

GPS WORK-FLOWS AND PERFORMANCE INSIGHTS

NZSCA (SESNZ) – SPRINZ (AUT) NZSCA

2025 S&C Practitioners Day

Massey University
Albany Campus
Tuesday, November 18th
9am-6pm



SESNZ
SPORT & EXERCISE SCIENCE
— NEW ZEALAND —



**AUT SPORTS PERFORMANCE
RESEARCH INSTITUTE NEW ZEALAND**







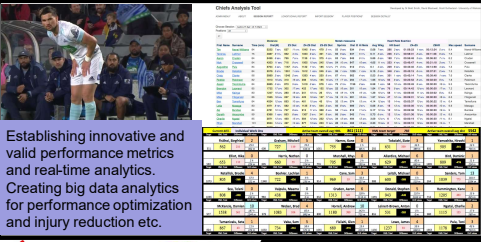
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Innovative return to play strategies



Establishing innovative and valid performance metrics and real-time analytics. Creating big data analytics for performance optimization and injury reduction etc.





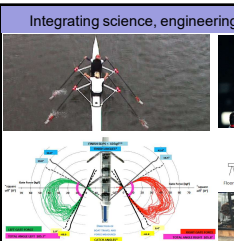
Developing innovations to support competition best practice





Mechanistic underpinnings of optimal performance

**Dr. Brett Smith
Technology & Innovation**



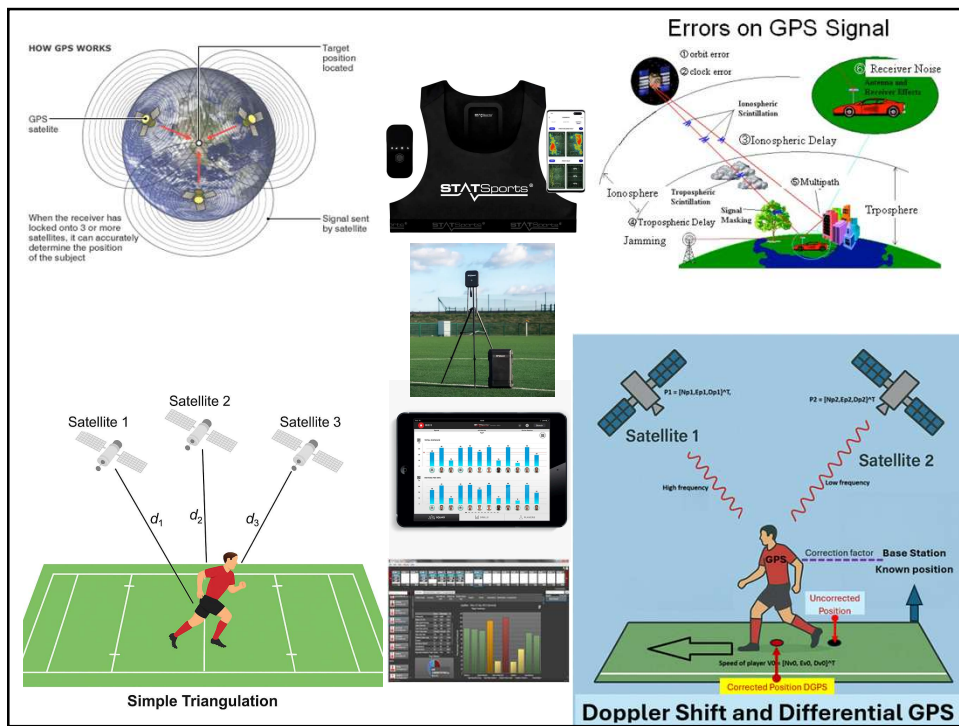
Integrating science, engineering and technology to optimize elite performance



