Keys to Conditioning – Utilizing Data Driven Prescription to Prepare Athletes for Competition

COLORADO
COLLEGE

Kevin Cronin, MS, CSCS*D, USAW-1, FMS-1

Head Strength and Conditioning Coach

www.coloradocollege.edu

SONOMA STATE UNIVERSITY
SEAWOLVES

NSCA™
National Strength and
Conditioning Association

COLORADO
COLLEGE

VARSITY ATHLETICS

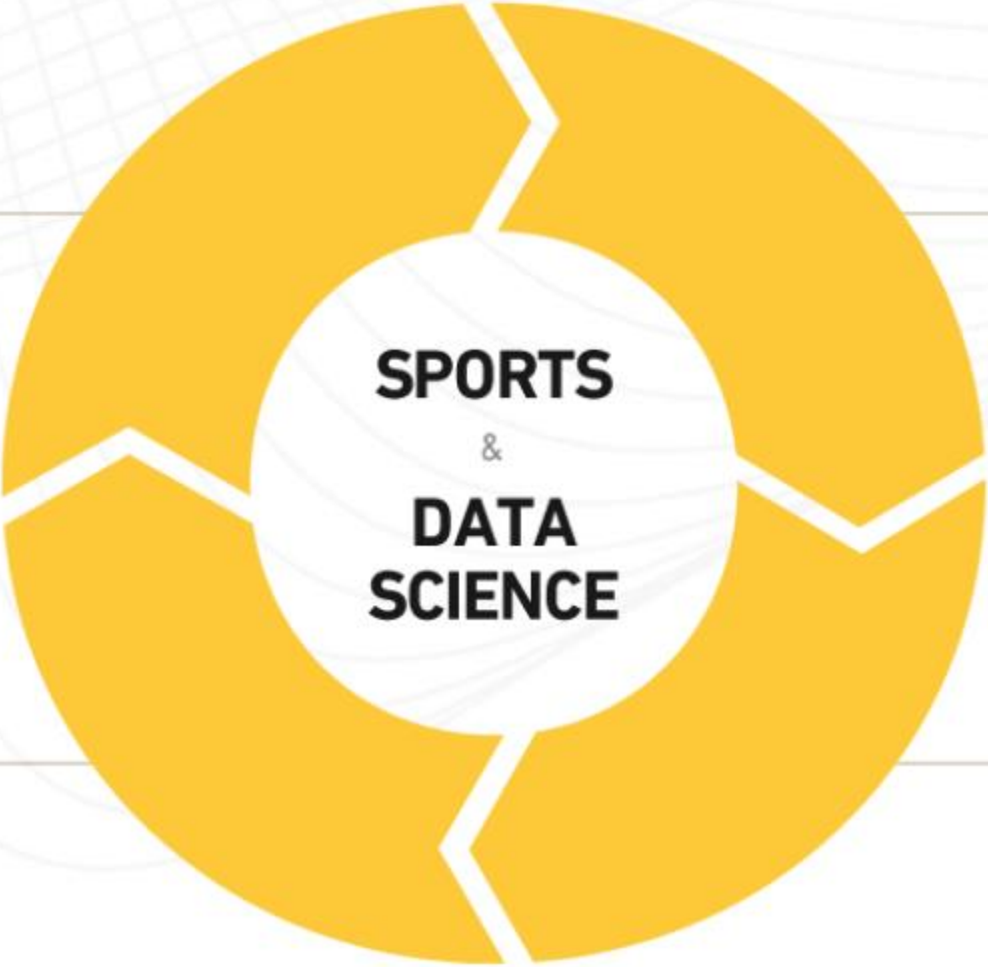
The Colorado College Athletics Department sponsors 17 varsity programs. Fifteen programs compete at the NCAA Division III level and two compete at the NCAA Division I level. Our Division III programs are members of the Southern Collegiate Athletic Conference (SCAC). Our Division I Men's Ice Hockey program is a member of the Western Collegiate Hockey Association (WCHA) and our Division I Women's Soccer program is a member of Conference USA (C-USA).

Men	**Women**
Basketball	Basketball
Cross Country	Cross Country
Hockey*	Lacrosse
Lacrosse	Soccer*
Soccer	Swimming & Diving
Swimming & Diving	Tennis
Tennis	Track & Field (Indoor & Outdoor)
Track & Field (Outdoor)	Volleyball

**compete at NCAA Division I level*

Overview

- Our view on our sports and data science
  - How we use and evaluate our data
  - Averages VS Individual Data
    - Prescription from data
- Review our ‘technology’
  - How we use it to help us make better decisions
- Review of our Conditioning System (30-15IFT)
  - Prescription
  - Manipulation of training variables to achieve different results



SPORTS

&

DATA SCIENCE

1

DATA CAPTURE

Your data: historical, current and new

PLAYERTEK by Catapult

FIRSTBEAT

2

ANALYTICS

Making sense of your data

PLAYERTEK

3

ACTIONABLE INSIGHTS

Informing better decisions

4

PERSONALIZED STRATEGIES

Optimizing performance

Data Capture

- Historic – we have been capturing GPS data since 2013
  - Started with 11 units through Catapult (Wsoccer,Mlax,Wlax)
    - MiniMax
- Current – PlayerTek since March 2018 (1691 sessions)
  - Provides similar metrics to Catapult (no IMA data)
  - Focus on volume and intensity metrics
- Current – FirstBeat HR since March 2018
  - A Heart Rate system
  - Focus on TRIMP and TRIMP permin
- *New – Polar Heart Rate (MBBall) – October 2018*
  - *Focus on TL Load Score and Calories Permin*
- *New – PlayerTek+ (Men's Lacrosse) – January 2019*
  - *10 units Focus on PL Permin and HR Load Permin*

COLORADO COLLEGE

Analytics

- Use excel to analyze longitudinal data via Pivot Table
- Compare days of the week to previous days of the week
- Individual Data Vs Team averages
- Attempting to get the best weekly periodization model
  - M Tue Wed Thur – look similar when compared to previous weeks
  - Along with evaluating potential need for change based on longitudinal data

PLAYERTEK by Catapult

- Use cloud based system to give ‘quick reports’ to coaches
- Displays Longitudinal data (since march)
- Use % of game values to present how ‘much we did in relation to game thresholds’

FIRSTBEAT

- Export to CSV: Duration, Calories, Training Effect Score, Time Spent in Zone 4 and Zone 5 and TRIMP – use excel to ‘connect’ w/ PlayerTek Data

COLORADO
COLLEGE

Personalized Strategies

- Optimize performance:
  - Use *internal and external load data* in conjunction with sRPE to make the best recommendations for weekly planning
  - Have *conversations with coaching staff* about how to minimize ‘load’ for athletes who play a lot of minutes and have higher sRPE
  - For those that don’t play a lot – utilize our 30-15IFT cards to prescribe conditioning sessions that match the ‘intensity’ of game stimulus
    - 66min and above – No Conditioning
    - 65min and below – Extra Conditioning
      - If you play less then 45min, no modifications to 30-15IFT Card
  - 30-15IFT cards to target our keys to conditioning in preparation for the season

COLORADO
COLLEGE

Actionable insight – informing better decisions

- Data that allows us to act or data that gives us enough insight into the future that the actions that should be taken become clear for decision making
  - GPS (sprint distance, distance permin, work ratio)
  - Heart Rate (TRIMP permin)
  - Conditioning protocols that can be manipulated to target ‘metrics’

- Insight into how we can design and manipulate conditioning variables to prepare athletes better for the demands of the season (especially competition)

Why GPS and Heart Rate?

We wanted to know what was ‘happening’ Internally/Externally during training and games

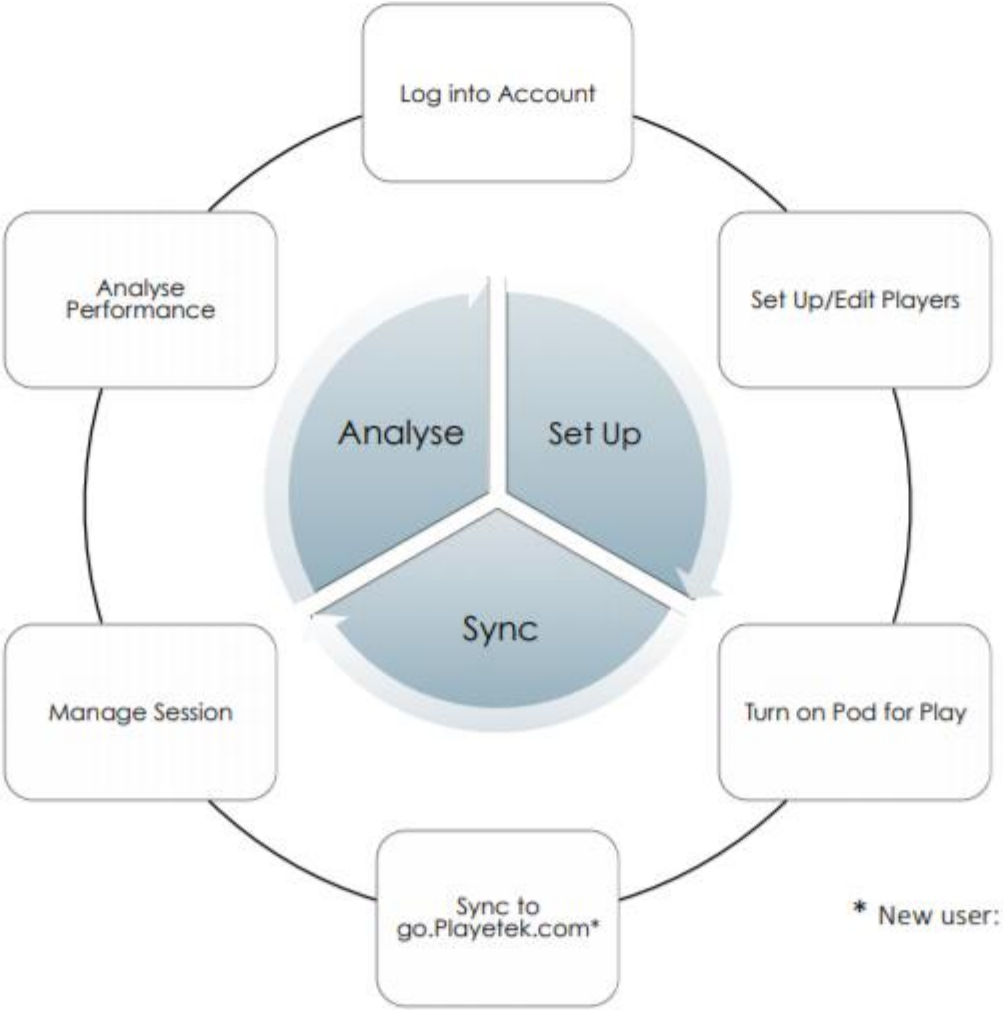
Gives us objective information to potentially effect change (actionable insight)

Objective data to aid in Practice planning and preparation for competition/practice

Use the 30-15IFT prescription to manipulate training variables to target specific adaptations associated with game/training data

PLAYERTEK

by Catapult



Log into Account

Set Up/Edit Players

Turn on Pod for Play

Sync to go.Playetek.com*

Manage Session

Analyse Performance

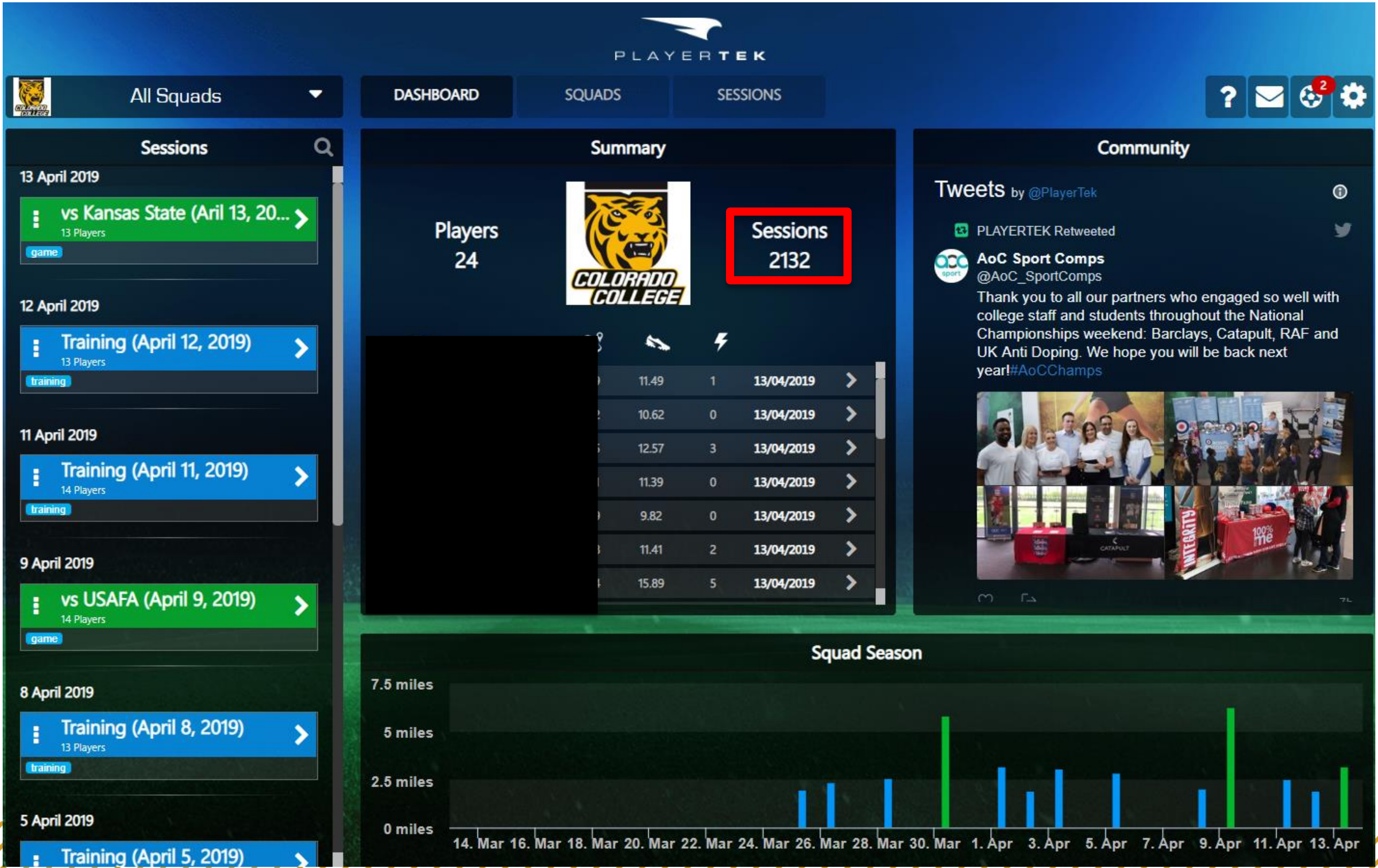
Analyse

Set Up

Sync

* New user: sync tool must be downloaded

COLORADO
COLLEGE


PLAYERTEK
All Squads
DASHBOARD
SQUADS
SESSIONS
2

Sessions

13 April 2019
vs Kansas State (Aril 13, 20...
13 Players
game

12 April 2019
Training (April 12, 2019)
13 Players
training

11 April 2019
Training (April 11, 2019)
14 Players
training

9 April 2019
vs USAFA (April 9, 2019)
14 Players
game

8 April 2019
Training (April 8, 2019)
13 Players
training

5 April 2019
Training (April 5, 2019)

Summary

Players
24

Sessions
2132

[redacted]	11.49	1	13/04/2019
[redacted]	10.62	0	13/04/2019
[redacted]	12.57	3	13/04/2019
[redacted]	11.39	0	13/04/2019
[redacted]	9.82	0	13/04/2019
[redacted]	11.41	2	13/04/2019
[redacted]	15.89	5	13/04/2019

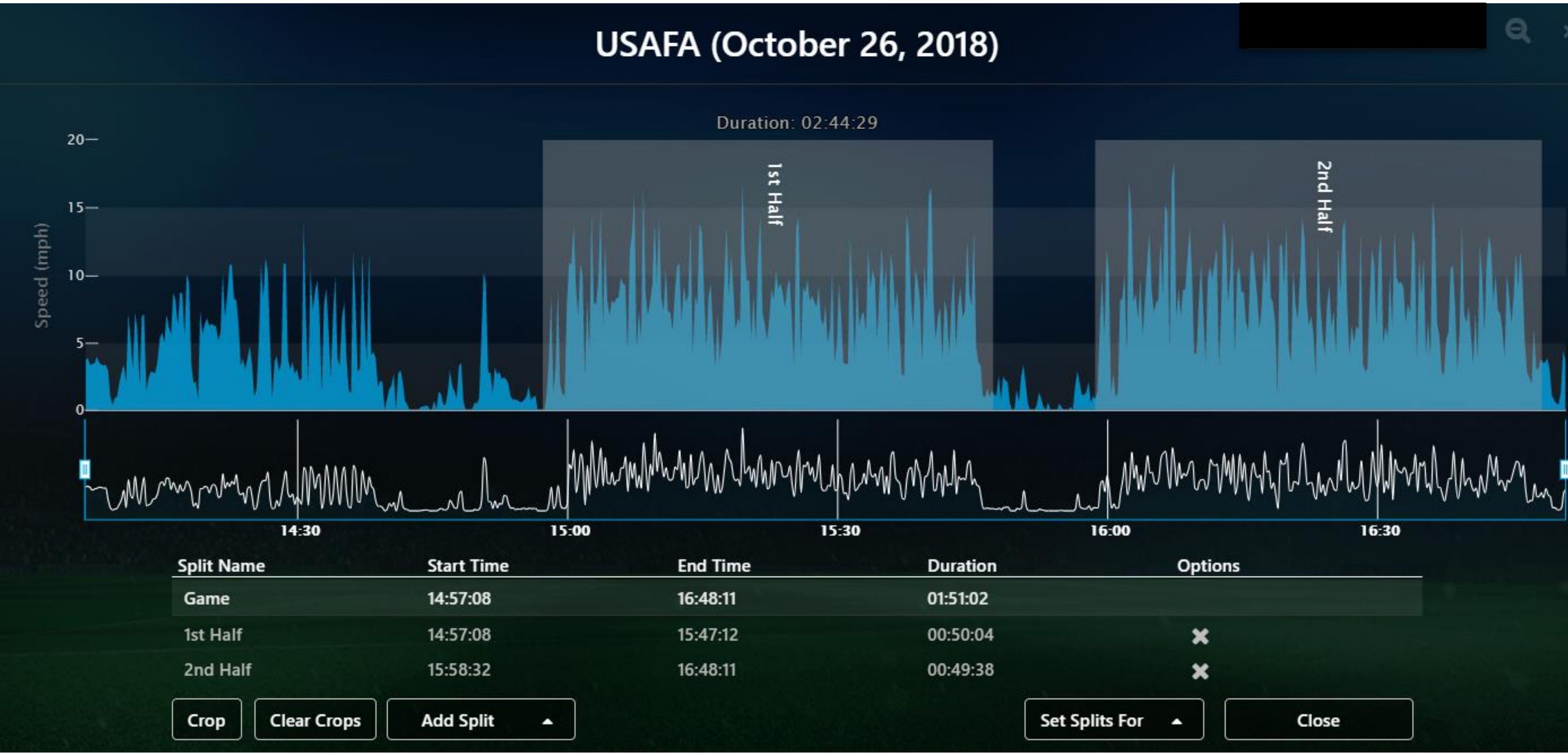
Community

Tweets by @PlayerTek

PLAYERTEK Retweeted
AoC Sport Comps
@AoC_SportComps
Thank you to all our partners who engaged so well with college staff and students throughout the National Championships weekend: Barclays, Catapult, RAF and UK Anti Doping. We hope you will be back next year!#AoCChamps

Squad Season

7.5 miles
5 miles
2.5 miles
0 miles
14. Mar
16. Mar
18. Mar
20. Mar
22. Mar
24. Mar
26. Mar
28. Mar
30. Mar
1. Apr
3. Apr
5. Apr
7. Apr
9. Apr
11. Apr
13. Apr



[redacted]

USAFA (October 26, 2018)

