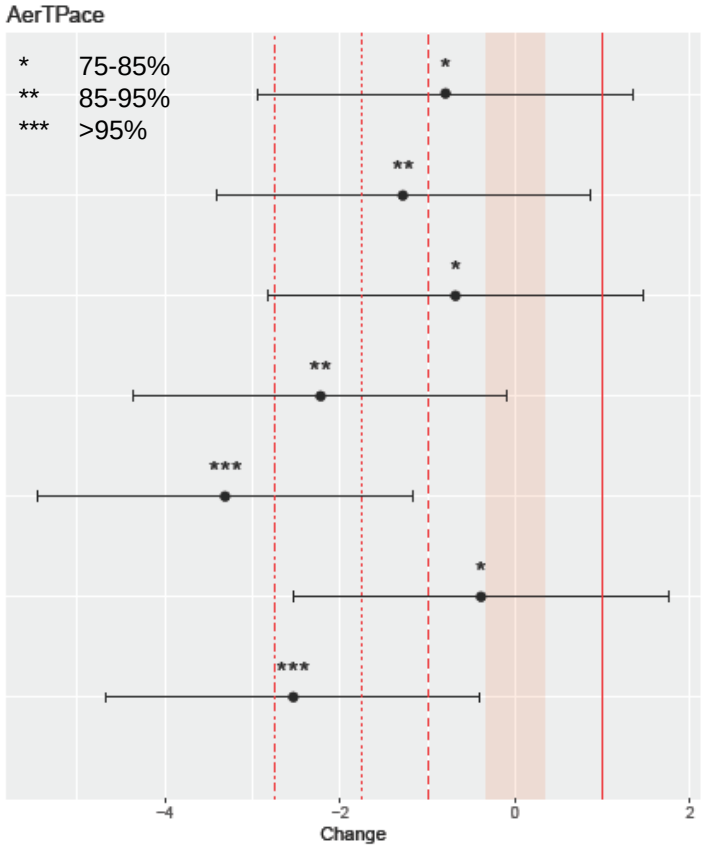
Descriptive Reports

Method	Comments
Mean	These are the averages but we **need more information** to understand the data better
Mean ± SD	These are the averages and the variation of the data. We **do not know if the changes are significant**
Coefficient of Variance	Within: the performance is inside/outside the athlete's variance Between: the performance is inside/outside the team variance
Effect Size	This shows the magnitude of change in performance
Small Worthwhile Change	Performance outside of this threshold is necessary to show a true change (**significance unclear yet**)

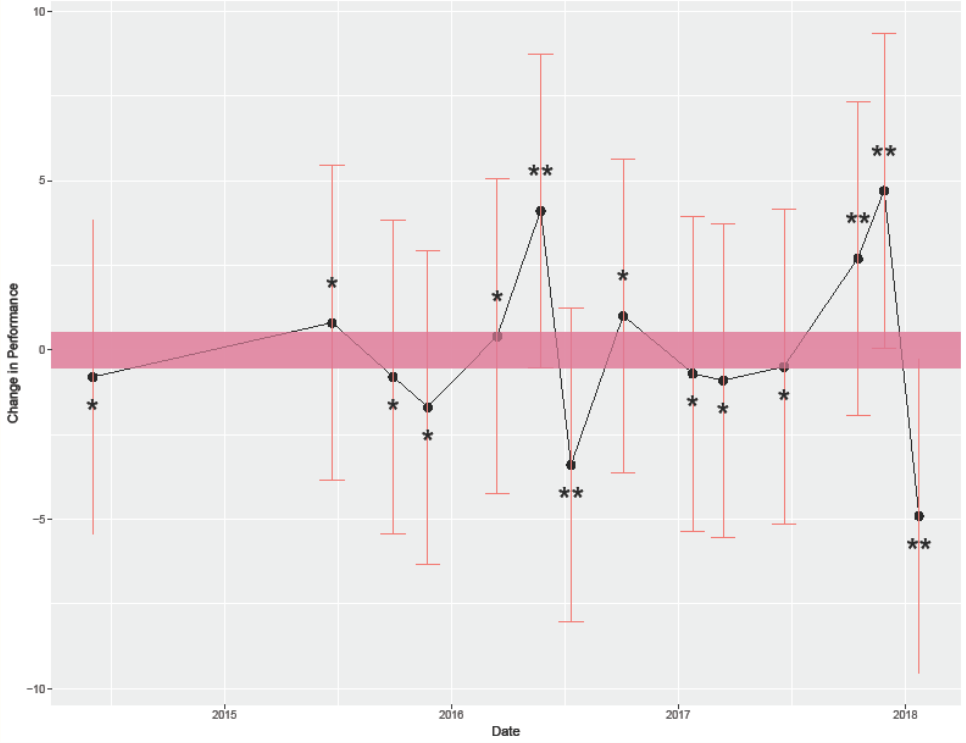
Inferential Reports

- Smallest Worthwhile Change (grey area)
  - Technical Measurement Error (TEM)
    - Biological variation
    - Technological error
      - equipment and/or measurement
  - Performance variation

- Probability



Inferential Report (Historic)