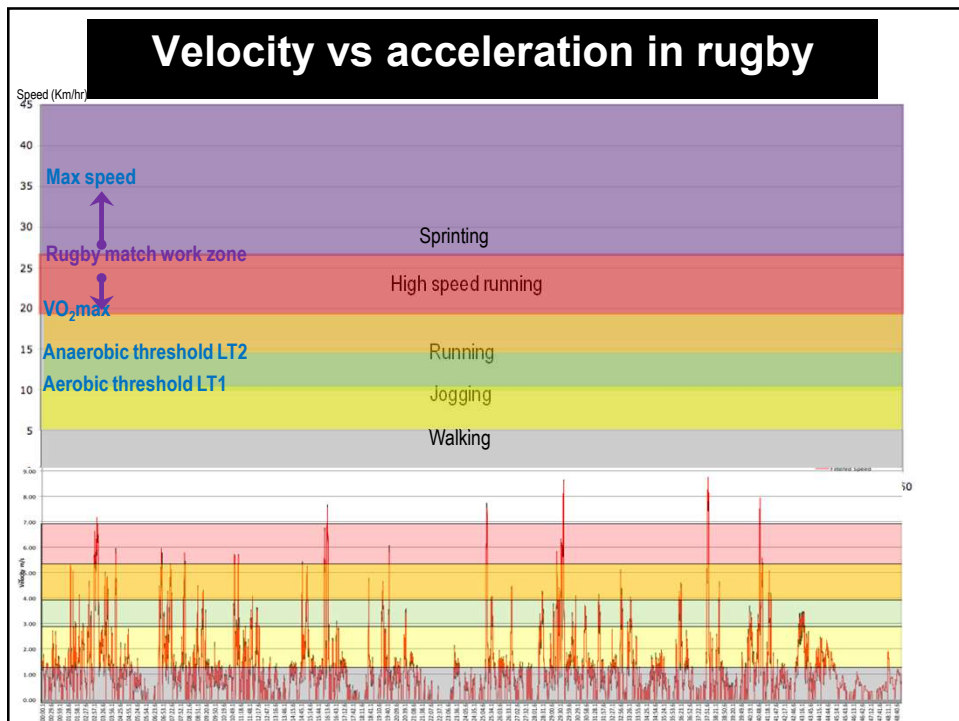


Innovative analytics to inform effective training

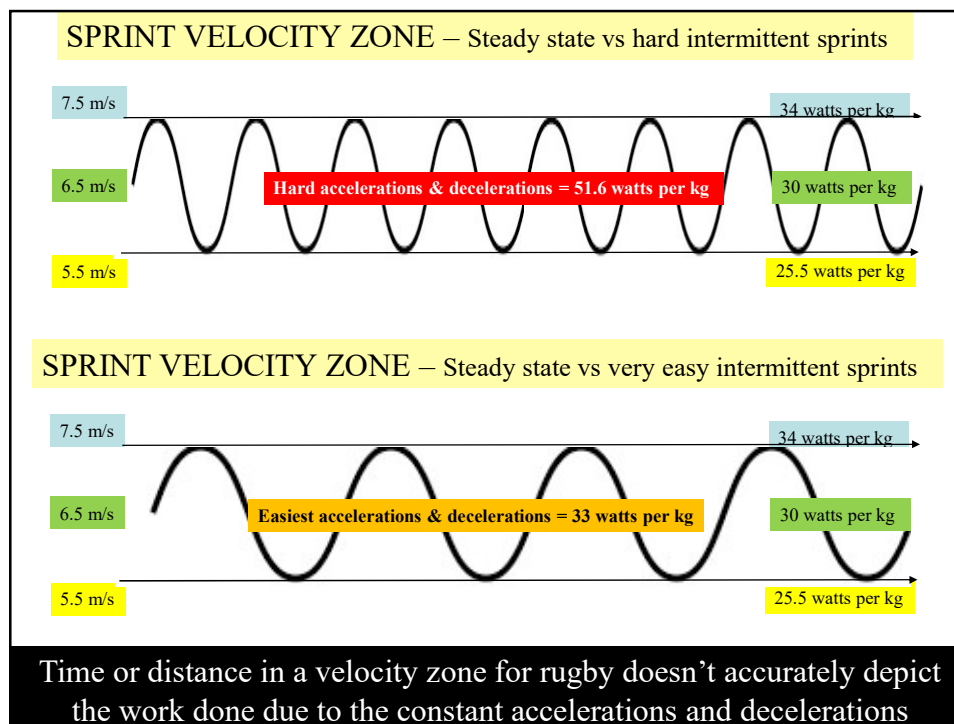
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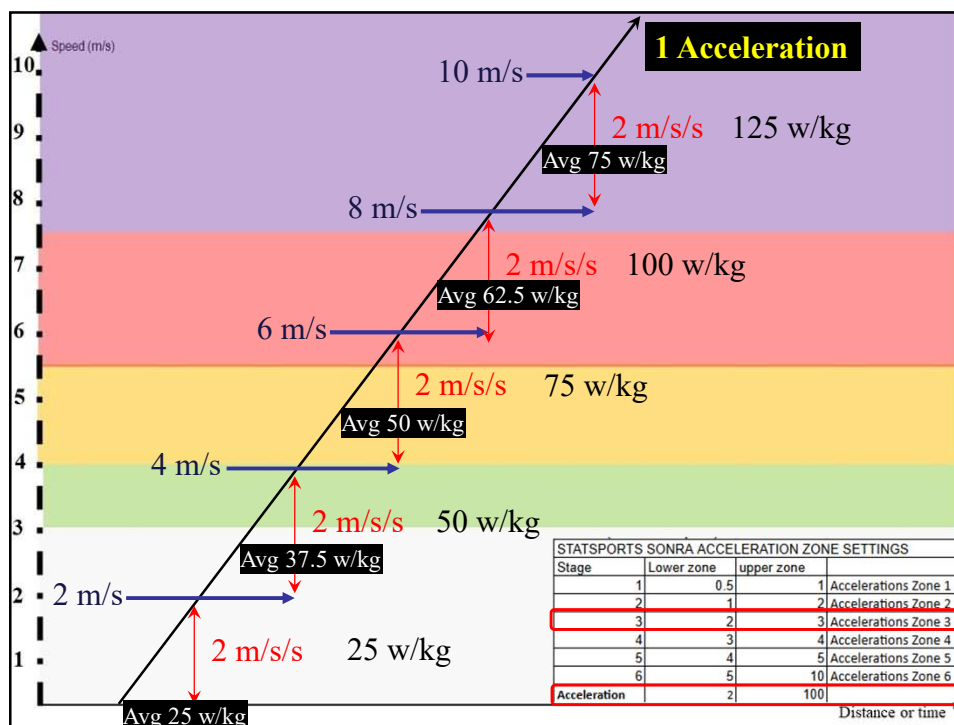
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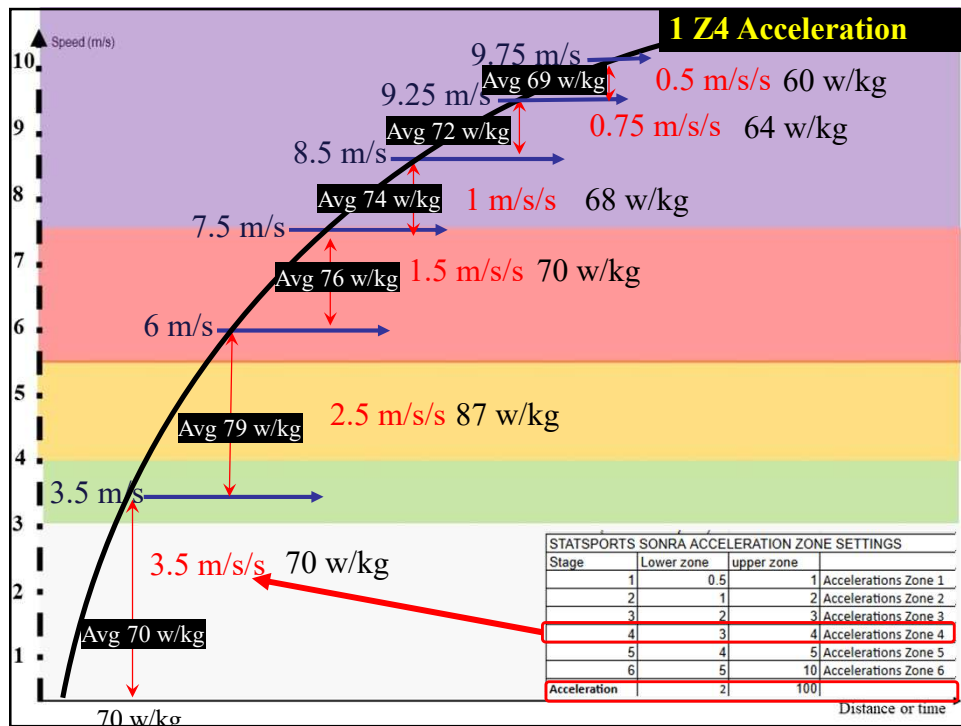