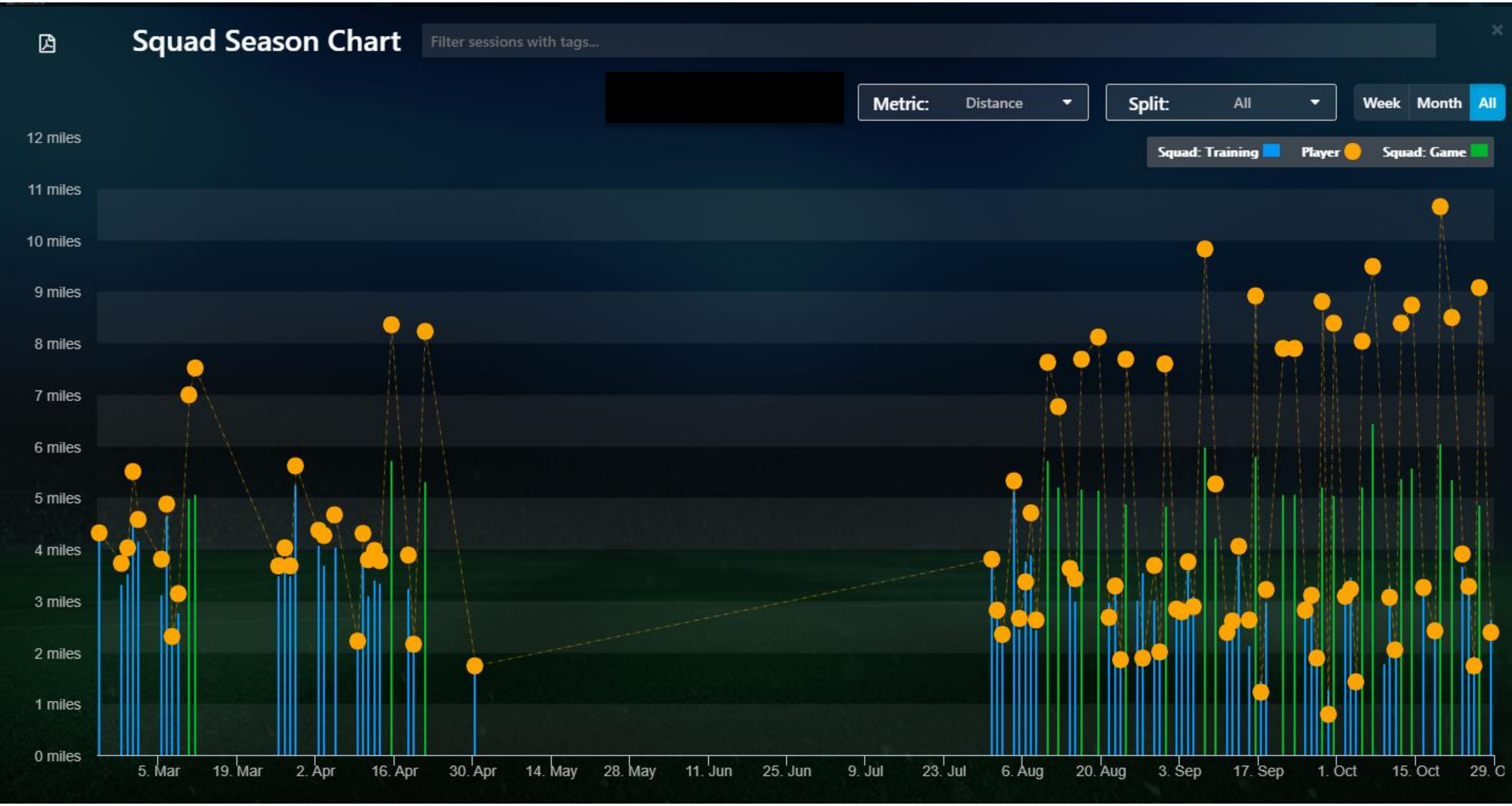
Duration: 02:44:29

Speed (mph)
20
15
10
5
0
1st Half
2nd Half
14:30
15:00
15:30
16:00
16:30

Split Name	Start Time	End Time	Duration	Options
Game	14:57:08	16:48:11	01:51:02	
1st Half	14:57:08	15:47:12	00:50:04	✖
2nd Half	15:58:32	16:48:11	00:49:38	✖

Crop
Clear Crops
Add Split ▲
Set Splits For ▲
Close

COLORADO
COLLEGE



Squad Season Chart

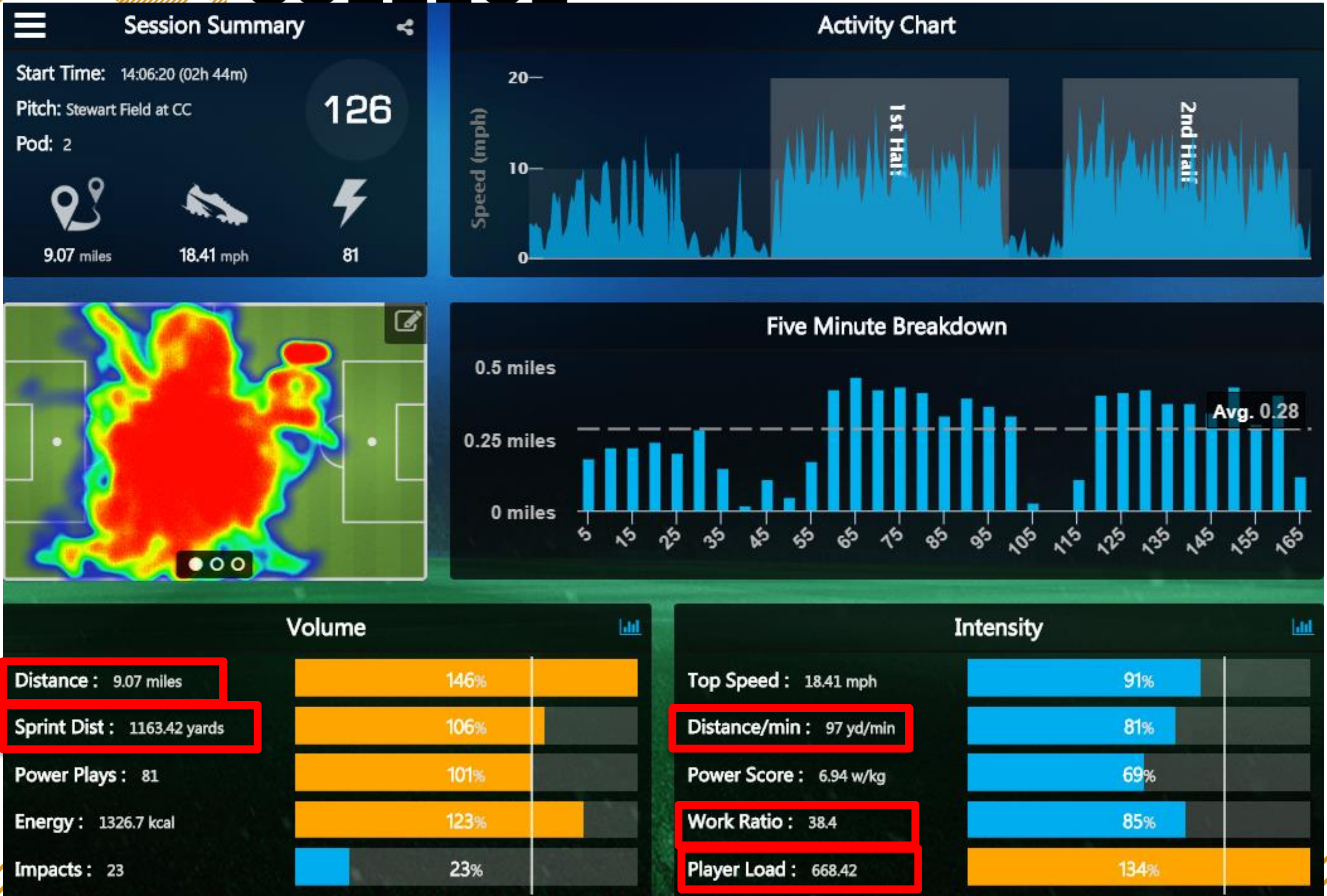
Filter sessions with tags...

[redacted]

Metric: Distance

Split: All

COLORADO
COLLEGE



Session Summary

Start Time: 14:06:20 (02h 44m)
Pitch: Stewart Field at CC
Pod: 2

126

9.07 miles
18.41 mph
81

Activity Chart
Speed (mph)
20
10
0
1st Half
2nd Half
Five Minute Breakdown
0.5 miles
0.25 miles
0 miles
Avg. 0.28
5
15
25
35
45
55
65
75
85
95
105
115
125
135
145
155
165

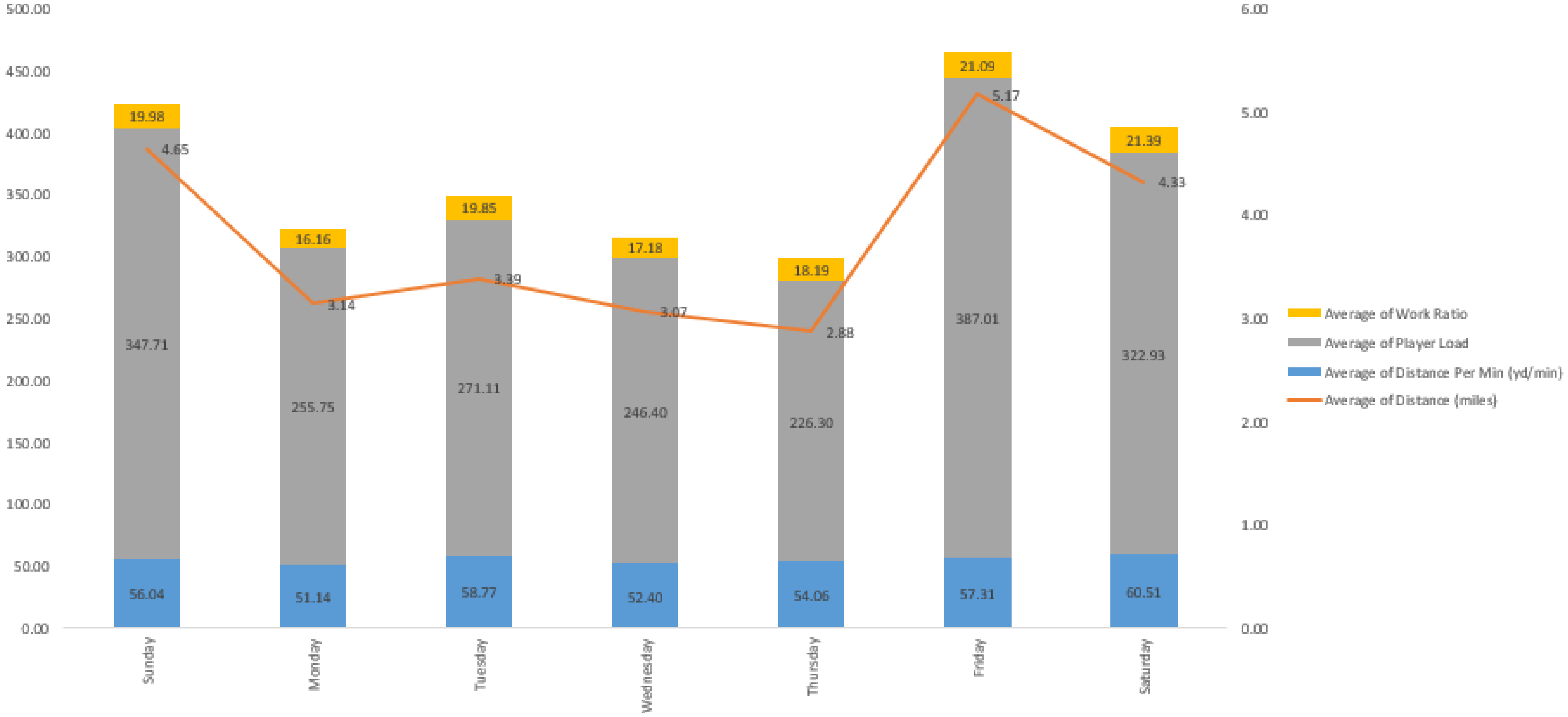
Volume

Distance : 9.07 miles	146%
Sprint Dist : 1163.42 yards	106%
Power Plays : 81	101%
Energy : 1326.7 kcal	123%
Impacts : 23	23%

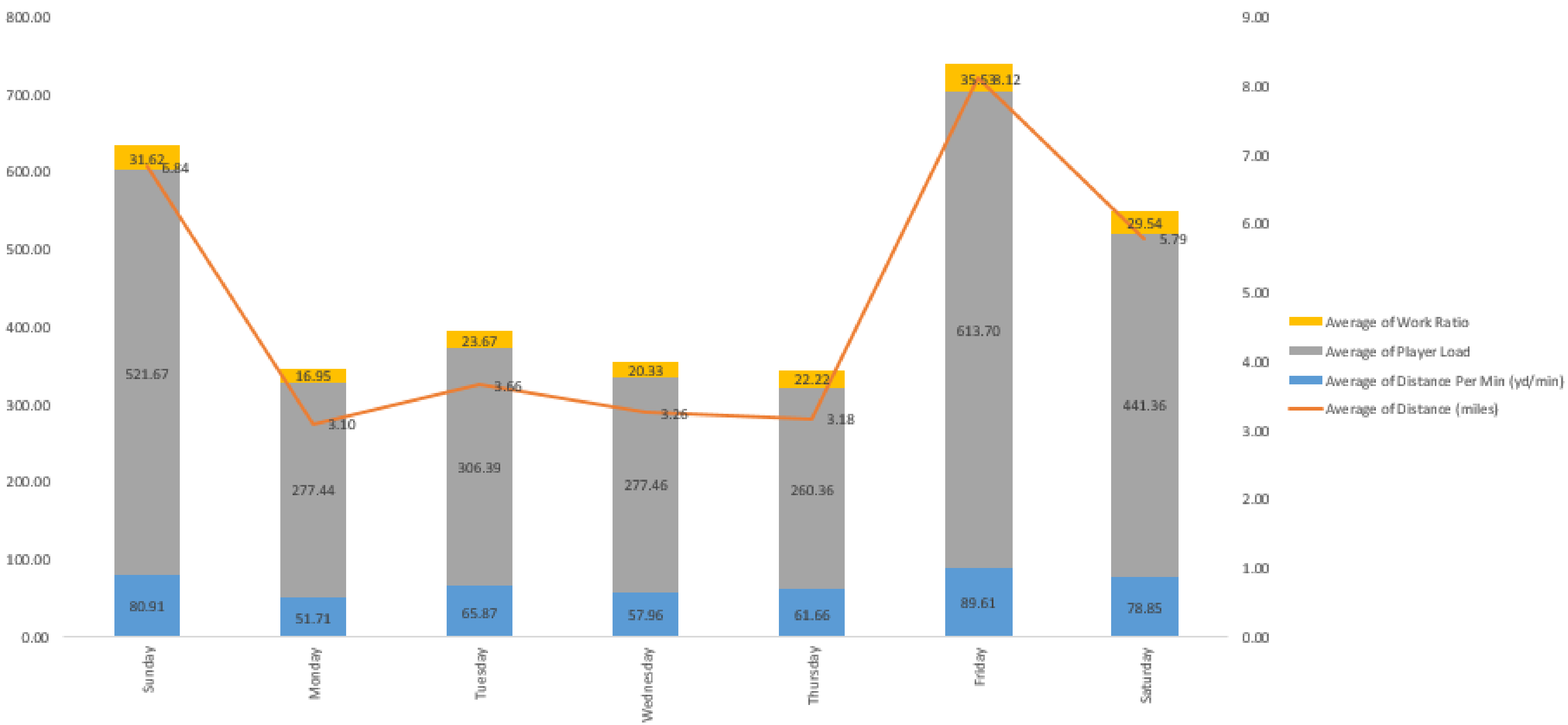
Intensity

Top Speed : 18.41 mph	91%
Distance/min : 97 yd/min	81%
Power Score : 6.94 w/kg	69%
Work Ratio : 38.4	85%
Player Load : 668.42	134%