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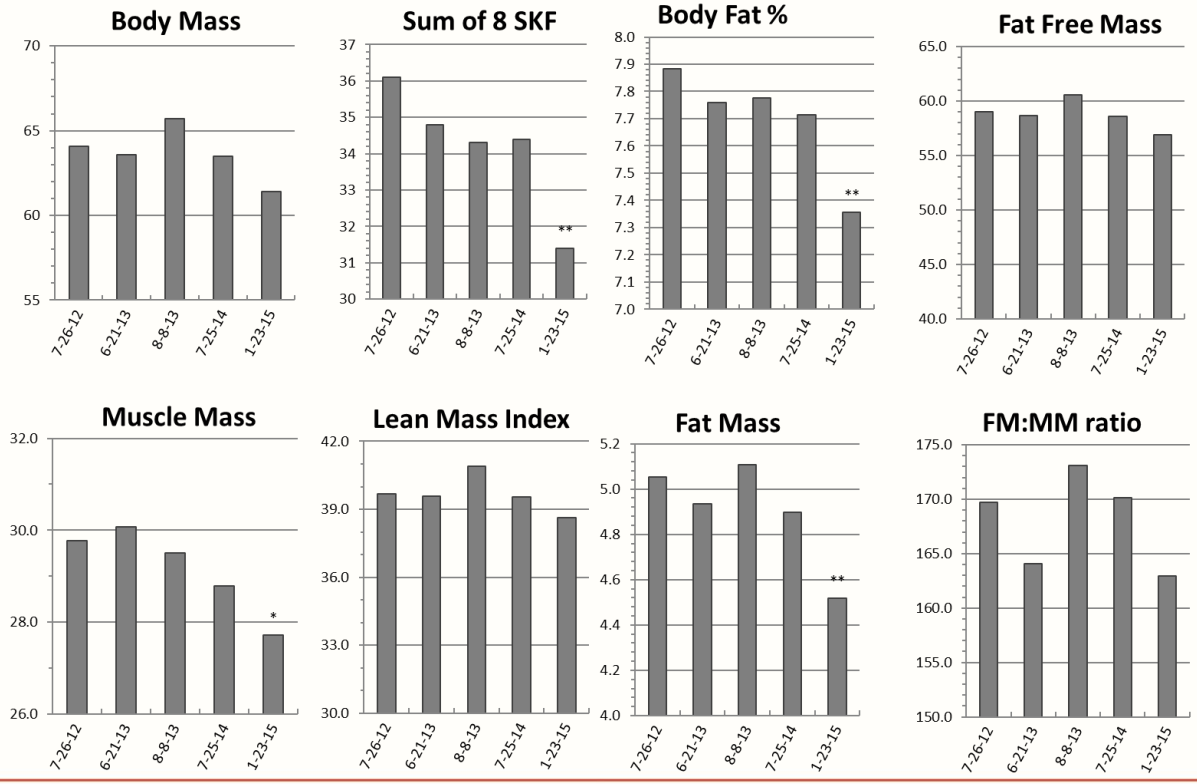
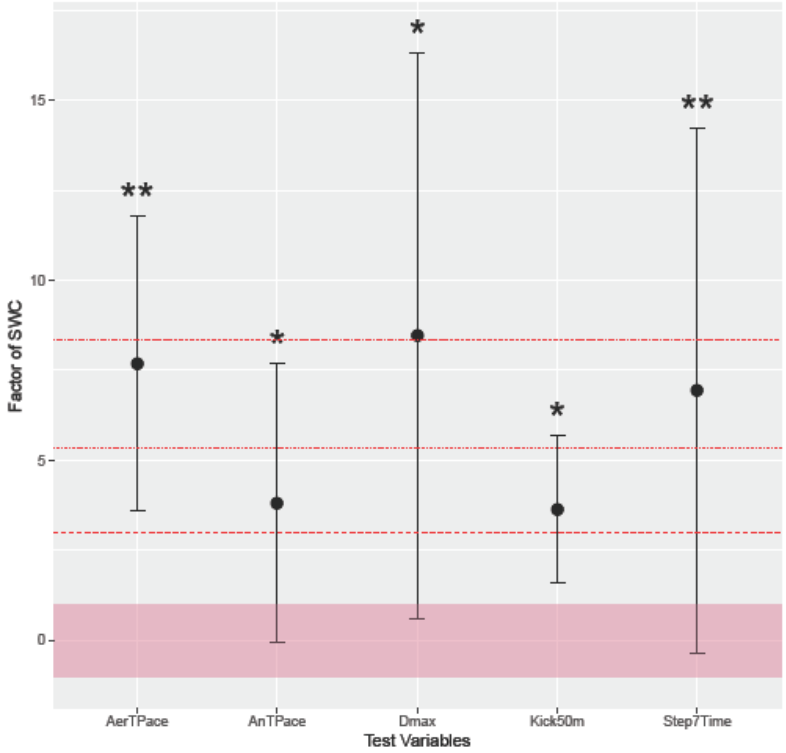


* 75-85%
** 85-95%
*** >95%

Inferential Report (Summary)



* 75-85%
** 85-95%
*** >95%

Thank you!