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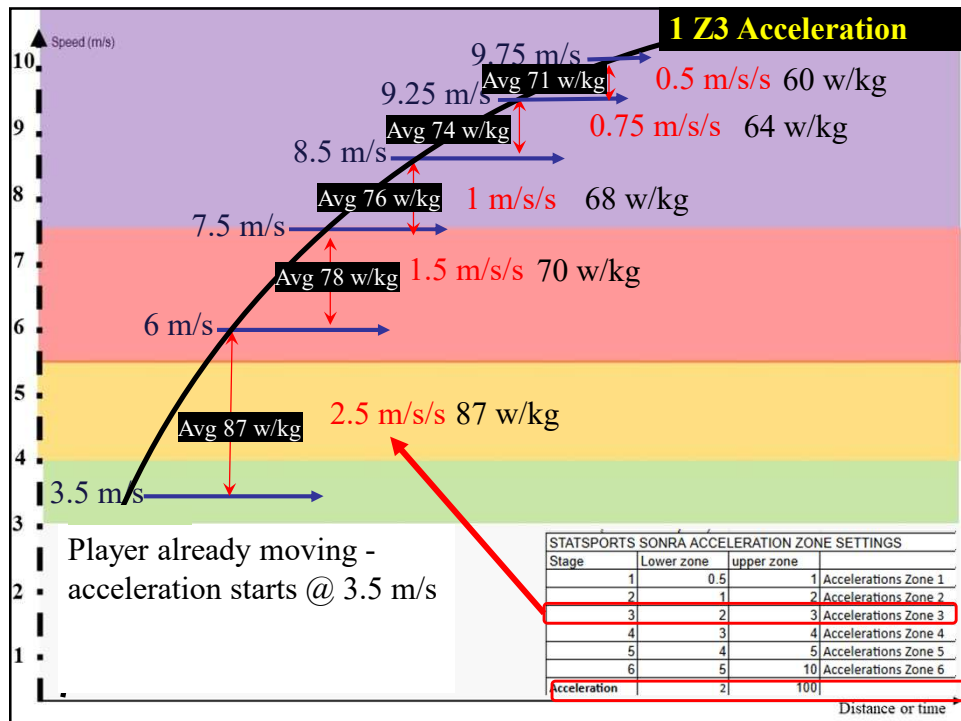
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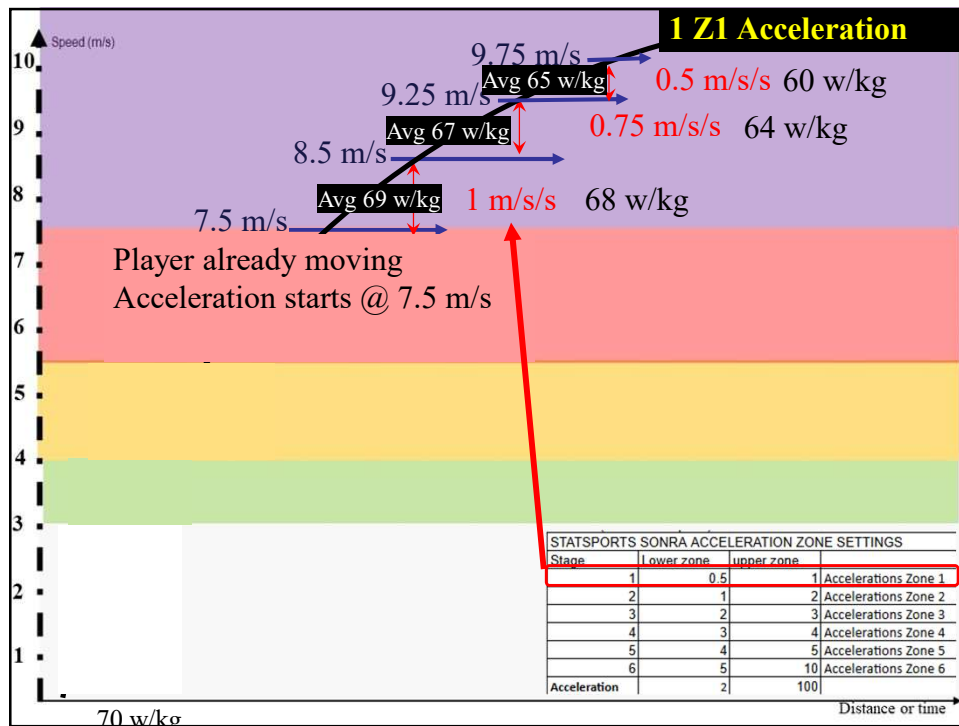
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Velocity vs acceleration work in rugby union