COLORADO
COLLEGE

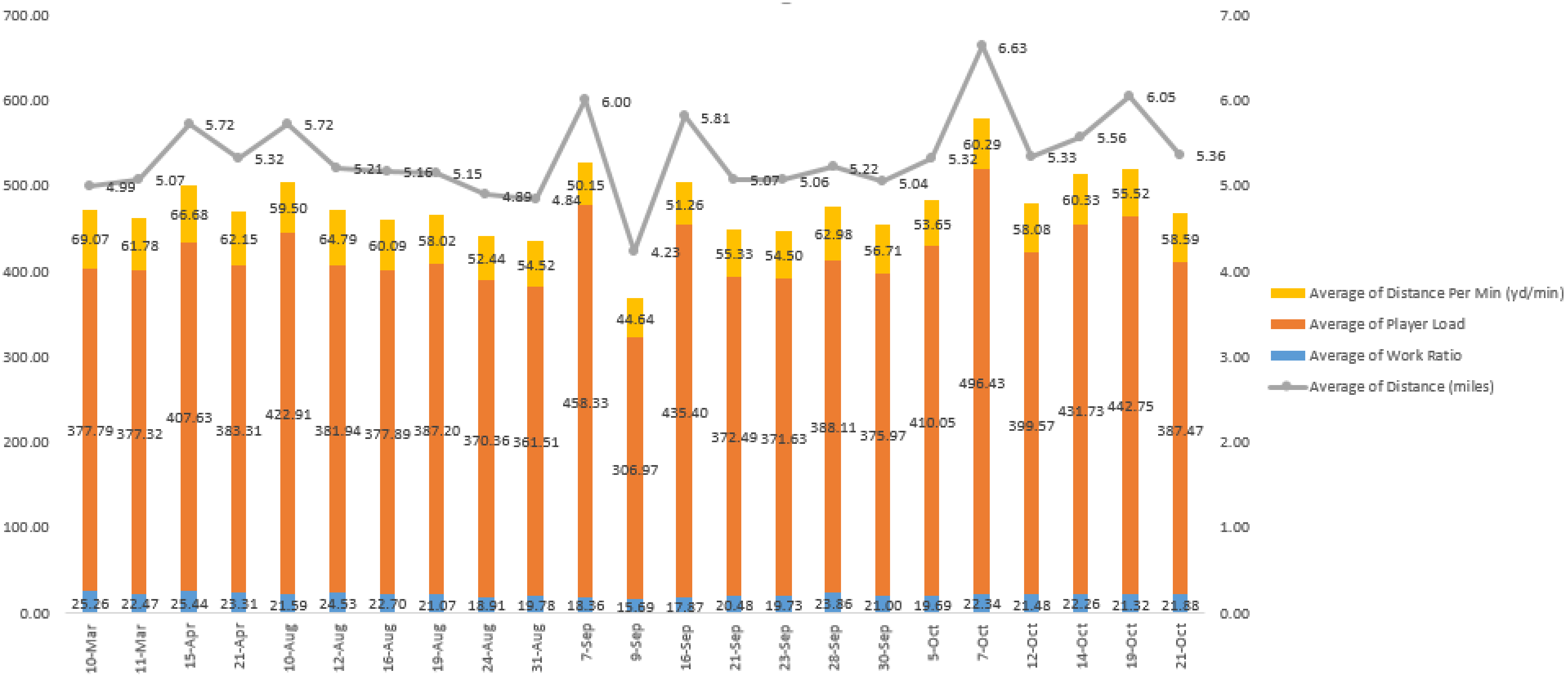


‘Season’ - Team Averages



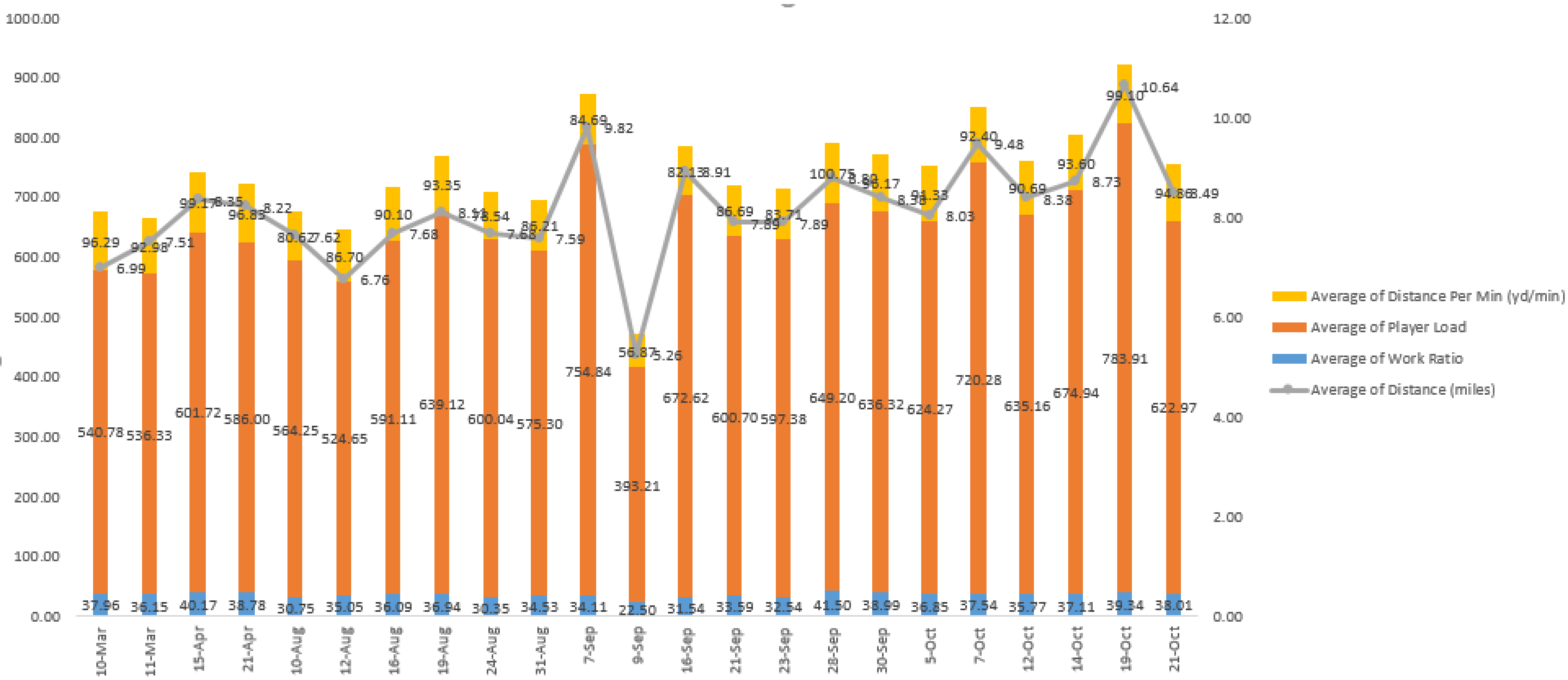
‘Season’ - Individual Data

COLORADO COLLEGE



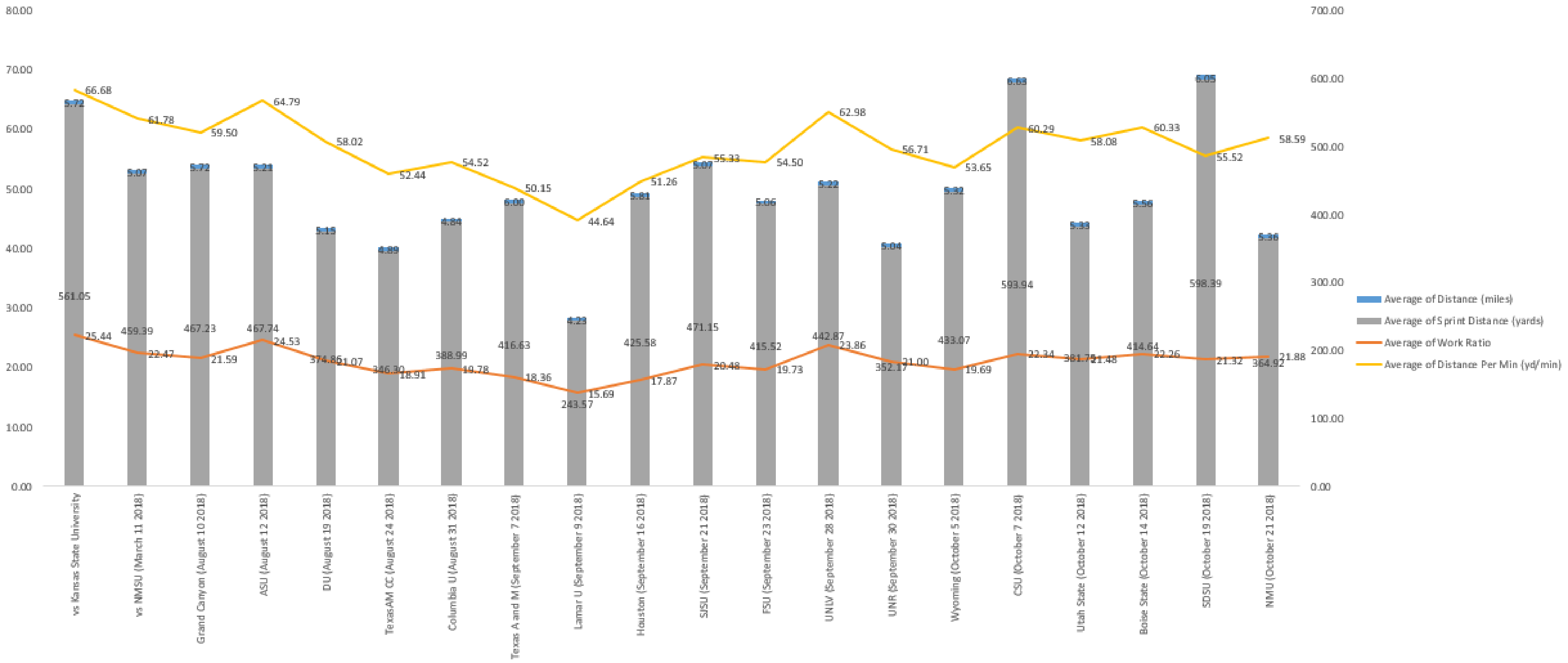
Game Data - Team Average

COLORADO
COLLEGE



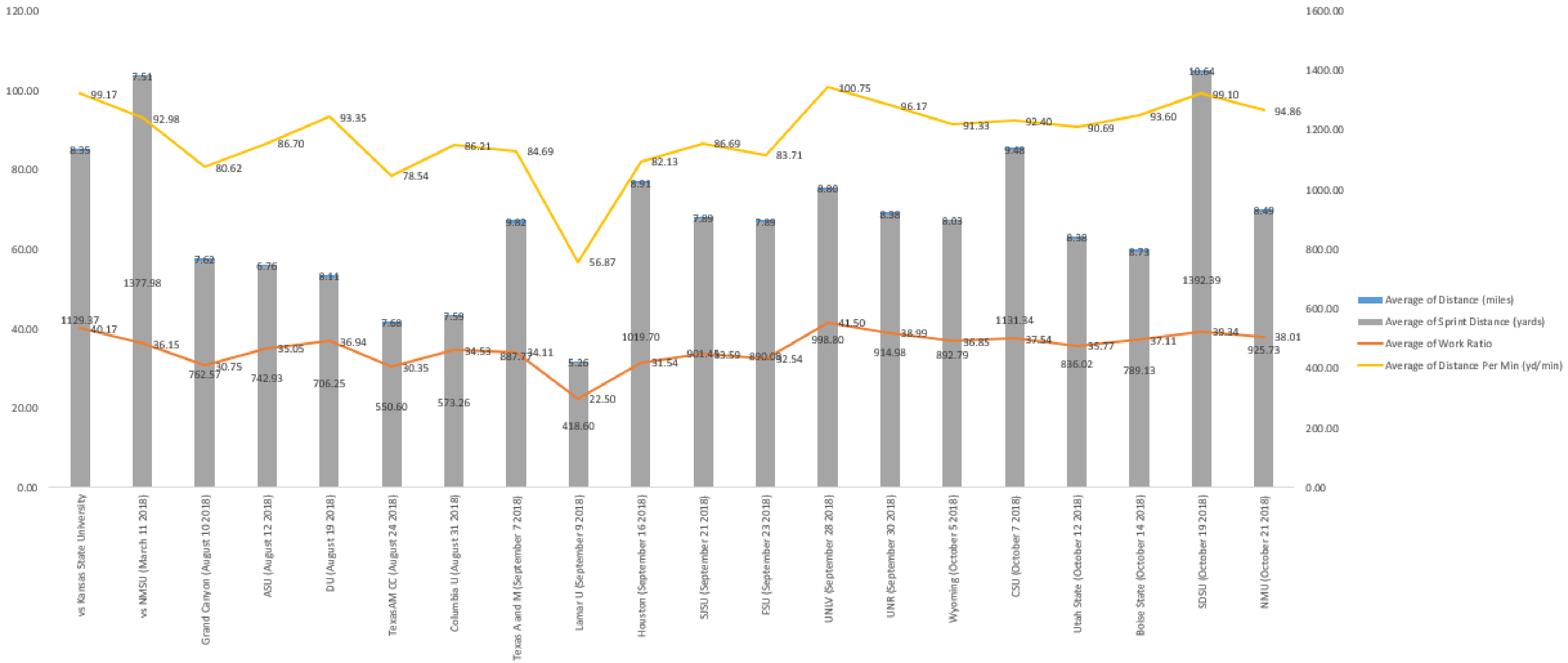
Game Data - Individual

COLORADO
COLLEGE



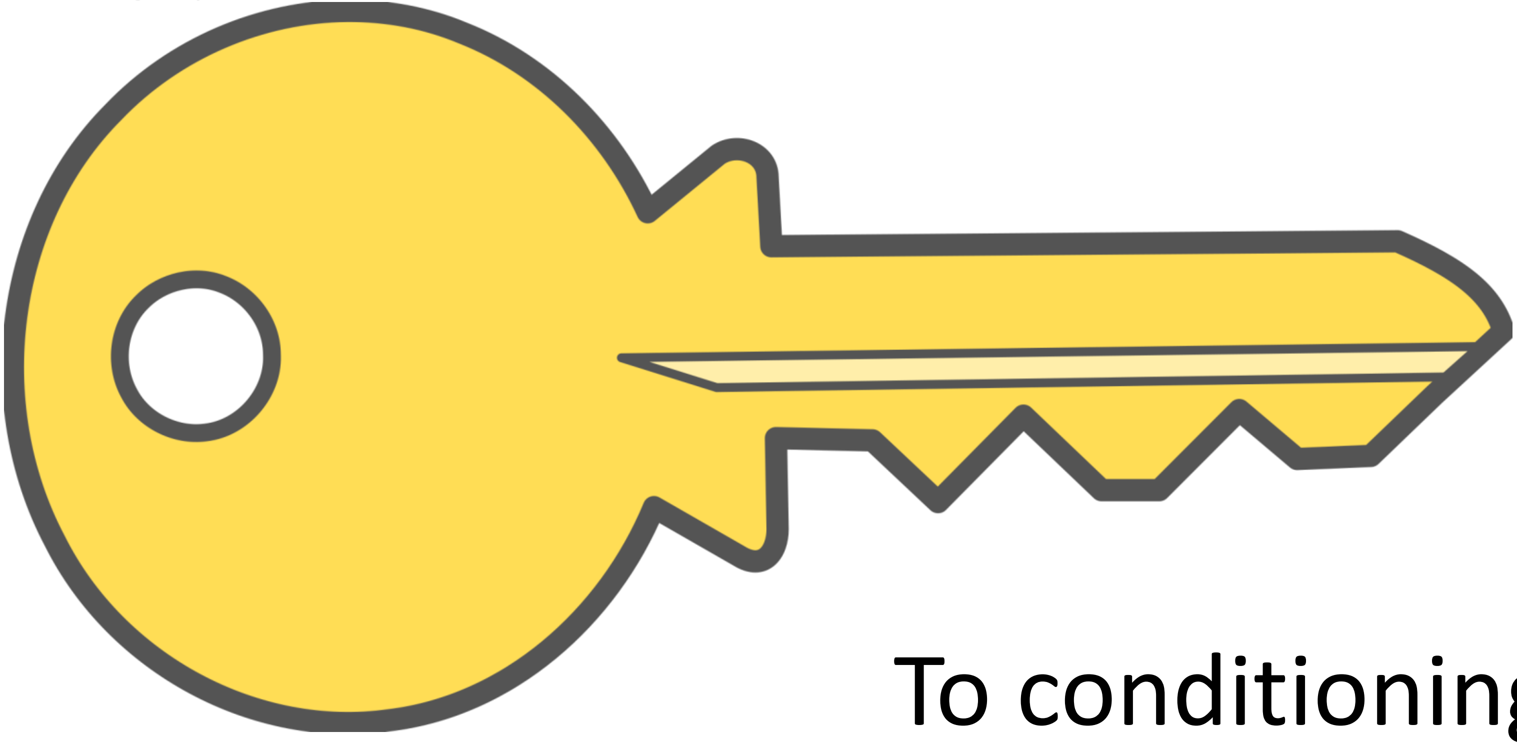
Sprint Distance Game Data - Team Average

COLORADO COLLEGE



Sprint Distance Game Data - Individual

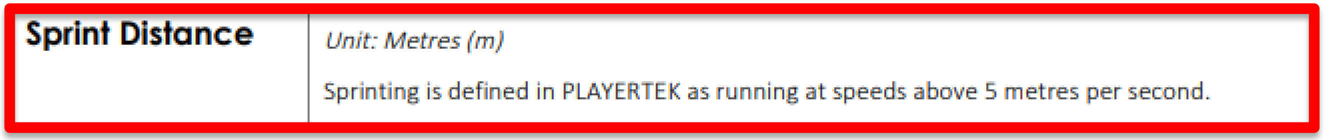
Our



To conditioning

COLORADO
COLLEGE

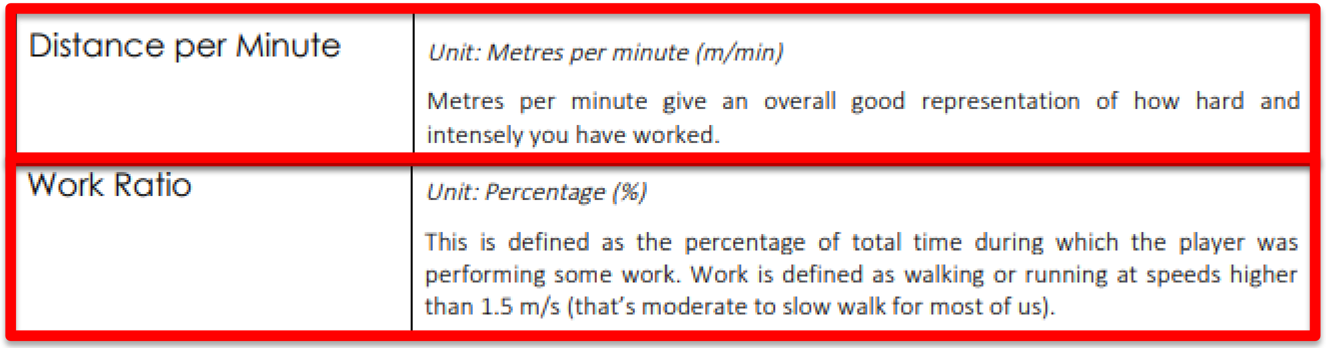
VOLUME METRICS



Sprint Distance	*Unit: Metres (m)* Sprinting is defined in PLAYERTEK as running at speeds above 5 metres per second.

Which is 11mph ☺

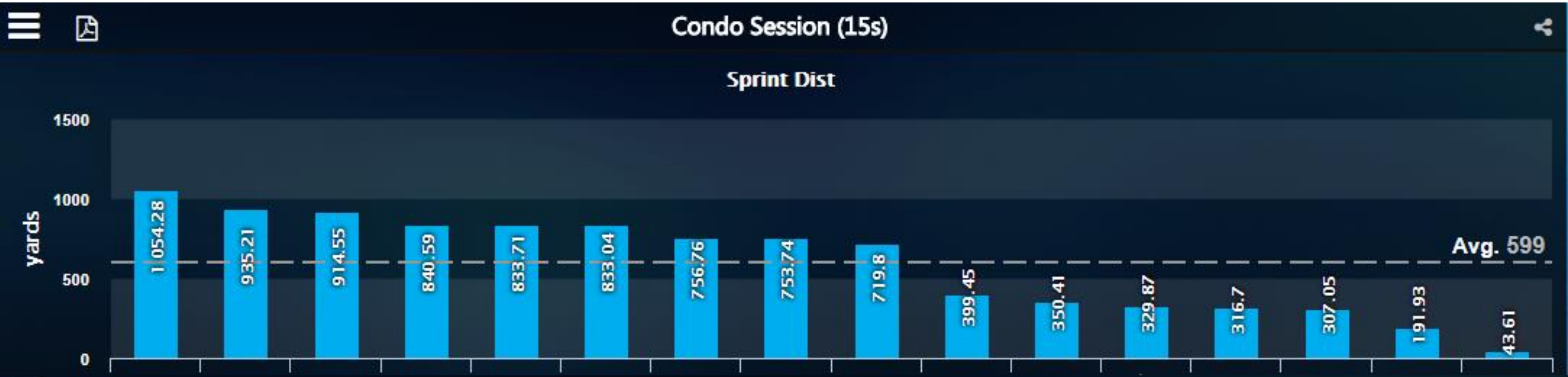
Intensity METRICS

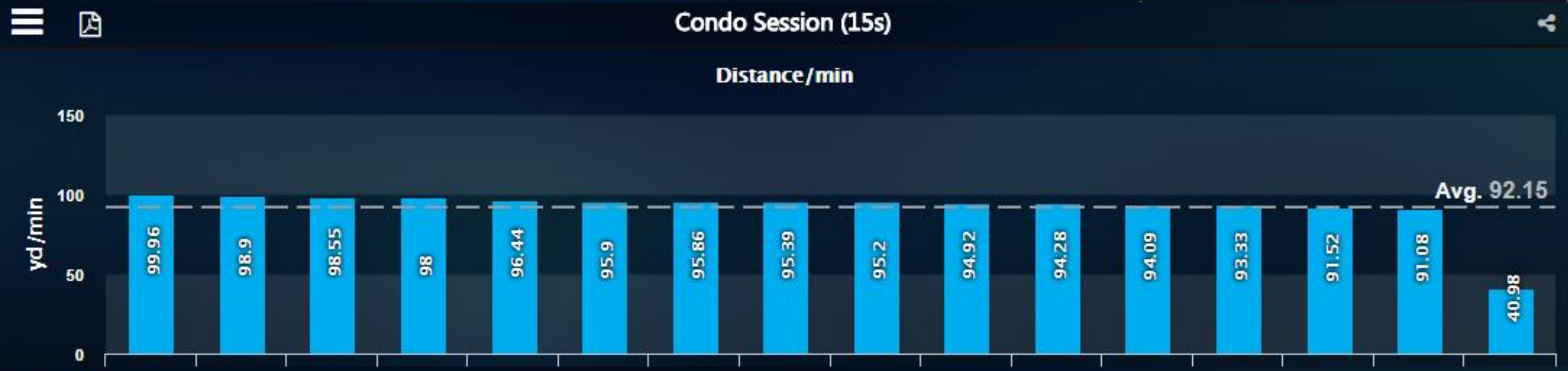


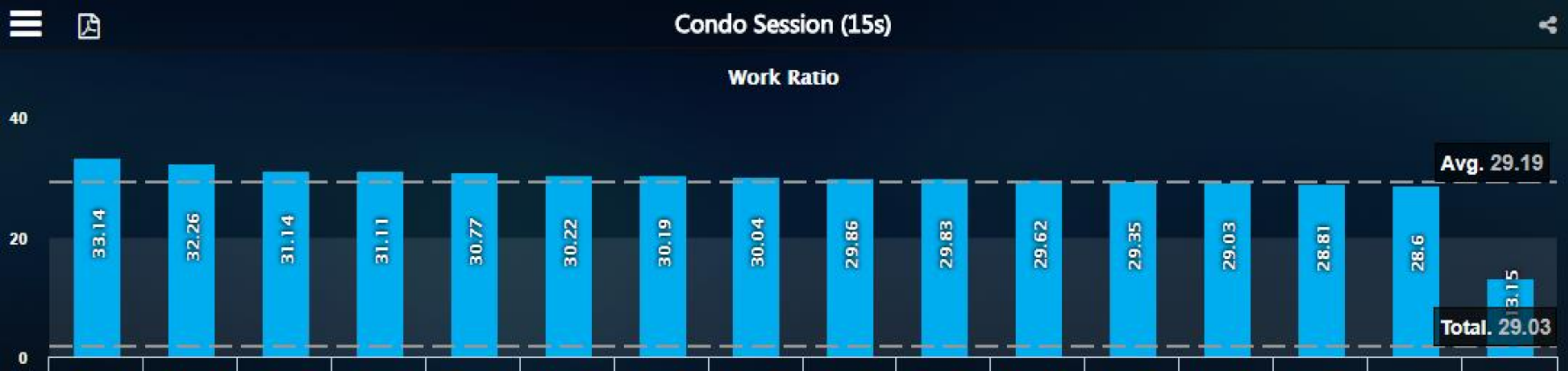
Distance per Minute	*Unit: Metres per minute (m/min)* Metres per minute give an overall good representation of how hard and intensely you have worked.
Work Ratio	*Unit: Percentage (%)* This is defined as the percentage of total time during which the player was performing some work. Work is defined as walking or running at speeds higher than 1.5 m/s (that's moderate to slow walk for most of us).