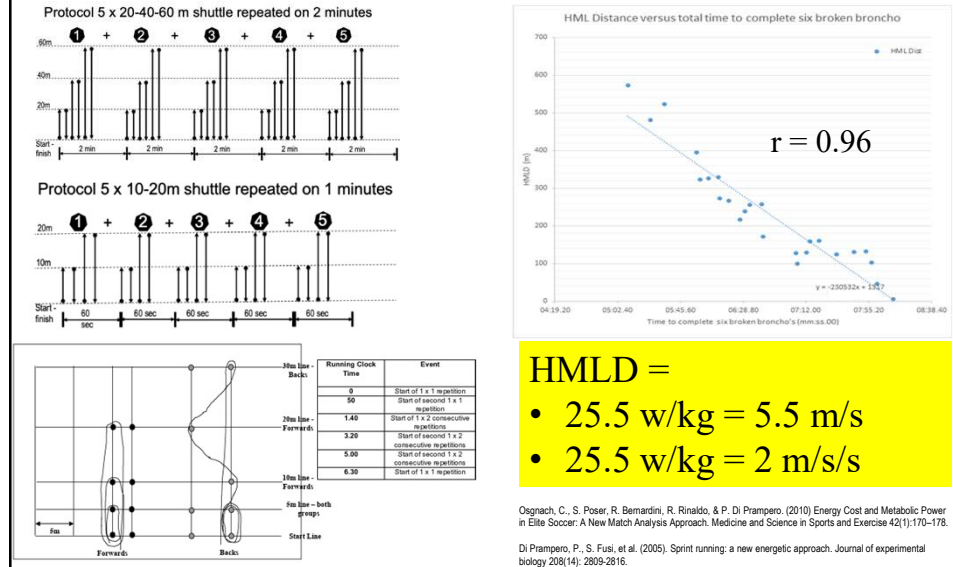
- Velocity
 - “The underlying assumption that displacement variables reflect energy cost is applicable only when activity is performed at a constant speed”
 - Polglaze, T., Dawson, B., & Peeling, P. (2016). Gold standard or fool's gold? The efficacy of displacement variables as indicators of energy expenditure in team sports. *Sports Medicine*, 46(5), 657-670.
- Acceleration
 - Distance (or time) in an acceleration zone cannot be used as a measure of work
 - Most accelerations occur when the player is already moving
 - distance or time in an acceleration zone is very inaccurate
 - Acceleration count is therefore used, and it is an inaccurate measure of the magnitude of work

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Locomotion workload in rugby union is a combination of velocity and acceleration Metrics that combine these are Metabolic Load Distance

Experiment: Compare time to complete rugby type tests (examples below) with available GPS metrics.

Results: Metabolic measures consistently generate the highest and very strong correlations



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RECOMMENDED KPI METRICS

1. HiMets (Match fitness)

- >25.5 w/kg ~ 5.5 m/s or 2 m/s/s (from standing start)
- Combination of acceleration and velocity
- KPI metric ~ VO2max pace

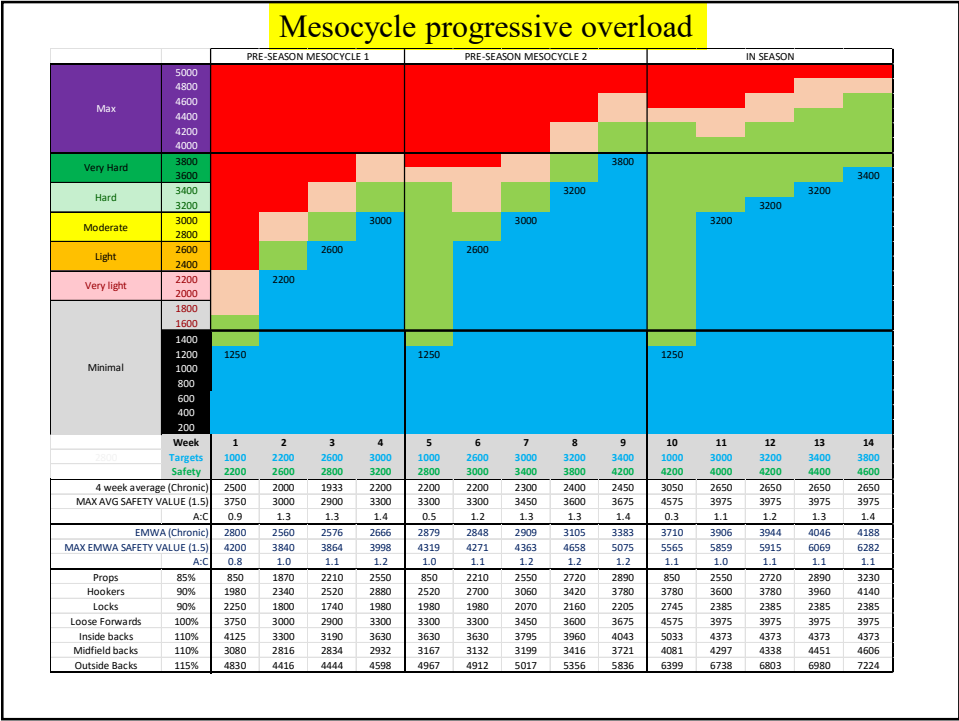
2. SpMets (Intensive Acceleration)

- >50 w/kg ~ 10.6 m/s or 3 m/s/s (from standing start)
- KPI metric ~ intensive accelerations
- Combination of acceleration at velocity

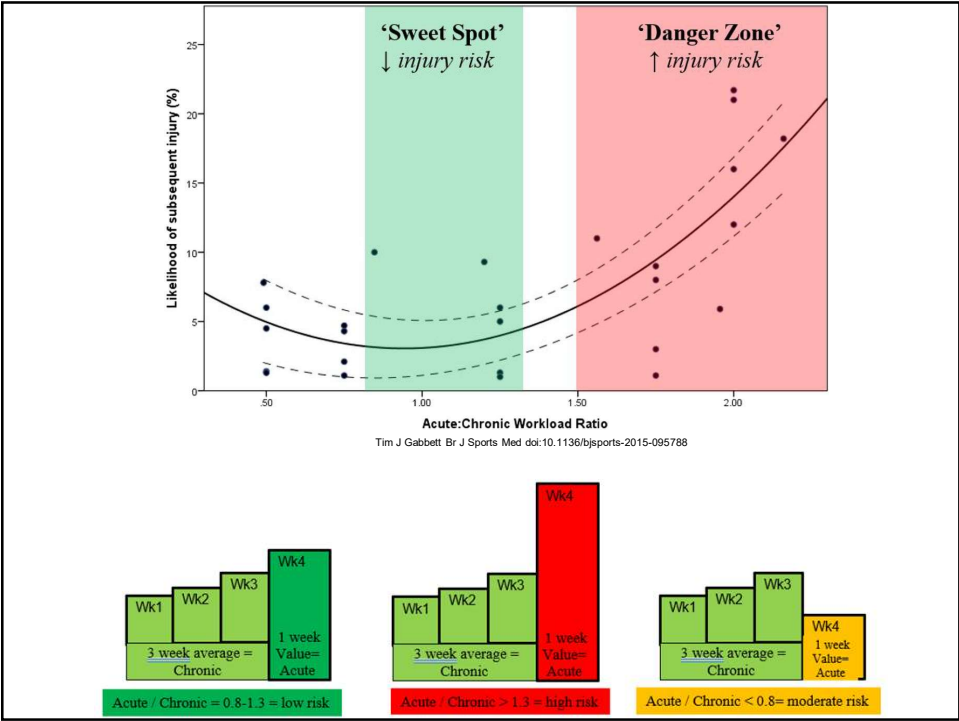
3. HiVel

- >85% peak velocity (& > 93%)
- Monitoring robustness (bullet proofing metric)
- Developing maximal speed