Which is 3.5mph ☺

IFT Card 11A – 15sec:15sec x14 @95%, Rest 6min, REPEAT



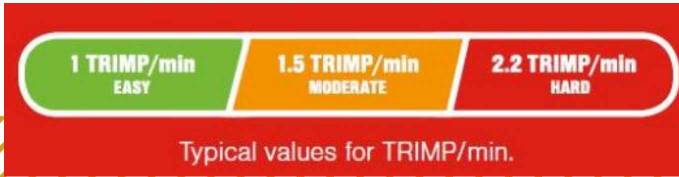




Hard training: TRIMP >140

Moderate training: TRIMP 70-140

Easy training: TRIMP < 70

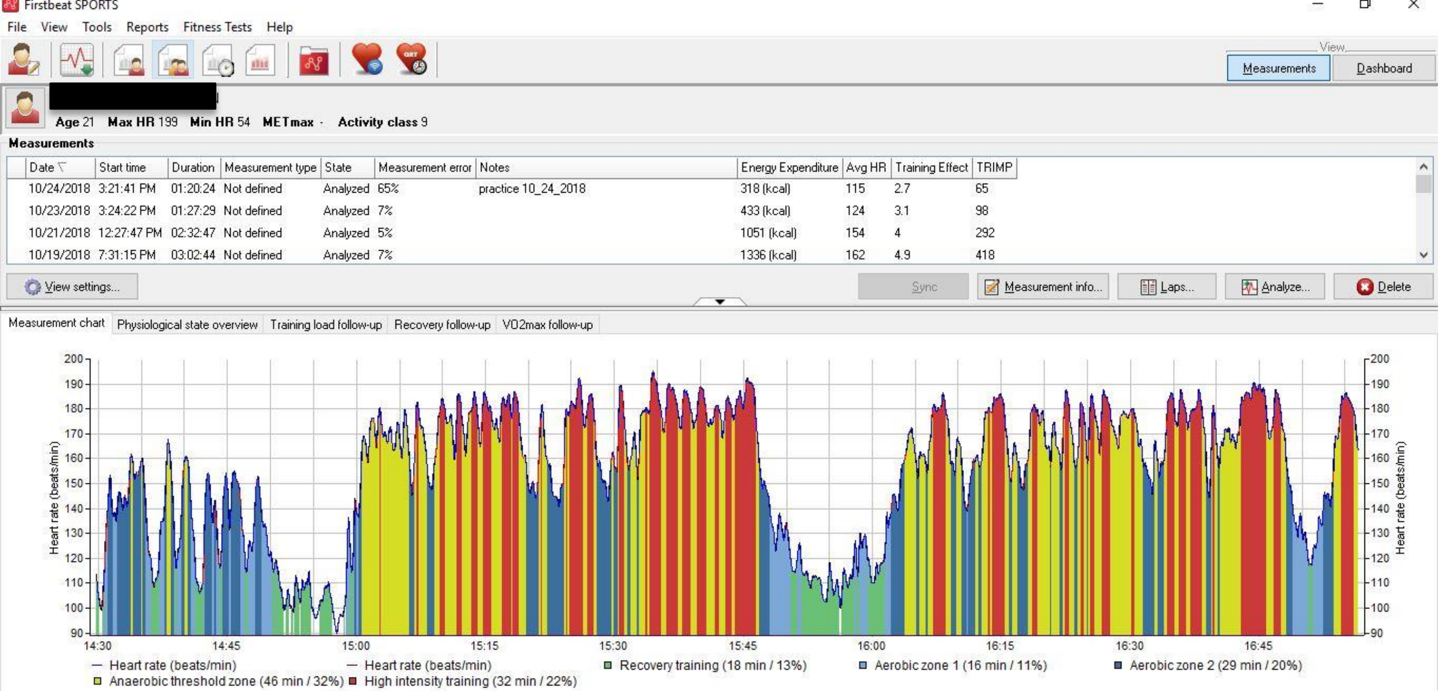


1 TRIMP/min
EASY

1.5 TRIMP/min
MODERATE

2.2 TRIMP/min
HARD

Typical values for TRIMP/min.


Firstbeat SPORTS
File View Tools Reports Fitness Tests Help
View
Measurements
Dashboard

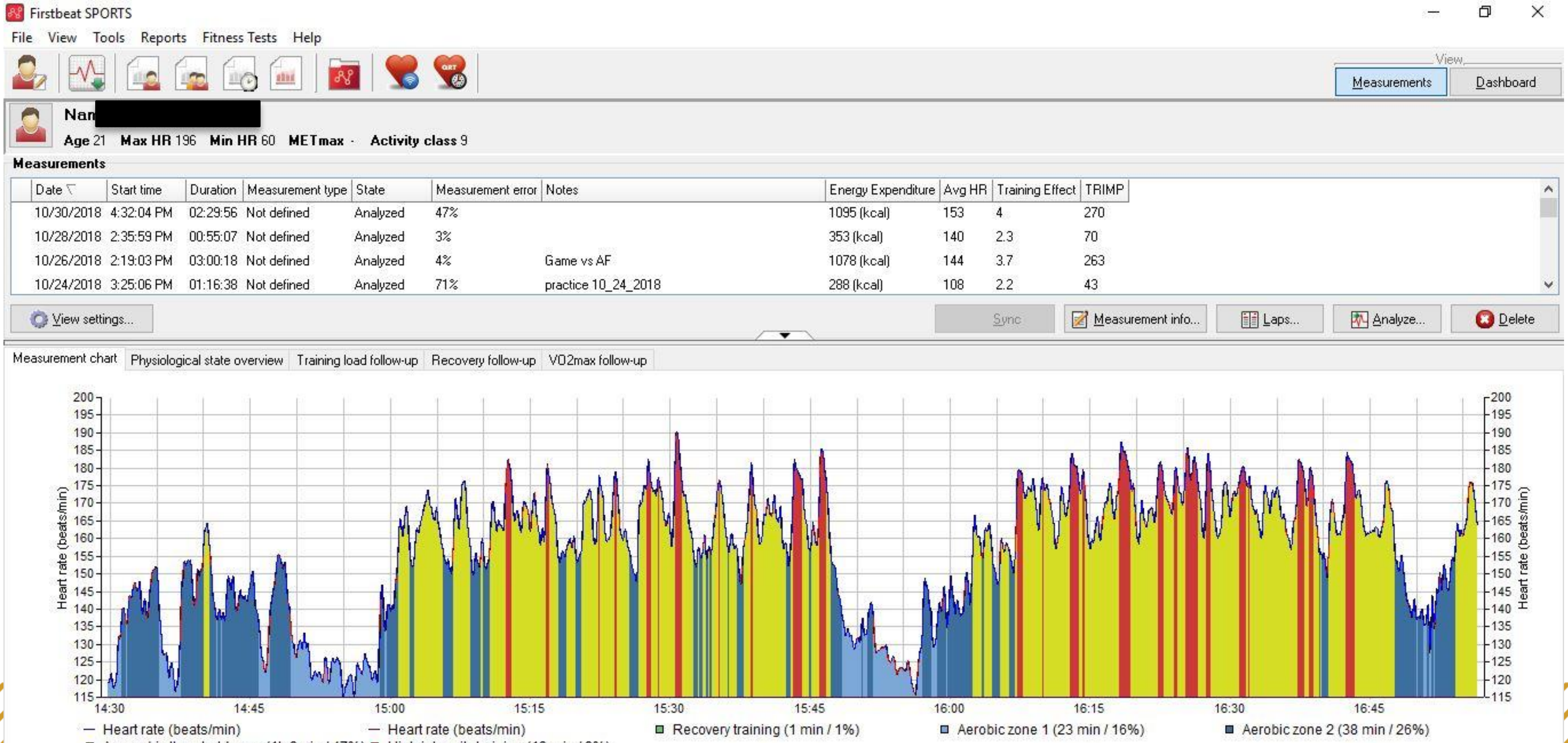
[redacted]

Age 21 **Max HR** 199 **Min HR** 54 **METmax** - **Activity class** 9

Measurements

Date	Start time	Duration	Measurement type	State	Measurement error	Notes	Energy Expenditure	Avg HR	Training Effect	TRIMP
10/24/2018	3:21:41 PM	01:20:24	Not defined	Analyzed	65%	practice 10_24_2018	318 (kcal)	115	2.7	65
10/23/2018	3:24:22 PM	01:27:29	Not defined	Analyzed	7%		433 (kcal)	124	3.1	98
10/21/2018	12:27:47 PM	02:32:47	Not defined	Analyzed	5%		1051 (kcal)	154	4	292
10/19/2018	7:31:15 PM	03:02:44	Not defined	Analyzed	7%		1336 (kcal)	162	4.9	418

View settings...
Sync
Measurement info...
Laps...
Analyze...
Delete
Measurement chart
Physiological state overview
Training load follow-up
Recovery follow-up
VO2max follow-up
Heart rate (beats/min)
200
190
180
170
160
150
140
130
120
110
100
90
14:30
14:45
15:00
15:15
15:30
15:45
16:00
16:15
16:30
16:45
Heart rate (beats/min)
Heart rate (beats/min)
Recovery training (18 min / 13%)
Aerobic zone 1 (16 min / 11%)
Aerobic zone 2 (29 min / 20%)
Anaerobic threshold zone (46 min / 32%)
High intensity training (32 min / 22%)


Firstbeat SPORTS
File View Tools Reports Fitness Tests Help
View
Measurements
Dashboard

Nam[redacted]

Age 21 **Max HR** 196 **Min HR** 60 **METmax** - **Activity class** 9

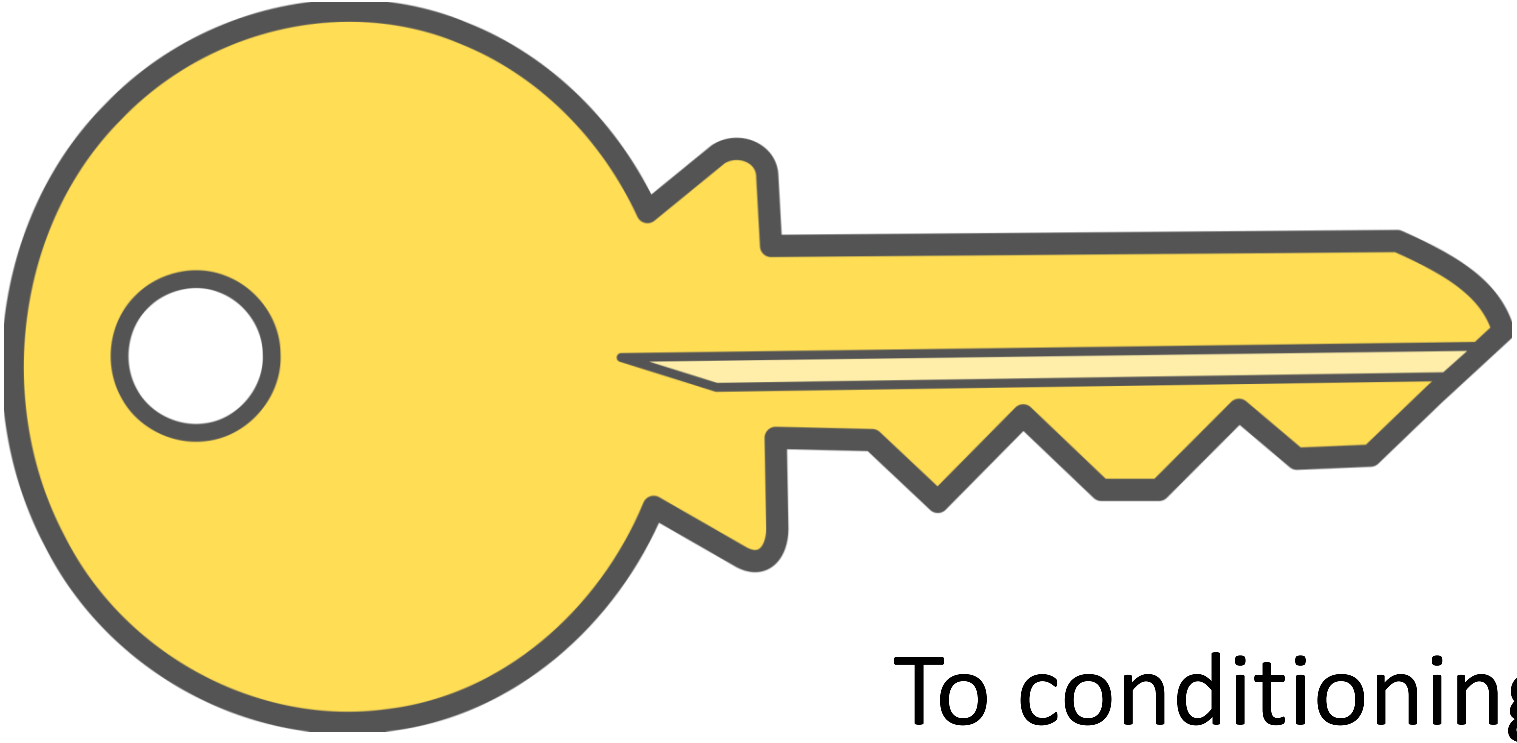
Measurements

Date	Start time	Duration	Measurement type	State	Measurement error	Notes	Energy Expenditure	Avg HR	Training Effect	TRIMP
10/30/2018	4:32:04 PM	02:29:56	Not defined	Analyzed	47%		1095 (kcal)	153	4	270
10/28/2018	2:35:59 PM	00:55:07	Not defined	Analyzed	3%		353 (kcal)	140	2.3	70
10/26/2018	2:19:03 PM	03:00:18	Not defined	Analyzed	4%	Game vs AF	1078 (kcal)	144	3.7	263
10/24/2018	3:25:06 PM	01:16:38	Not defined	Analyzed	71%	practice 10_24_2018	288 (kcal)	108	2.2	43

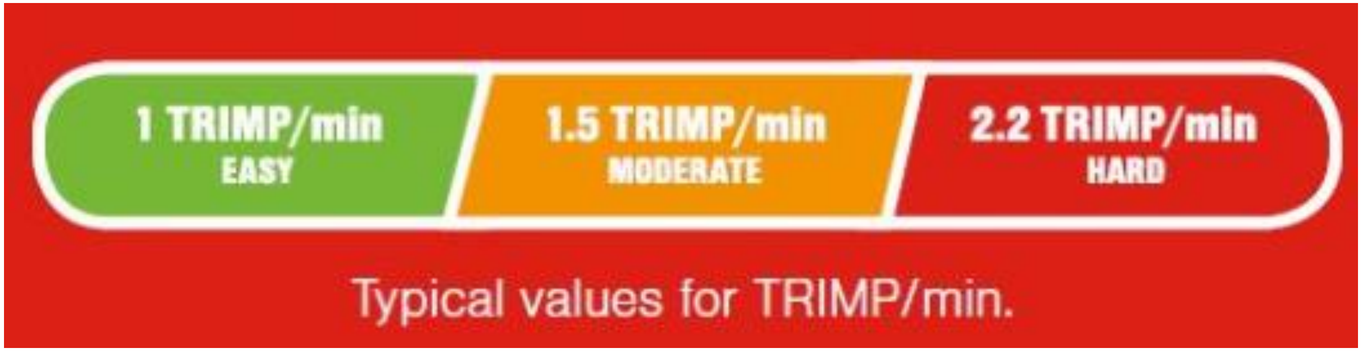
View settings...
Sync
Measurement info...
Laps...
Analyze...
Delete
Measurement chart
Physiological state overview
Training load follow-up
Recovery follow-up
VO2max follow-up
Heart rate (beats/min)
200
195
190
185
180
175
170
165
160
155
150
145
140
135
130
125
120
115
14:30
14:45
15:00
15:15
15:30
15:45
16:00
16:15
16:30
16:45
Heart rate (beats/min)
Heart rate (beats/min)
Recovery training (1 min / 1%)
Aerobic zone 1 (23 min / 16%)
Aerobic zone 2 (38 min / 26%)

COLORADO
COLLEGE

Our



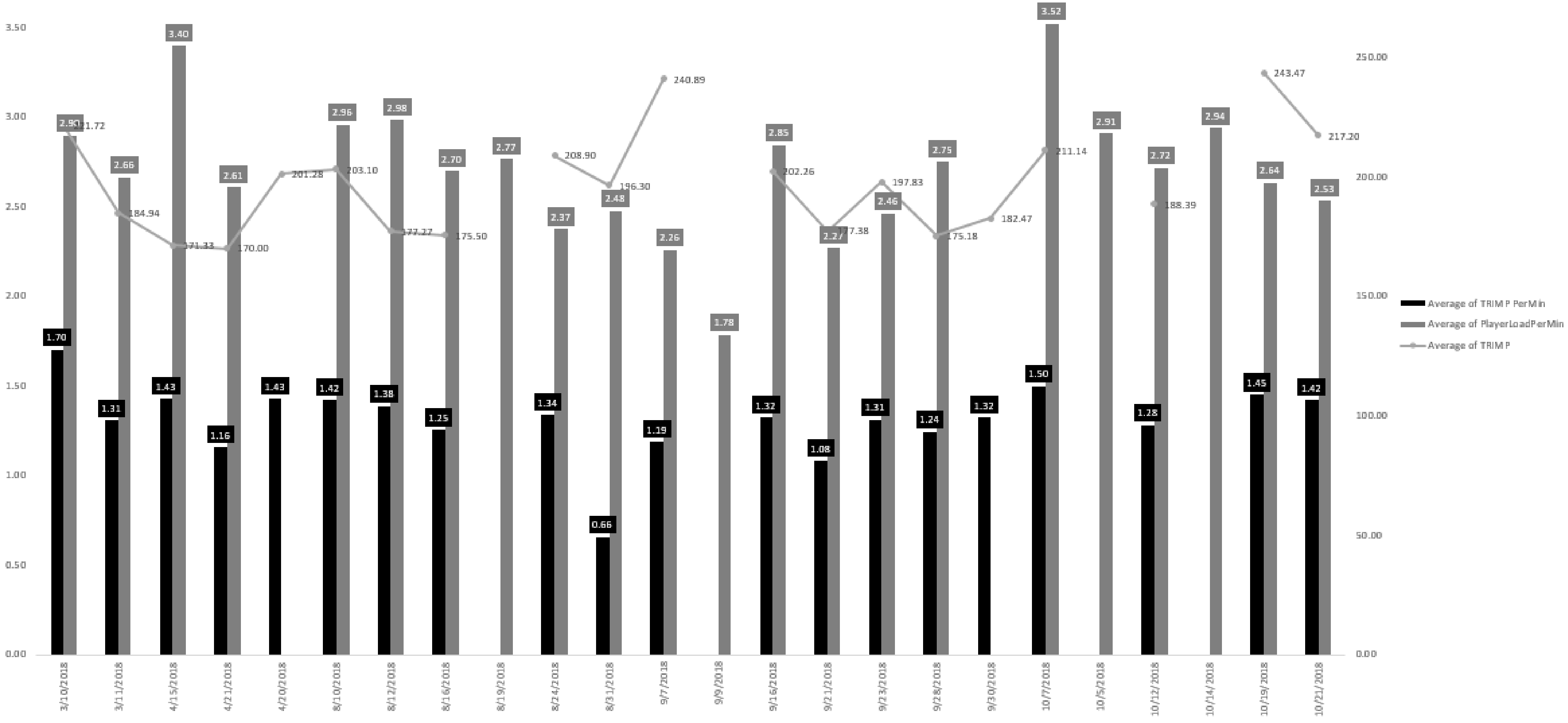
To conditioning


1 TRIMP/min
EASY
1.5 TRIMP/min
MODERATE
2.2 TRIMP/min
HARD

Typical values for TRIMP/min.

Game Data - Team Average

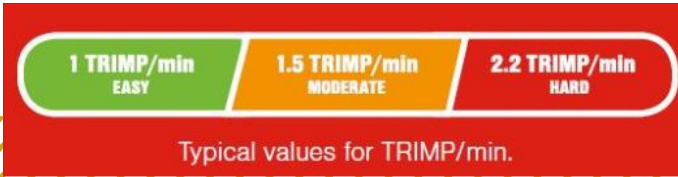
COLORADO COLLEGE



Hard training: TRIMP >140

Moderate training: TRIMP 70-140

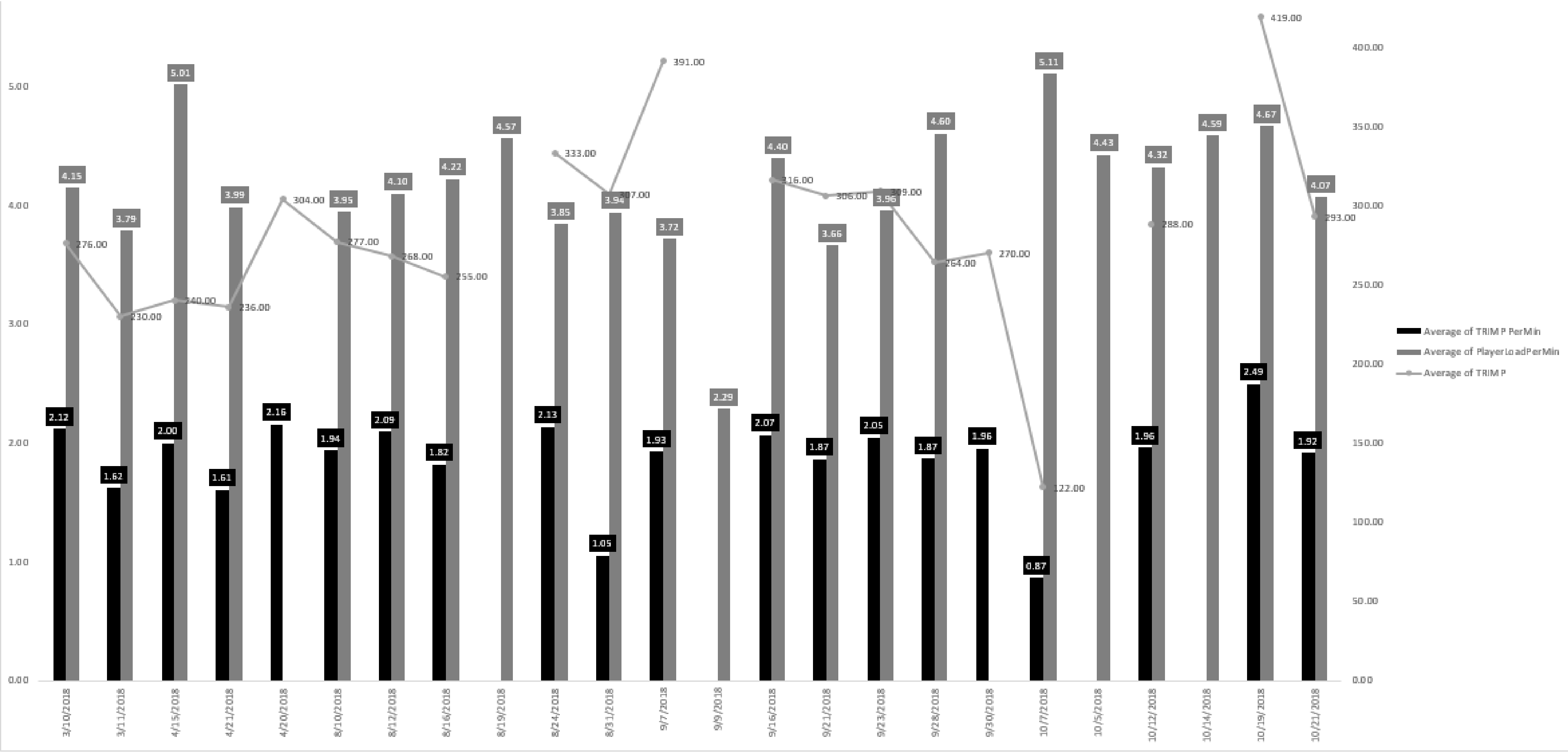
Easy training: TRIMP < 70


1 TRIMP/min
EASY
1.5 TRIMP/min
MODERATE
2.2 TRIMP/min
HARD

Typical values for TRIMP/min.