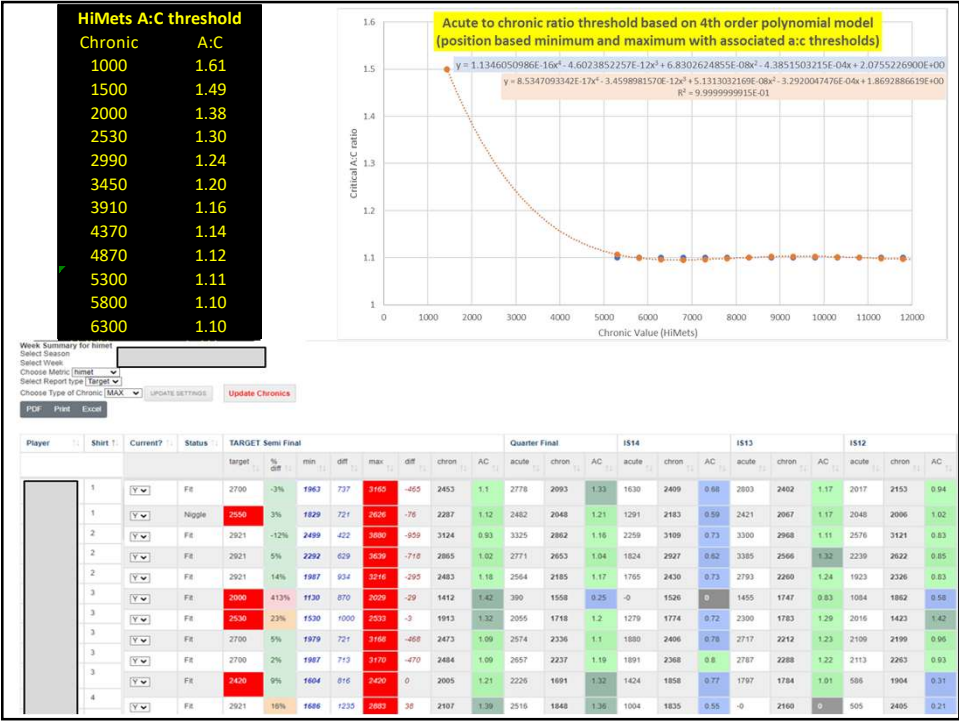
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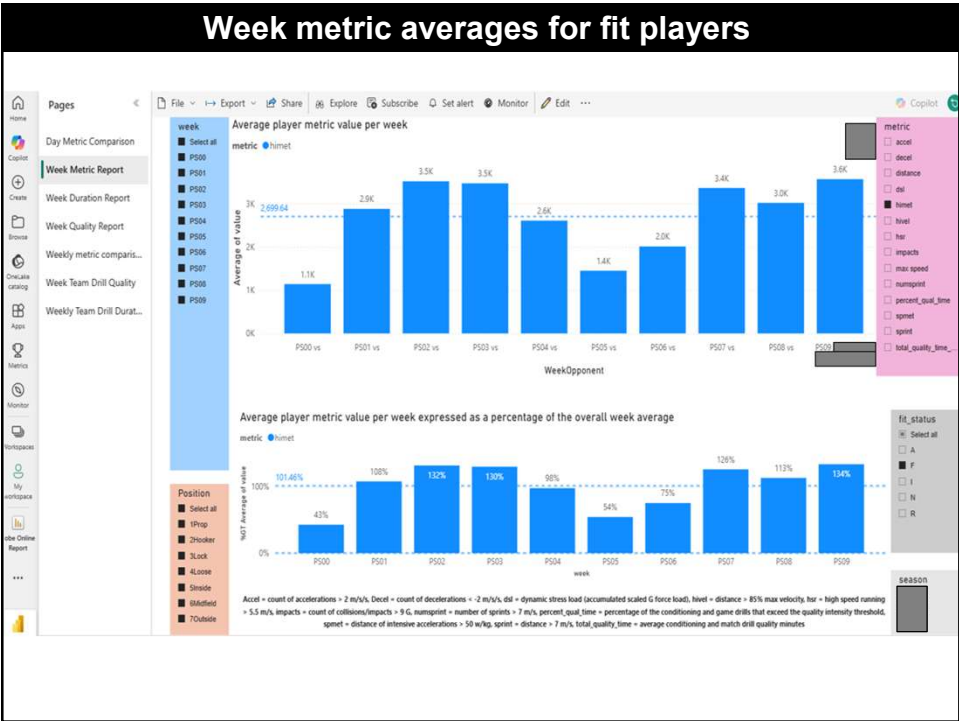
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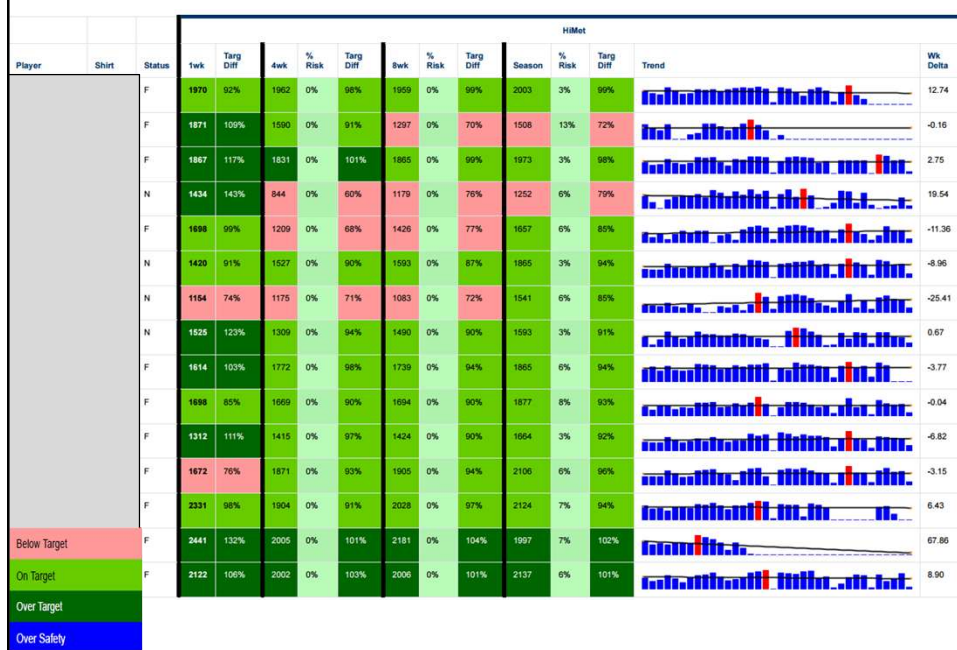


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Week player report vs targets & safeties



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Week player reports vs standards and safeties

Intensive acceleration = Dist > 50 w/kg (3 m/s/s/ or 10.6 m/s).