Game Data - Individual

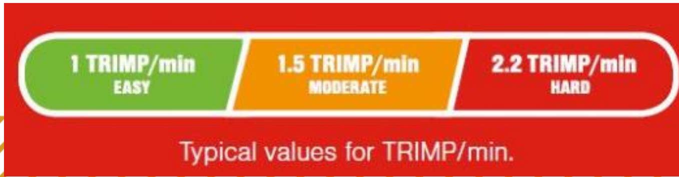
COLORADO COLLEGE



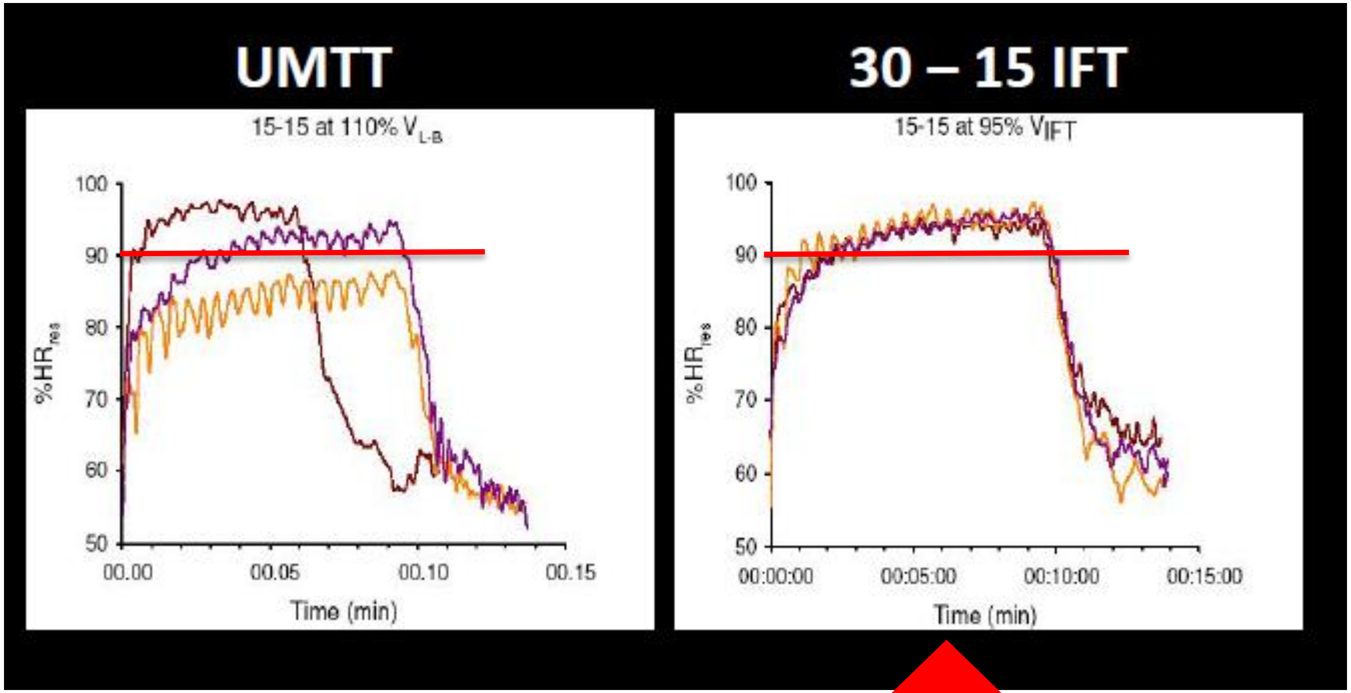
Hard training: TRIMP >140

Moderate training: TRIMP 70-140

Easy training: TRIMP < 70


1 TRIMP/min
EASY
1.5 TRIMP/min
MODERATE
2.2 TRIMP/min
HARD

Typical values for TRIMP/min.



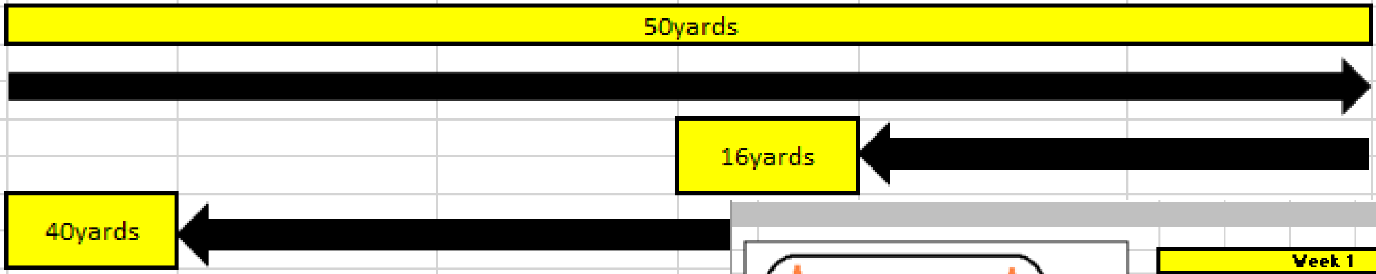
HR Response for 30-15IFT…

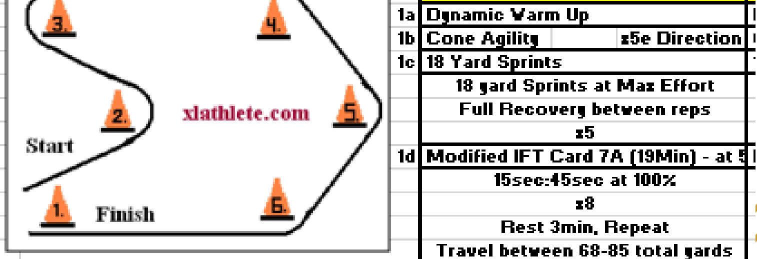
How we target TRIMP permin

Modified IFT Card - Promote Work at 80-90% of MaxHR

Card #	7A		% of Max	100%	Shuttle Length (yds)	50
Total Time	19.00					
					Total Distance	
			Number of Sets		Set 1	Set 2
Work	15		Time	8.00	717.2	717
Rest	45		Rest Between Sets	3	529.4	529
Reps w/ in Set	8		Number of Sets	2	**Total For Set1/2**	1434.4 1058.8

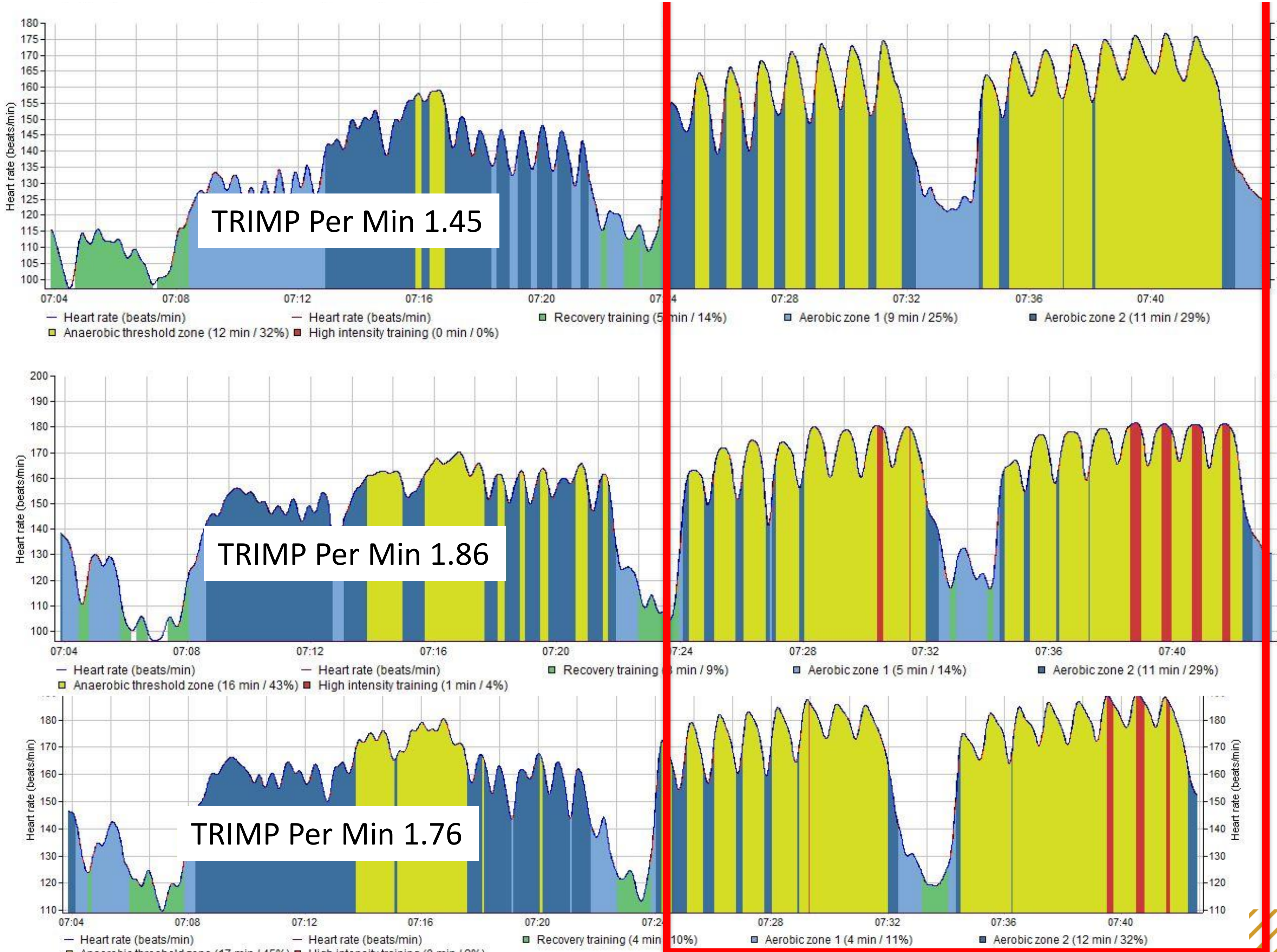
Name	**Max IFT**	**Straight Dist. (yds)**	**Shuttle Dist (yds)**	**# of Shuttles**	**Additional Yards**	**Treadmill Speed 1% Incline**
	21	95	90	1	40	13
	20.5	93	88	1	38	12.7
	20	91	85	1	35	12.4
	19.5	89	83	1	33	12.1
	19	86	81	1	31	11.8
	18.5	84	79	1	29	11.5
	18	82	77	1	27	11.1
	17.5	79	75	1	25	10.8
	17	77	73	1	23	10.5
	16.5	75	70	1	20	10.2
	16	73	68	1	18	9.9
	15.5	70	66	1	16	9.6

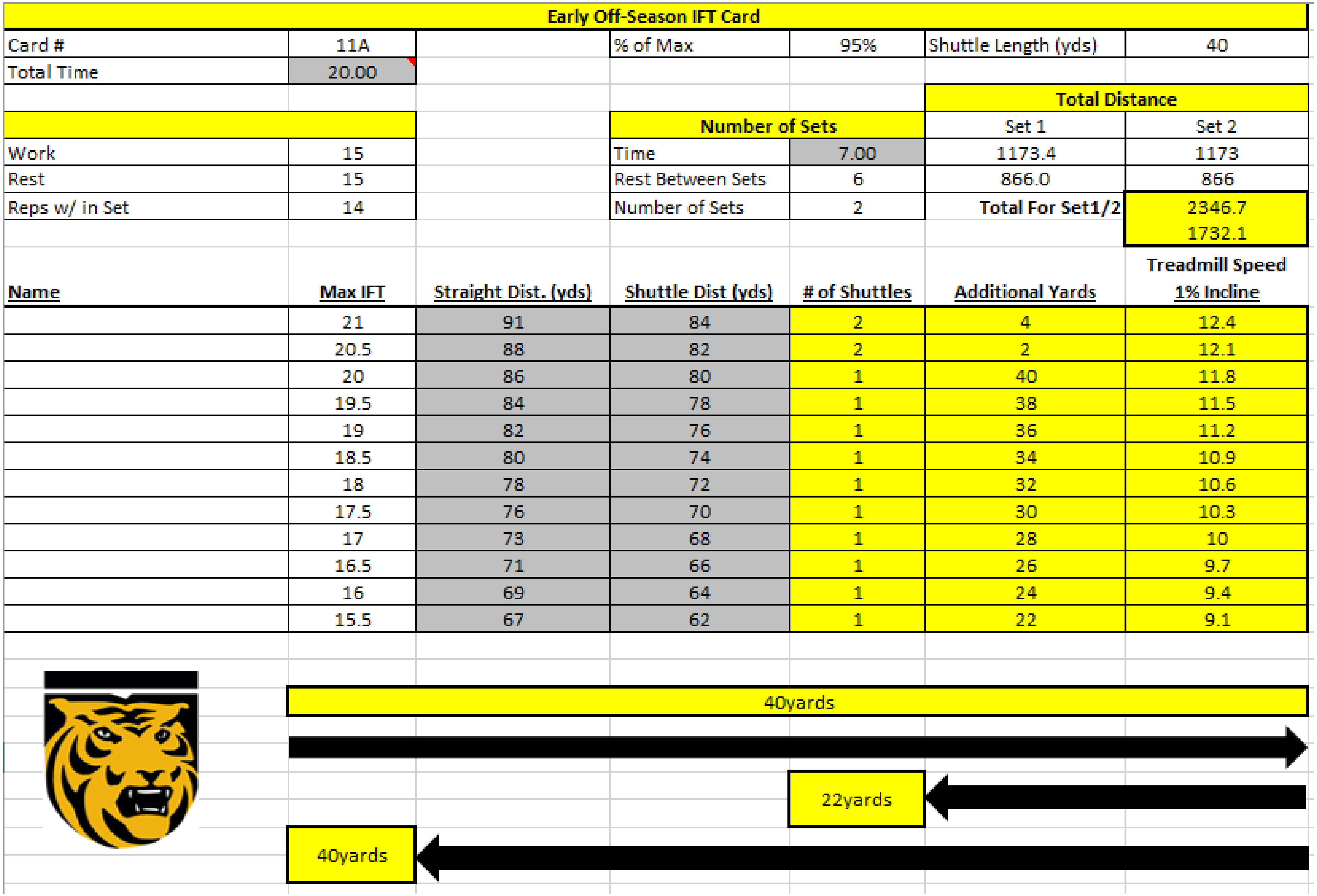




	Week 1	
1a	Dynamic Warm Up	
1b	Cone Agility	x5e Direction
1c	18 Yard Sprints	
	18 yard Sprints at Max Effort	
	Full Recovery between reps	
	x5	
1d	Modified IFT Card 7A (19Min) - at 5	
	15sec:45sec at 100%	
	x8	
	Rest 3min, Repeat	
	Travel between 68-85 total yards	

Modified IFT Card 7A – 15sec:45sec x8 @100%, Rest 3min, REPEAT



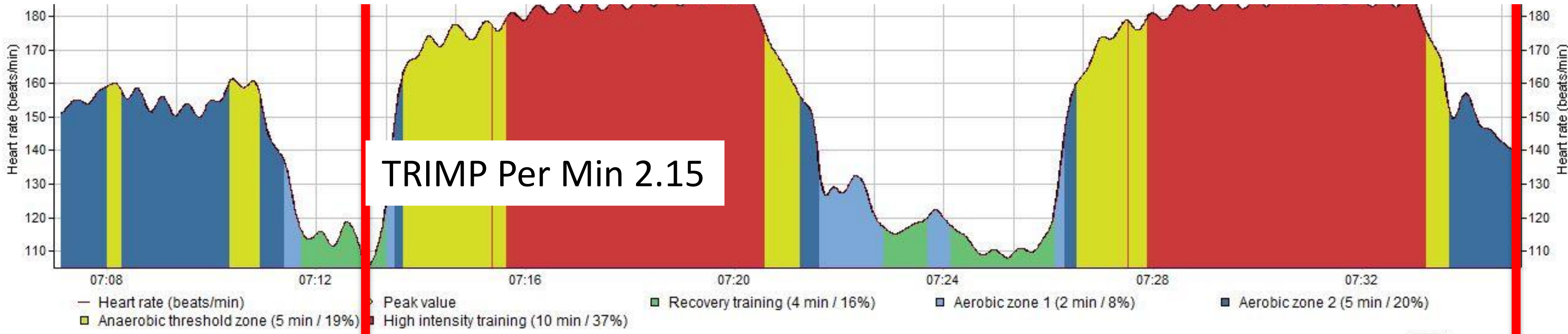


Early Off-Season IFT Card

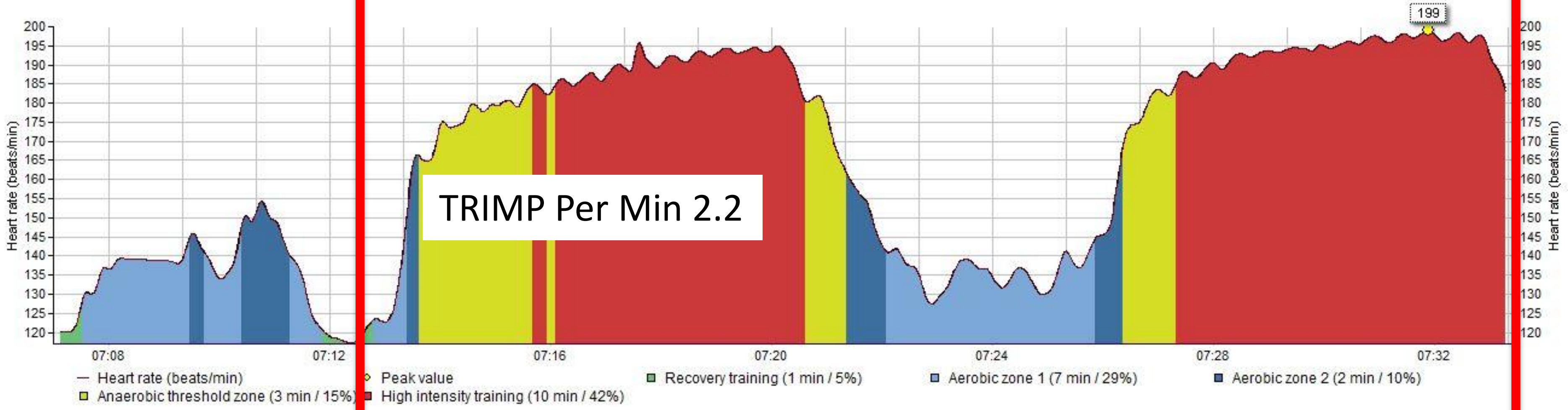
Card #	11A		% of Max	95%	Shuttle Length (yds)	40
Total Time	20.00					
					Total Distance	
			Number of Sets		Set 1	Set 2
Work	15		Time	7.00	1173.4	1173
Rest	15		Rest Between Sets	6	866.0	866
Reps w/ in Set	14		Number of Sets	2	**Total For Set1/2**	2346.7 1732.1

Name	Max IFT	Straight Dist. (yds)	Shuttle Dist (yds)	# of Shuttles	Additional Yards	Treadmill Speed 1% Incline
	21	91	84	2	4	12.4
	20.5	88	82	2	2	12.1
	20	86	80	1	40	11.8
	19.5	84	78	1	38	11.5
	19	82	76	1	36	11.2
	18.5	80	74	1	34	10.9
	18	78	72	1	32	10.6
	17.5	76	70	1	30	10.3
	17	73	68	1	28	10
	16.5	71	66	1	26	9.7
	16	69	64	1	24	9.4
	15.5	67	62	1	22	9.1

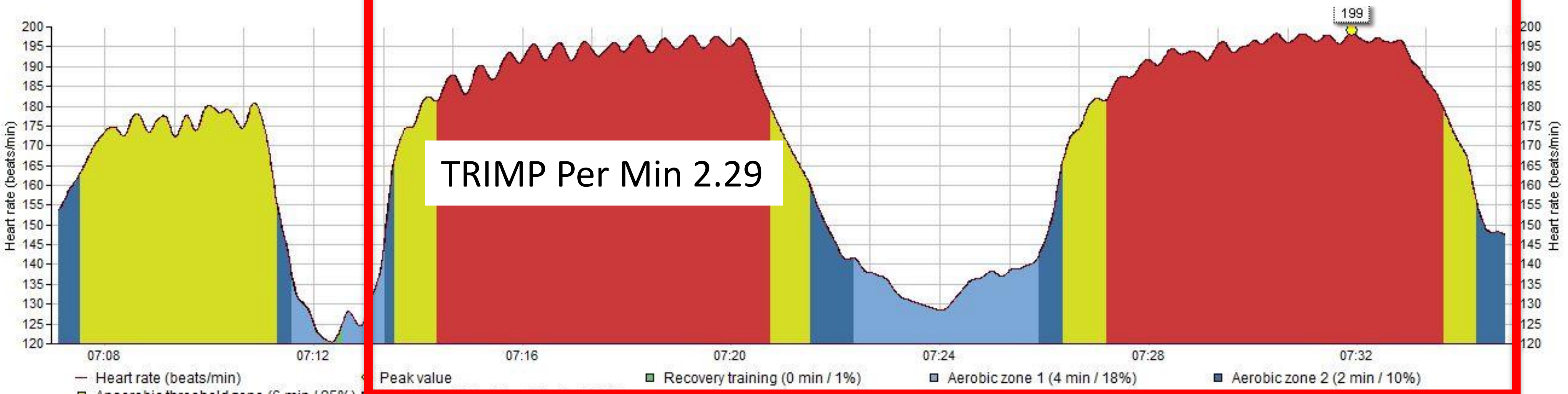
IFT Card 11A – 15sec:15sec x14 @95%, Rest 6min, REPEAT



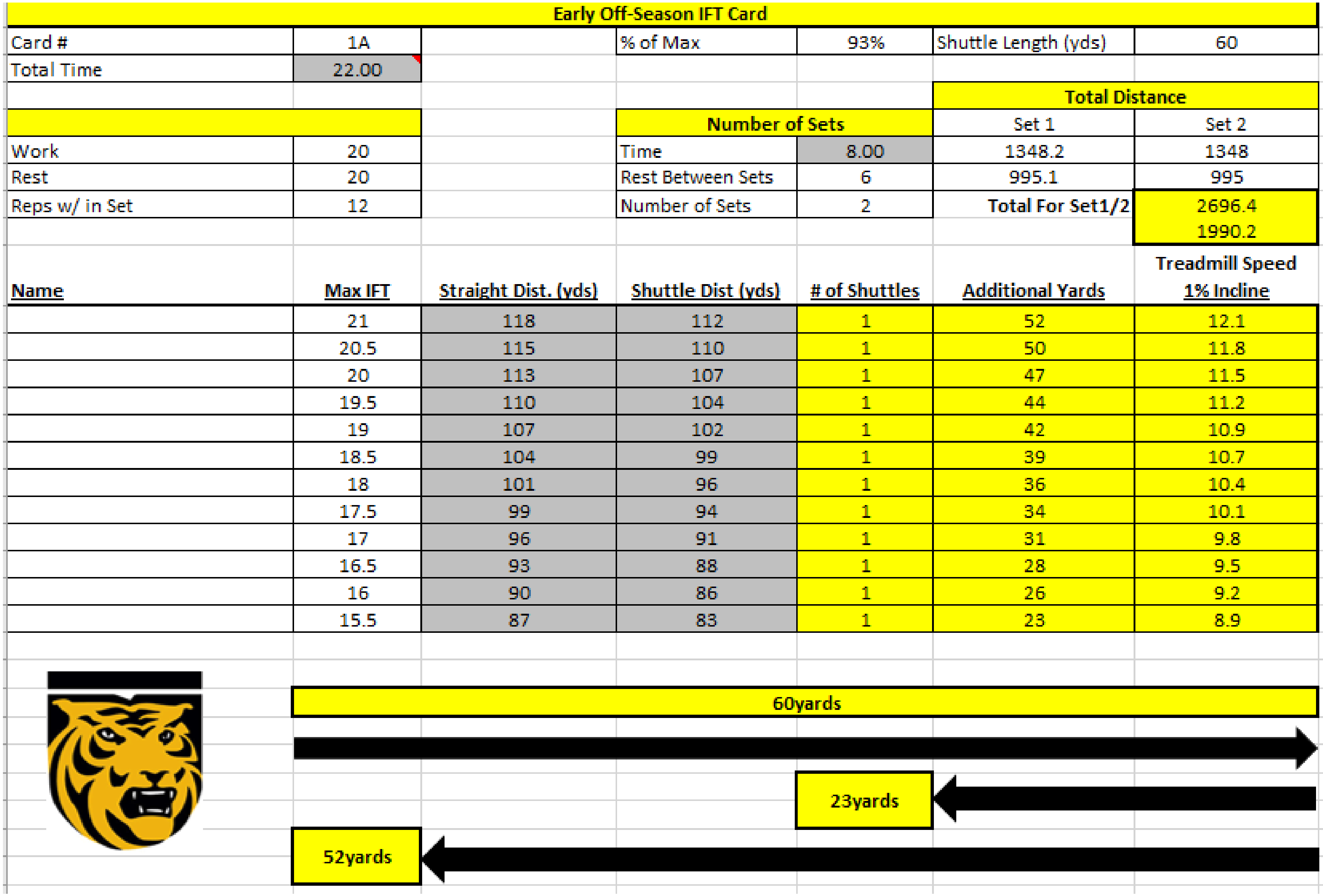
TRIMP Per Min 2.15



TRIMP Per Min 2.2



TRIMP Per Min 2.29

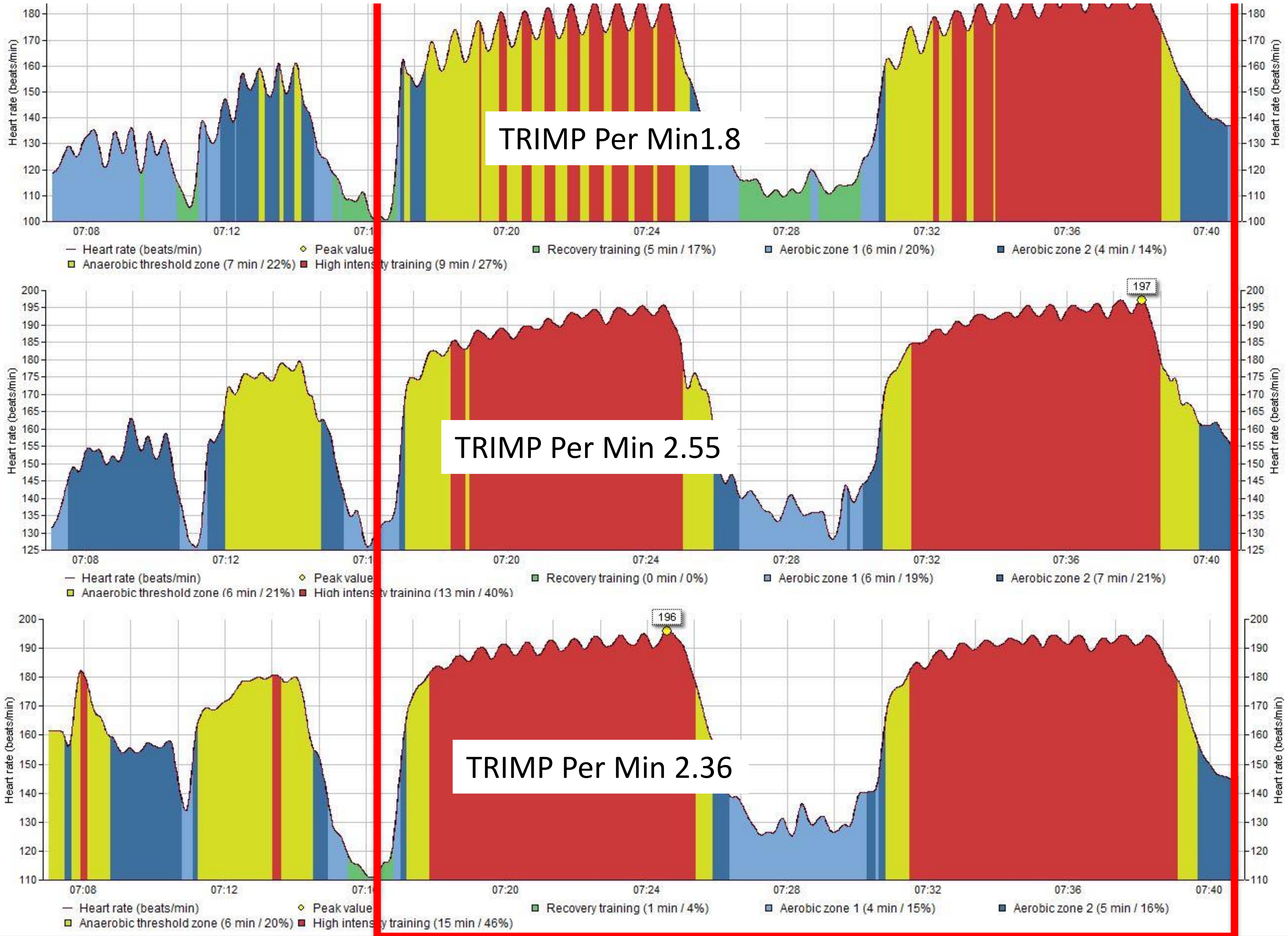


Early Off-Season IFT Card

Card #	1A		% of Max	93%	Shuttle Length (yds)	60
Total Time	22.00					
					Total Distance	
			Number of Sets		Set 1	Set 2
Work	20		Time	8.00	1348.2	1348
Rest	20		Rest Between Sets	6	995.1	995
Reps w/ in Set	12		Number of Sets	2	**Total For Set1/2**	2696.4 1990.2

Name	**Max IFT**	**Straight Dist. (yds)**	**Shuttle Dist (yds)**	**# of Shuttles**	**Additional Yards**	**Treadmill Speed 1% Incline**
	21	118	112	1	52	12.1
	20.5	115	110	1	50	11.8
	20	113	107	1	47	11.5
	19.5	110	104	1	44	11.2
	19	107	102	1	42	10.9
	18.5	104	99	1	39	10.7
	18	101	96	1	36	10.4
	17.5	99	94	1	34	10.1
	17	96	91	1	31	9.8
	16.5	93	88	1	28	9.5
	16	90	86	1	26	9.2
	15.5	87	83	1	23	8.9

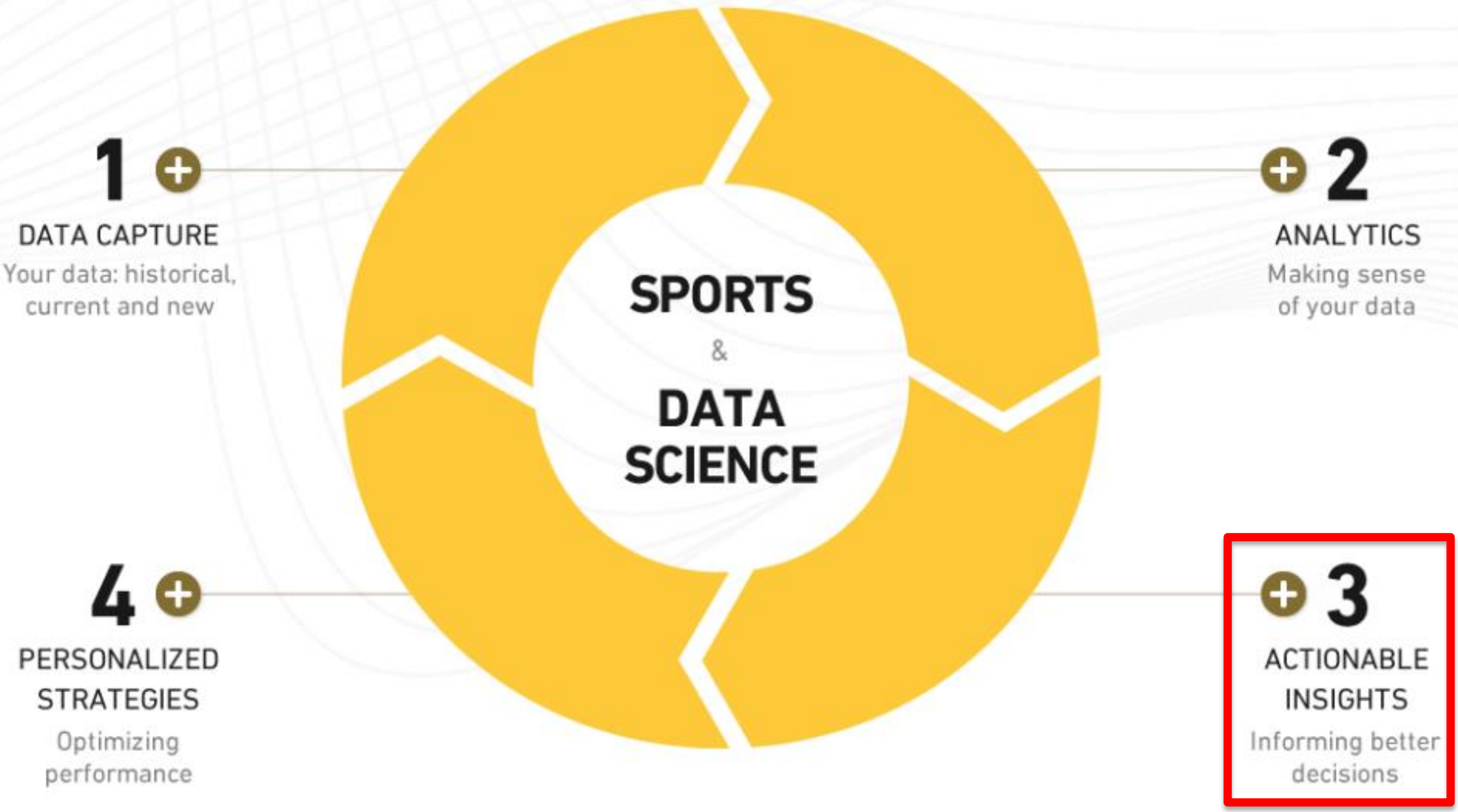
IFT Card 1A – 20sec:20sec x 12 @93%, Rest 6min, REPEAT



TRIMP Per Min1.8

TRIMP Per Min 2.55

TRIMP Per Min 2.36



SPORTS & DATA SCIENCE

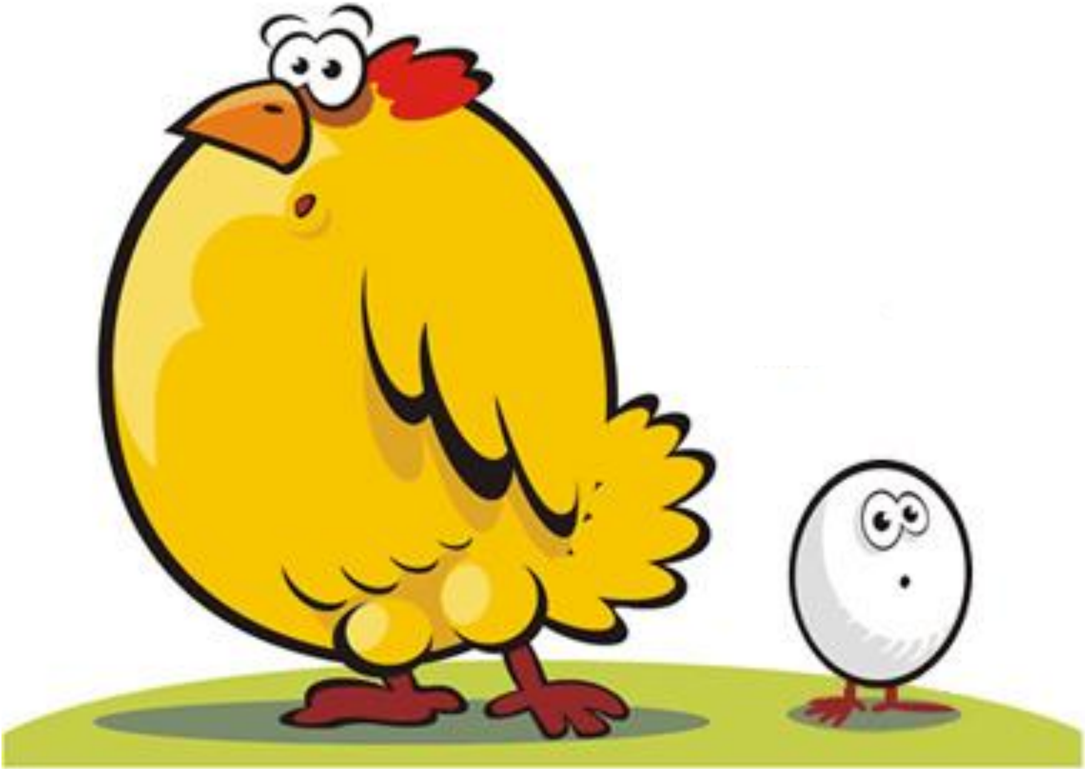
1 DATA CAPTURE
Your data: historical, current and new

2 ANALYTICS
Making sense of your data

3 ACTIONABLE INSIGHTS
Informing better decisions

4 PERSONALIZED STRATEGIES
Optimizing performance

Chicken or the Egg?



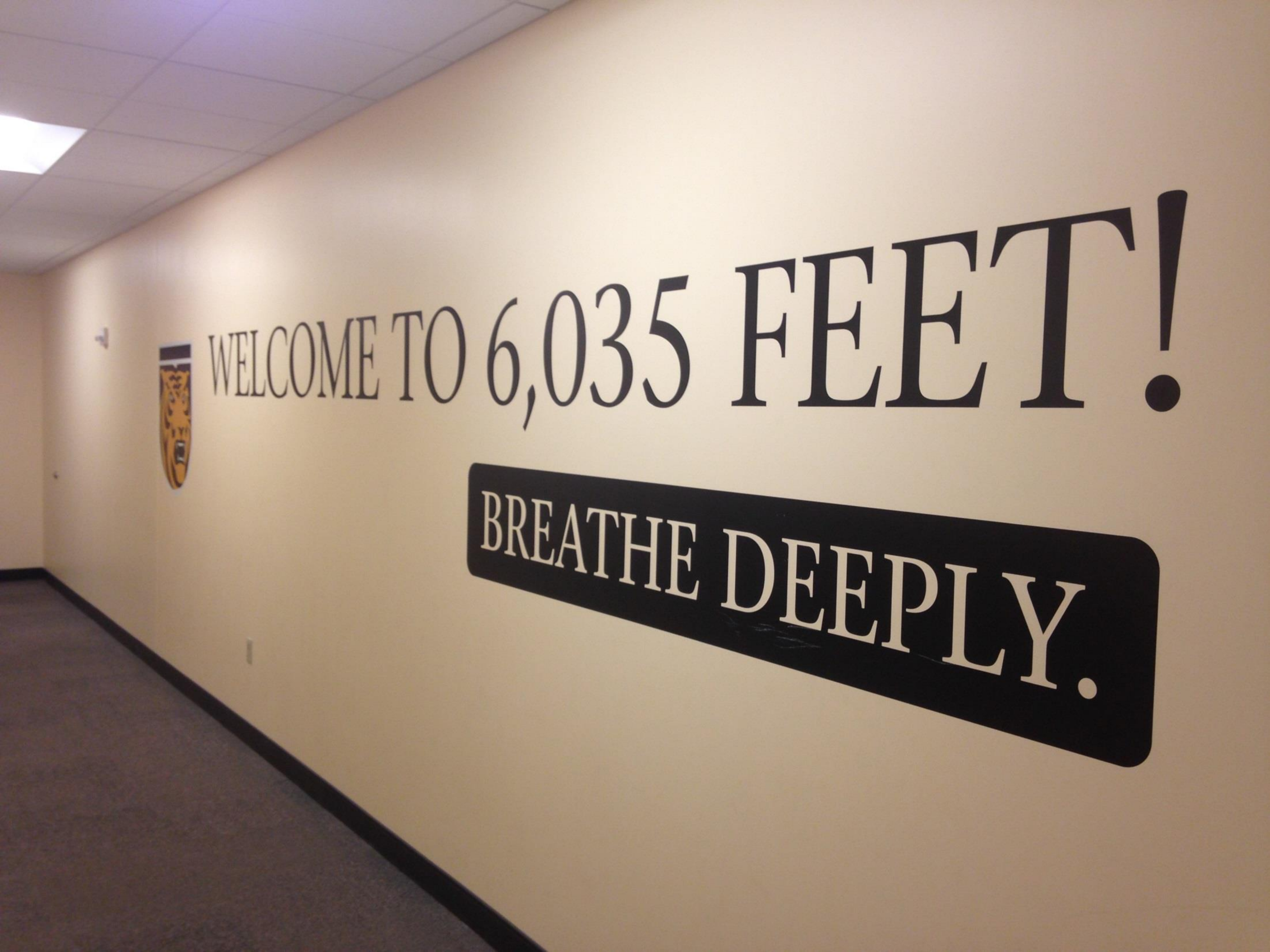
COLORADO
COLLEGE

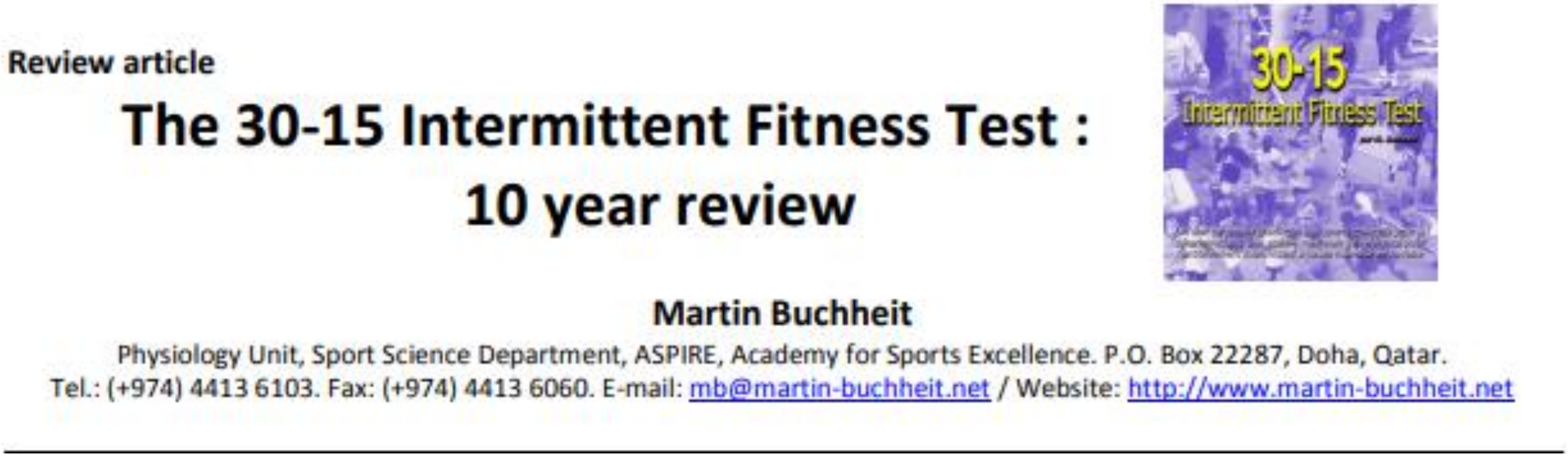
2008

NSCA™
National Strength and
Conditioning Association

Present

Introduction to implementation and refinement


WELCOME TO 6,035 FEET!
BREATHE DEEPLY.