Week values are colored by position based weekly standards - see end of report for more details. 1 wk = one week value, 4wk = average over four weeks, 8wk = average over eight weeks. Season = average over the season. Wk Delta = linearized weekly change across season i.e., theoretically the trend of the per week change (positively or negatively) across the season so far.



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RUGBY “PREPARING FOR WAR”

Required conditioning vs optimal conditioning
recovery focus vs survival focus

MATCH SPECIFIC, QUALITY & WORST-CASE SCENARIO
WELLNESS & INJURY MANAGEMENT



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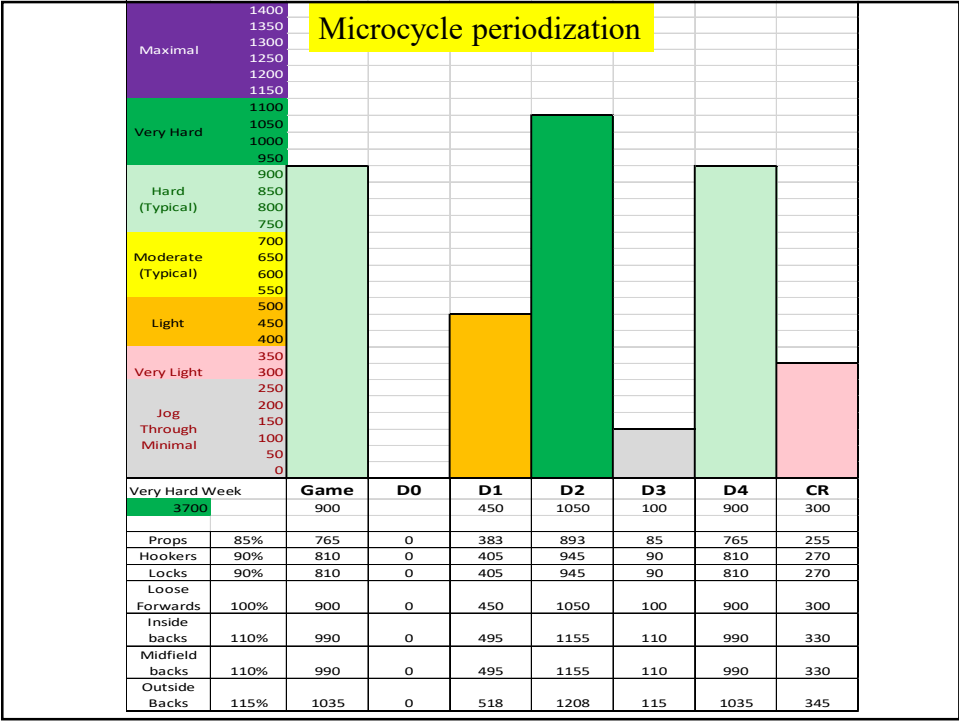
Microcycle FITT principles, planning considerations

Rep	Duration	Wattage	~ vel (m/s)	W:R	Total work duration (mins)	Training Zone
2-20 sec		1032.8	7.5	1:10	6	Lactate Production
10 sec - 1 min		800	6	1:5	10	Lactate Production
15 sec - 2 mins		720	5.5	1:02	12	Lactate Tolerance
30 sec - 5 mins		670	5	1:0.5	20	Lactate Tolerance
5-50 mins		575	4	1:03	50	Anaerobic threshold
5-60 mins		552	3.8	1:0.1	60	Anaerobic threshold
5-90 mins		526	3.6	3.5	90	Anaerobic threshold
1-2 hrs		513	3.4	NA	~2 hrs	Aerobic intensity
2 hrs		487	3.3	NA	~2-3 hrs	Aerobic
4 hrs		466	3	NA	~4 hrs	Aerobic