Review article

The 30-15 Intermittent Fitness Test : 10 year review

30-15
Intermittent Fitness Test

Martin Buchheit

Physiology Unit, Sport Science Department, ASPIRE, Academy for Sports Excellence. P.O. Box 22287, Doha, Qatar.
Tel.: (+974) 4413 6103. Fax: (+974) 4413 6060. E-mail: mb@martin-buchheit.net / Website: http://www.martin-buchheit.net

Martin Buchheit

30-15IFT is now 18years old!!!!!!!!!!!!

COLORADO
COLLEGE

Martin Buchheit – Head of Performance 30-15IFT

Jason Dudley – Director of Strength and Conditioning (Olympic Sports) at Washington State University

Sgt Mick Steirli – Health and Fitness Officer NSW Police Force

Chris West – Associate Head Strength and Conditioning Coach at the University of Connecticut

COLORADO
COLLEGE

30-15IFT by Martin Buchiett

Purpose: field test to evaluate cardiorespiratory function, maximal aerobic velocity and ones ability to recover/repeat intermittent bouts activity

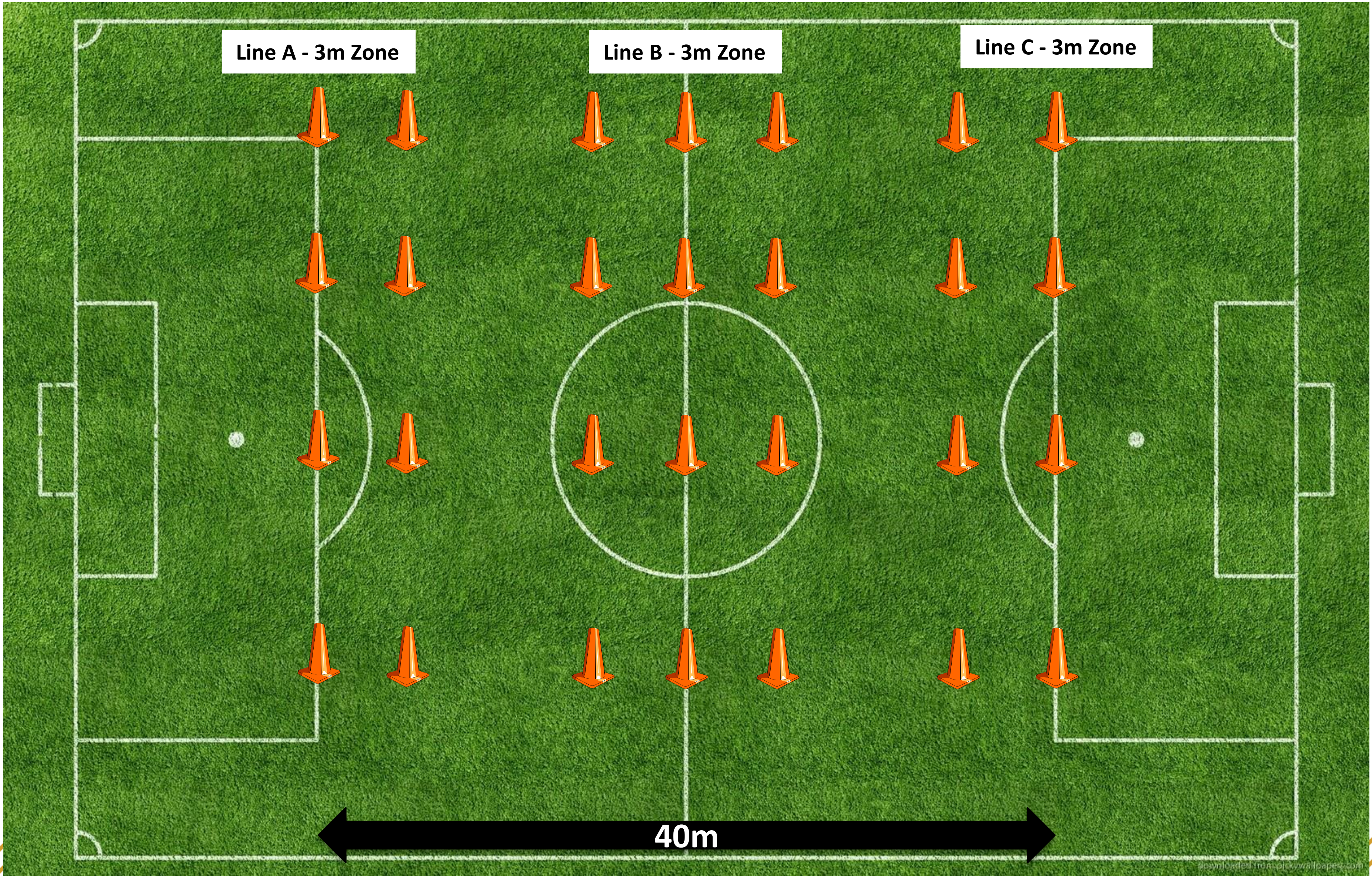
What is it????

- An intermittent field test that consists of 30-sec shuttle runs with 15-sec passive recovery periods
- Test can be done at 40m, 28m, and on Ice

Why do we use it?

- It's a conditioning system based on individual failing speed
- *Prescription gives us a mixed approach to ESDevelopment – tax both anaerobic and aerobic (running at vVO2Max) systems at high levels*
- Allows us to quantify 'stress' because prescription is done at a percentage of VIFT - Can quantify sprint distance, distance per/min, work ratio, and TRIMP permin
- Allows for us to prescribe individualized distance for HIIT – and in-turn a relative HR response regardless of prescribed distance

COLORADO
COLLEGE



Line A - 3m Zone

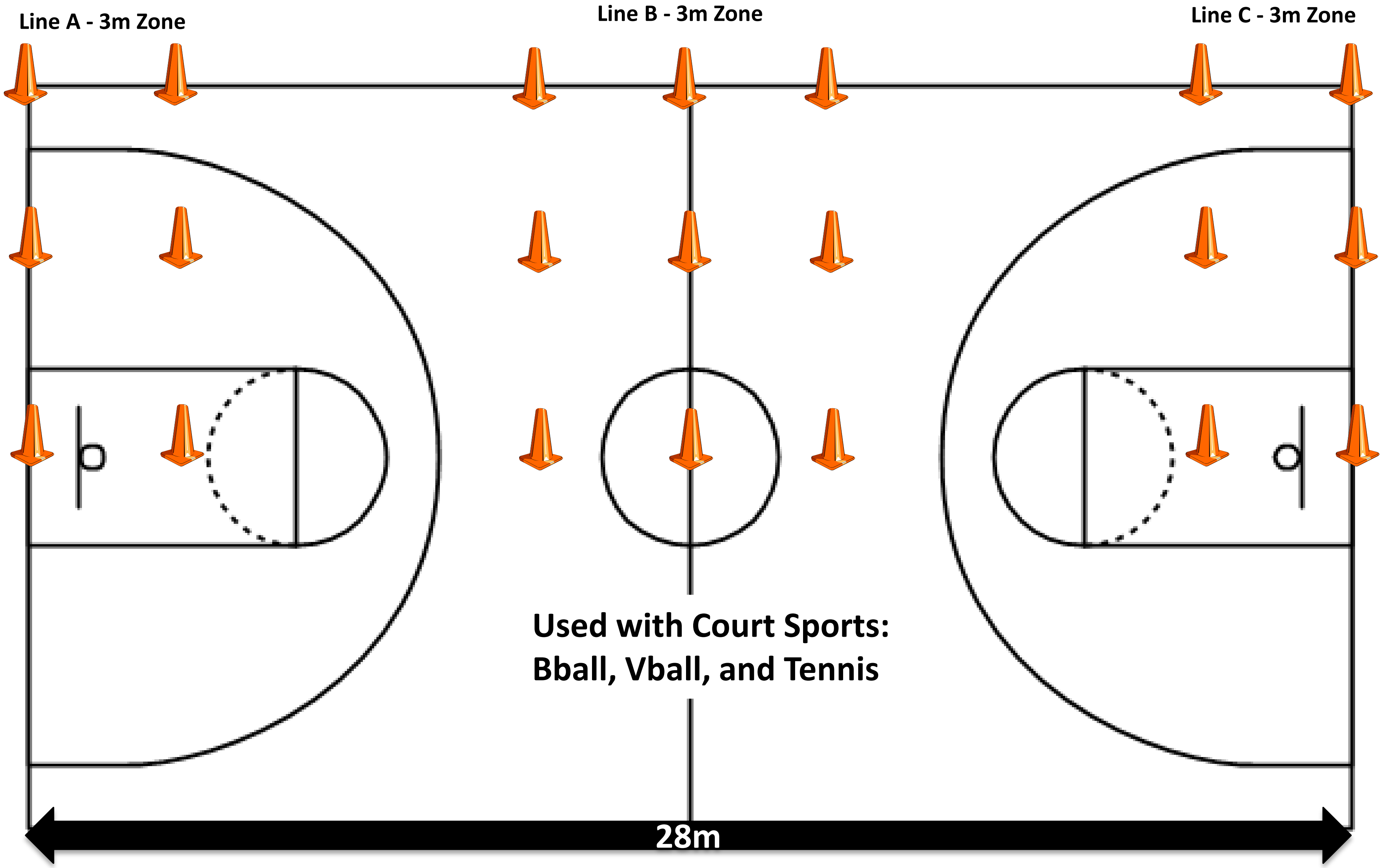
Line B - 3m Zone

Line C - 3m Zone

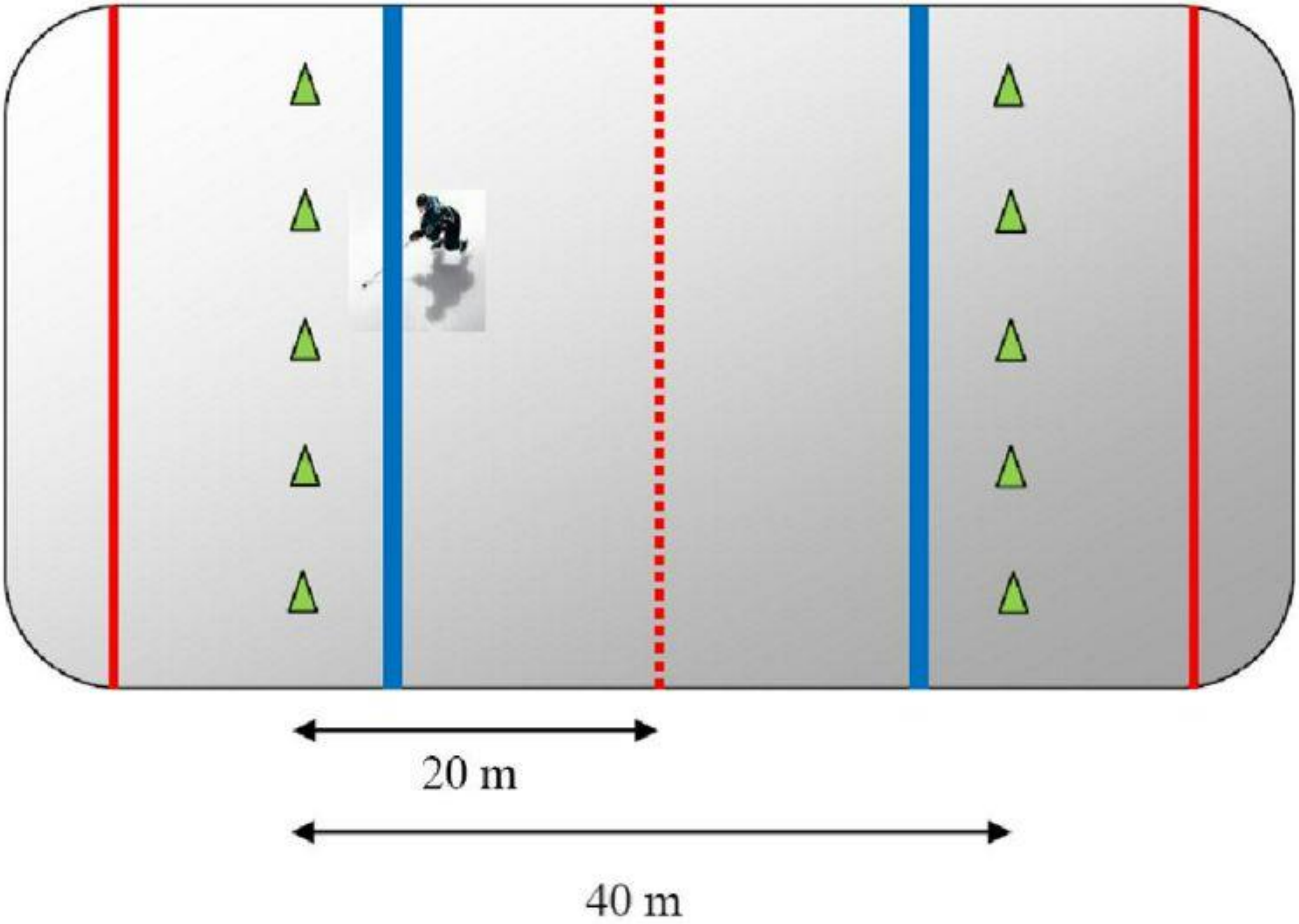
40m

downloaded from pickywallpapers.com

COLORADO
COLLEGE

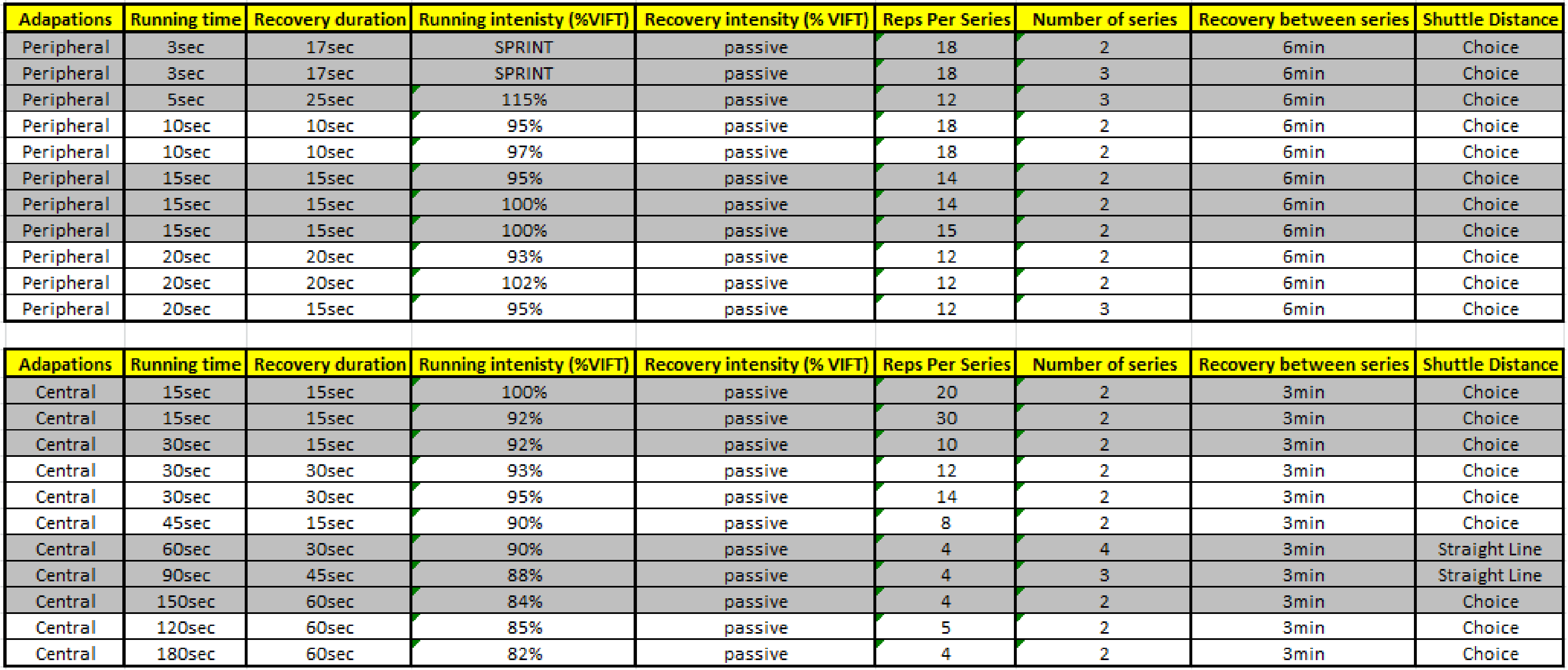

Line A - 3m Zone
Line B - 3m Zone
Line C - 3m Zone
28m

Used with Court Sports:
Bball, Vball, and Tennis


20 m
40 m

COLORADO
COLLEGE

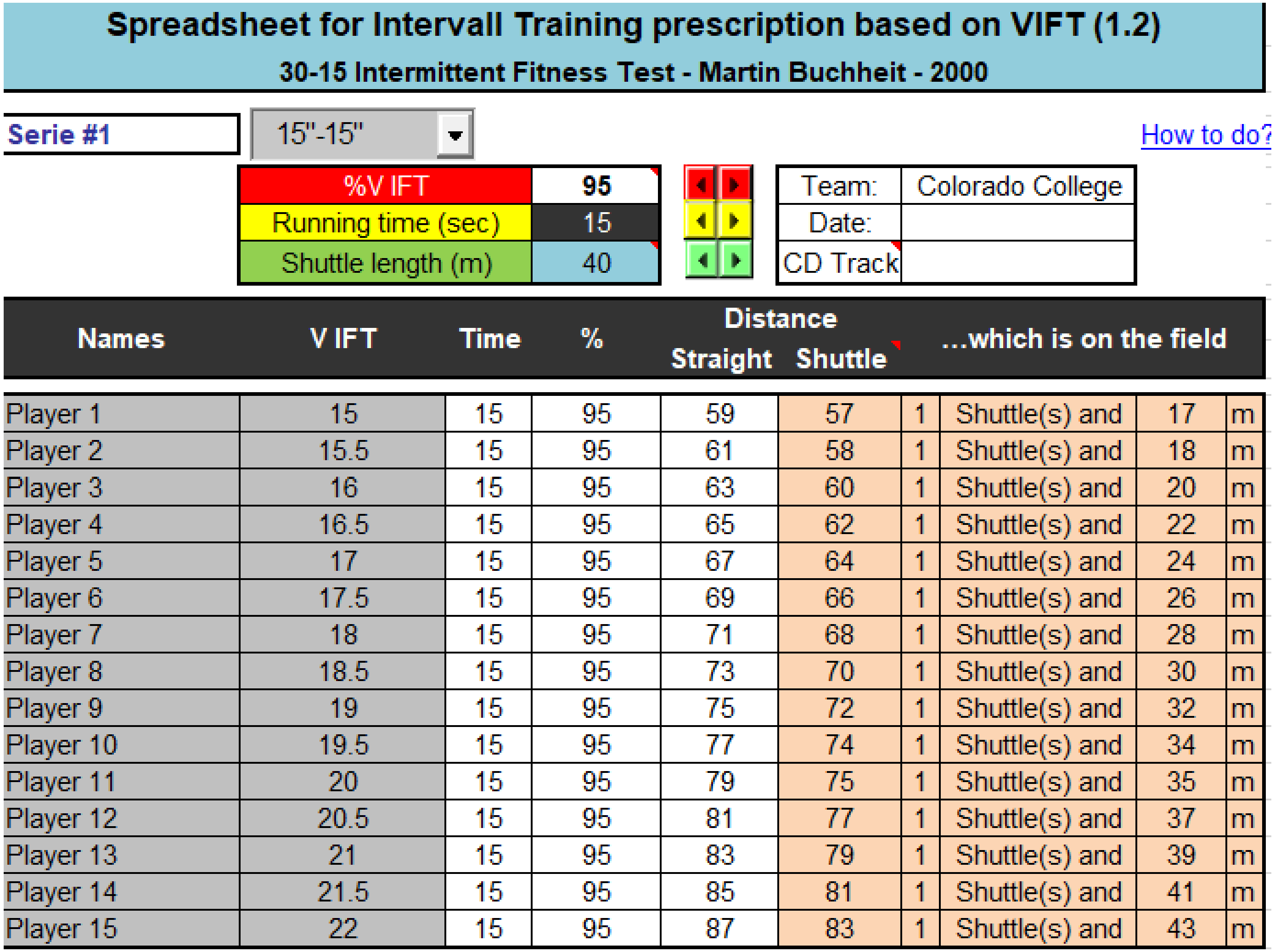
30-15IFT Prescription



Adapations	Running time	Recovery duration	Running intenisty (%VIFT)	Recovery intensity (% VIFT)	Reps Per Series	Number of series	Recovery between series	Shuttle Distance
Peripheral	3sec	17sec	SPRINT	passive	18	2	6min	Choice
Peripheral	3sec	17sec	SPRINT	passive	18	3	6min	Choice
Peripheral	5sec	25sec	115%	passive	12	3	6min	Choice
Peripheral	10sec	10sec	95%	passive	18	2	6min	Choice
Peripheral	10sec	10sec	97%	passive	18	2	6min	Choice
Peripheral	15sec	15sec	95%	passive	14	2	6min	Choice
Peripheral	15sec	15sec	100%	passive	14	2	6min	Choice
Peripheral	15sec	15sec	100%	passive	15	2	6min	Choice
Peripheral	20sec	20sec	93%	passive	12	2	6min	Choice
Peripheral	20sec	20sec	102%	passive	12	2	6min	Choice
Peripheral	20sec	15sec	95%	passive	12	3	6min	Choice

Adapations	Running time	Recovery duration	Running intenisty (%VIFT)	Recovery intensity (% VIFT)	Reps Per Series	Number of series	Recovery between series	Shuttle Distance
Central	15sec	15sec	100%	passive	20	2	3min	Choice
Central	15sec	15sec	92%	passive	30	2	3min	Choice
Central	30sec	15sec	92%	passive	10	2	3min	Choice
Central	30sec	30sec	93%	passive	12	2	3min	Choice
Central	30sec	30sec	95%	passive	14	2	3min	Choice
Central	45sec	15sec	90%	passive	8	2	3min	Choice
Central	60sec	30sec	90%	passive	4	4	3min	Straight Line
Central	90sec	45sec	88%	passive	4	3	3min	Straight Line
Central	150sec	60sec	84%	passive	4	2	3min	Choice
Central	120sec	60sec	85%	passive	5	2	3min	Choice
Central	180sec	60sec	82%	passive	4	2	3min	Choice

COLORADO COLLEGE



Spreadsheet for Intervall Training prescription based on VIFT (1.2)

30-15 Intermittent Fitness Test - Martin Buchheit - 2000

Serie #1

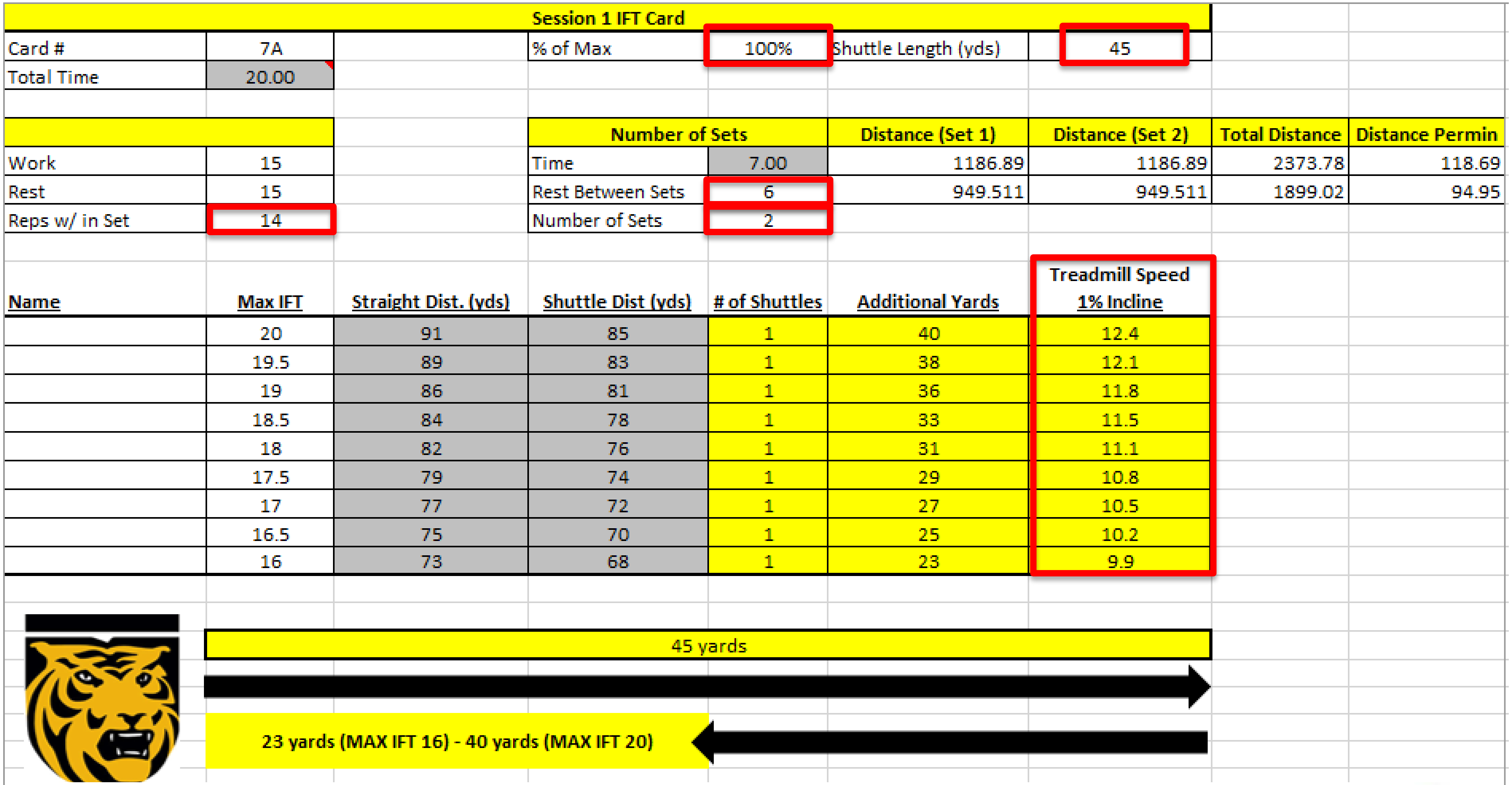
15"-15"

How to do?

%V IFT	95
Running time (sec)	15
Shuttle length (m)	40

Team:	Colorado College
Date:	
CD Track	

Names	V IFT	Time	%	Distance		...which is on the field			
				Straight	Shuttle				
Player 1	15	15	95	59	57	1	Shuttle(s) and	17	m
Player 2	15.5	15	95	61	58	1	Shuttle(s) and	18	m
Player 3	16	15	95	63	60	1	Shuttle(s) and	20	m
Player 4	16.5	15	95	65	62	1	Shuttle(s) and	22	m
Player 5	17	15	95	67	64	1	Shuttle(s) and	24	m
Player 6	17.5	15	95	69	66	1	Shuttle(s) and	26	m
Player 7	18	15	95	71	68	1	Shuttle(s) and	28	m
Player 8	18.5	15	95	73	70	1	Shuttle(s) and	30	m
Player 9	19	15	95	75	72	1	Shuttle(s) and	32	m
Player 10	19.5	15	95	77	74	1	Shuttle(s) and	34	m
Player 11	20	15	95	79	75	1	Shuttle(s) and	35	m
Player 12	20.5	15	95	81	77	1	Shuttle(s) and	37	m
Player 13	21	15	95	83	79	1	Shuttle(s) and	39	m
Player 14	21.5	15	95	85	81	1	Shuttle(s) and	41	m
Player 15	22	15	95	87	83	1	Shuttle(s) and	43	m



Session 1 IFT Card

Card #	7A	% of Max	100%	Shuttle Length (yds)	45
Total Time	20.00				

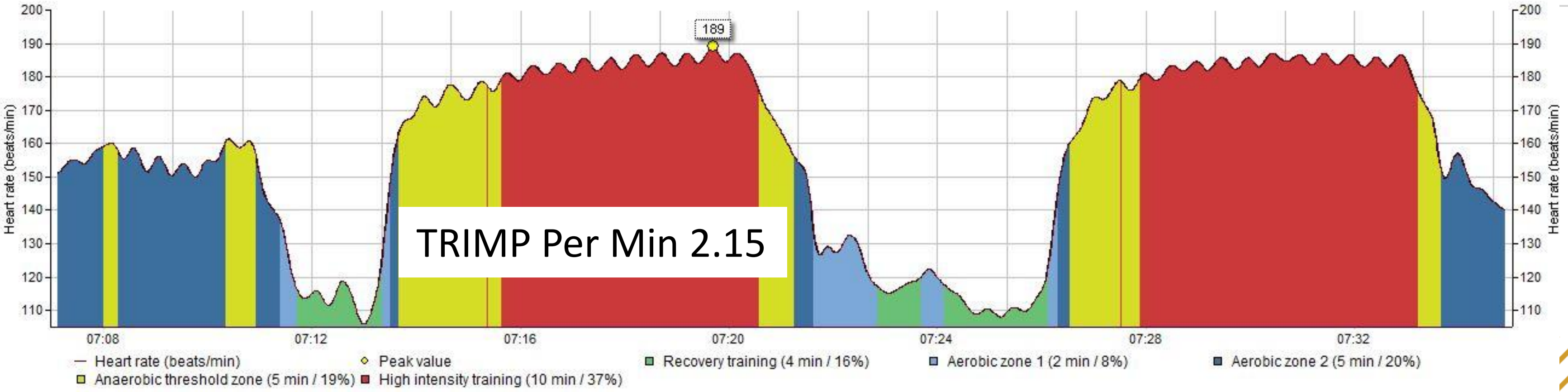
Work	15
Rest	15
Reps w/ in Set	14

Number of Sets		Distance (Set 1)	Distance (Set 2)	Total Distance	Distance Permin
Time	7.00	1186.89	1186.89	2373.78	118.69
Rest Between Sets	6	949.511	949.511	1899.02	94.95
Number of Sets	2				

Name	Max IFT	Straight Dist. (yds)	Shuttle Dist (yds)	# of Shuttles	Additional Yards	Treadmill Speed 1% Incline
	20	91	85	1	40	12.4
	19.5	89	83	1	38	12.1
	19	86	81	1	36	11.8
	18.5	84	78	1	33	11.5
	18	82	76	1	31	11.1
	17.5	79	74	1	29	10.8
	17	77	72	1	27	10.5
	16.5	75	70	1	25	10.2
	16	73	68	1	23	9.9

45 yards

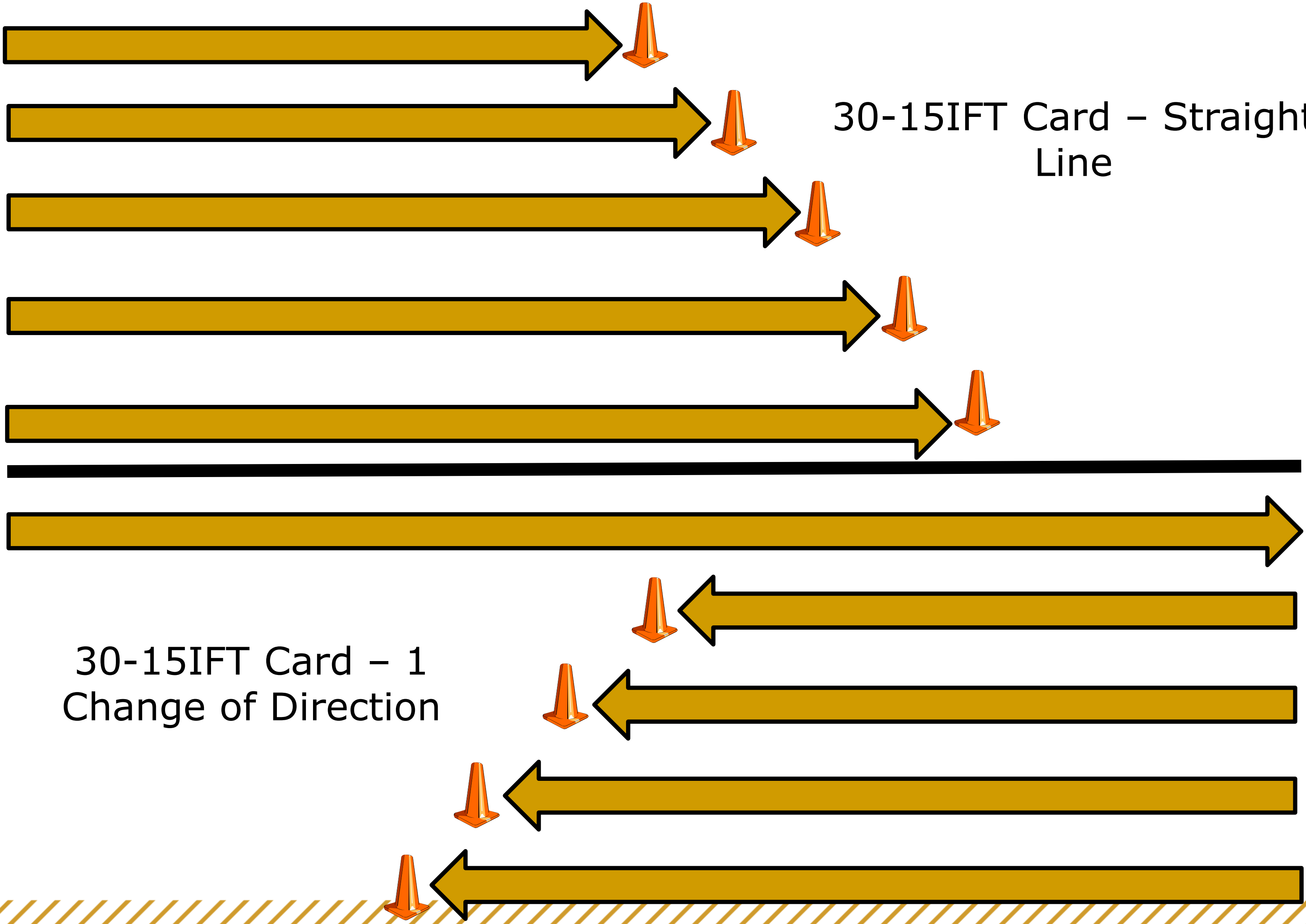
23 yards (MAX IFT 16) - 40 yards (MAX IFT 20)



TRIMP Per Min 2.15

COLORADO
COLLEGE

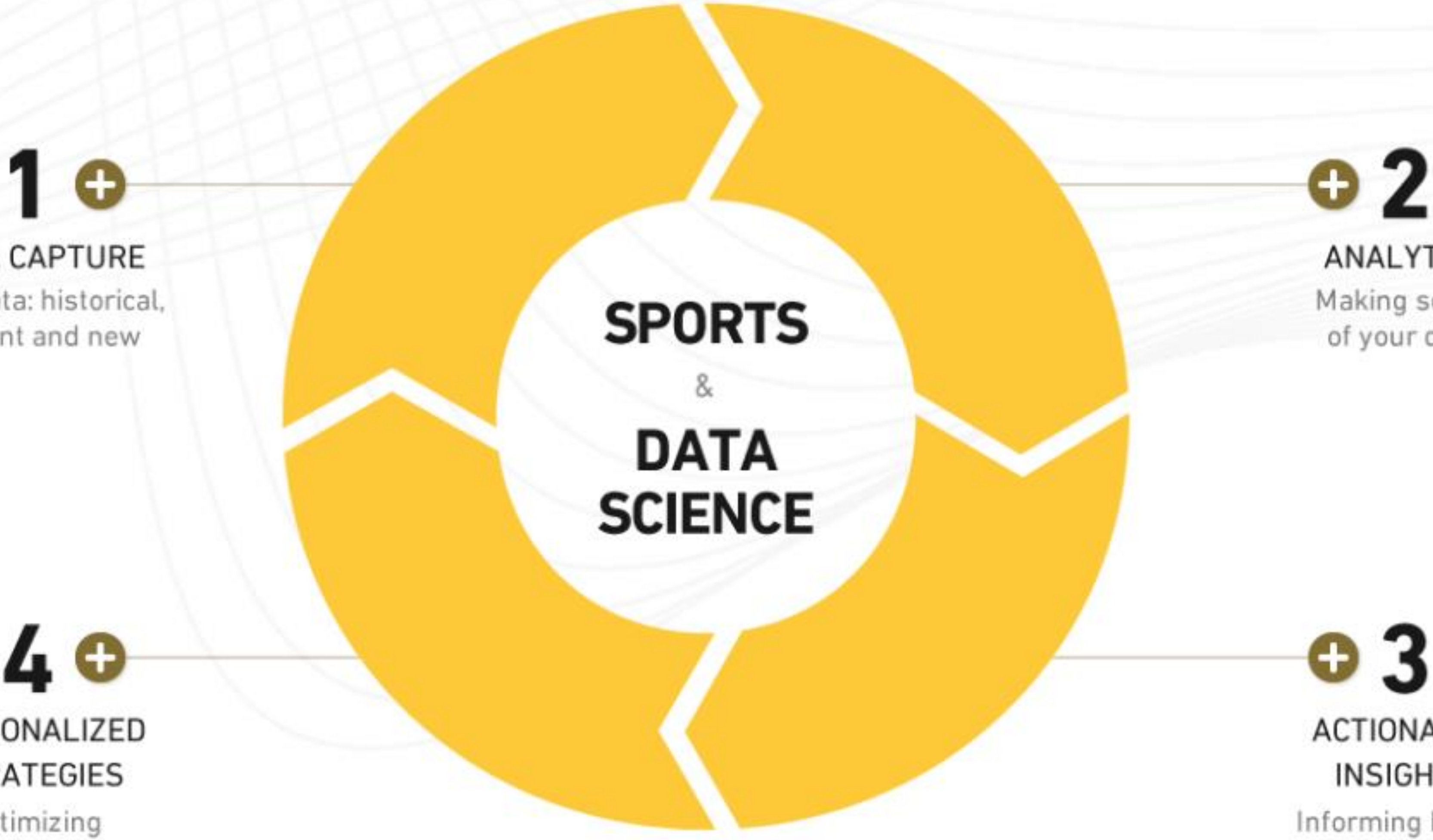
Individualized Distances based on Failing Speed from 30-15IFT



30-15IFT Card – Straight Line

30-15IFT Card – 1 Change of Direction

COLORADO
COLLEGE



SPORTS
&
DATA
SCIENCE

1 DATA CAPTURE
Your data: historical, current and new

2 ANALYTICS
Making sense of your data

3 ACTIONABLE INSIGHTS
Informing better decisions

4 PERSONALIZED STRATEGIES
Optimizing performance

COLORADO COLLEGE

TREY PURES IT.
DēLonghi

COLORADO
COLLEGE

Questions?

Contact Information

@KJCroni

[Colorado College Strength and Conditioning](#)

KevinJamesCronin@gmail.com