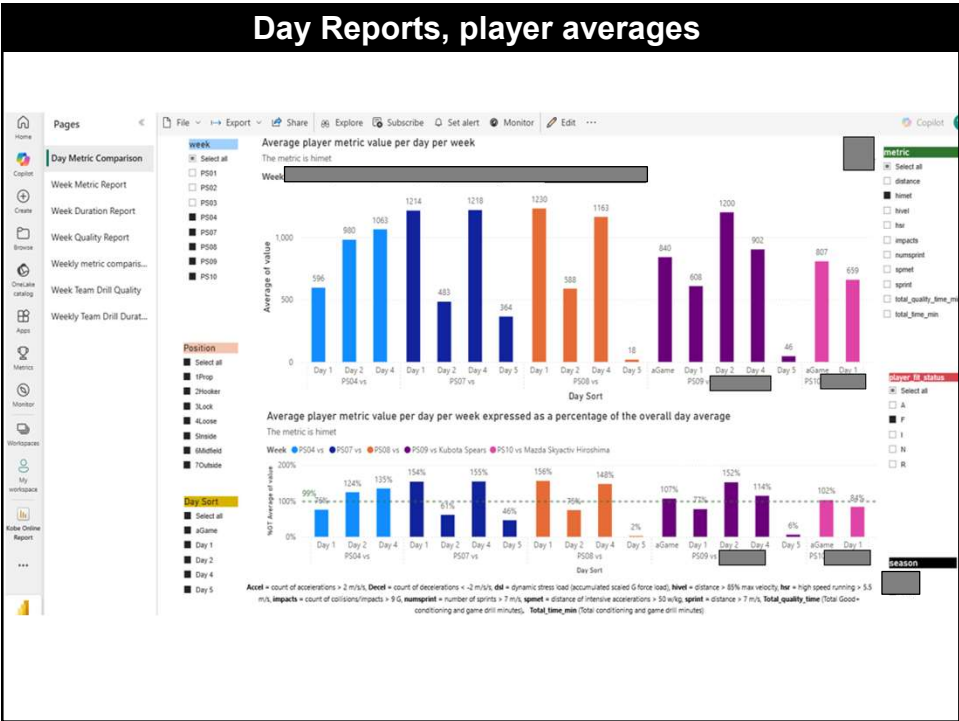
Drill book – monitoring session intensities

QUALITY	Drill Label	WORK MINUTES		REST MINUTES		REPS	TOTAL TIME	Normal Total HiMets	Best Practice Total HiMets	AVERAGE		BEST PRACTICE HiMets/min Quality
		Minutes	Seconds	Minutes	Seconds					HiMets/min	Avg Time	
Poor	Warm up	10		1		1	11:00	78.9	136.1	7.9	0.2	07:56
Almost good	Clarity	15		1		1	16:00	155.0	235.9	10.3	0.0	14:10
Good	Position specifics	7		1	30	1	8:30	73.1	98.6	10.4	0.1	06:51
Great	5v4 edges	3		1		1	4:00	32.6	39.0	10.9	0.0	03:13
Excellent	movement grids	2	30	1	15	3	11:15	126.8	164.0	16.9	0.6	02:31
	Good ball tap	1		1		2	4:00	57.5	66.9	28.8	1.2	00:53
	Circle of pressure	1	20	1		2	4:40	110.1	110.1	41.3	3.0	01:20
	Battling ball	1		1	30	5	7:30	305.3	368.7	61.1	2.8	00:37
	attack sets yardage	1		1		4	8:00	122.5	154.1	30.6	1.3	01:10
	Arm wrestle	5		1		1	6:00	122.1	144.4	24.4	2.3	05:20
	Work ons	10					10:00	63.0	63.0	6.3	0.0	10:25
	TOTAL	1:11:10		0:19:45			1:30:55	1246.8	1580.9			
	TOTAL TIME	1:30:55										
	ESTIMATED QUALITY	0:18:40	~ Anaerobic work time					844.2	1008.3			
	HiMets Target	1300	Target difference (-ve under & +ve over)					-53.2	280.9			

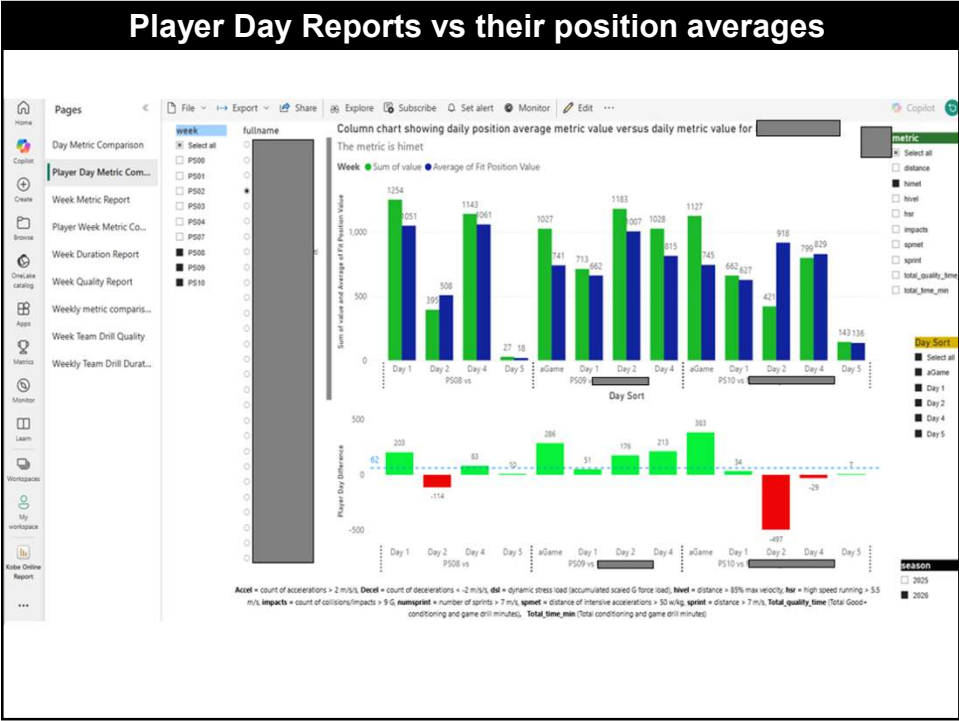
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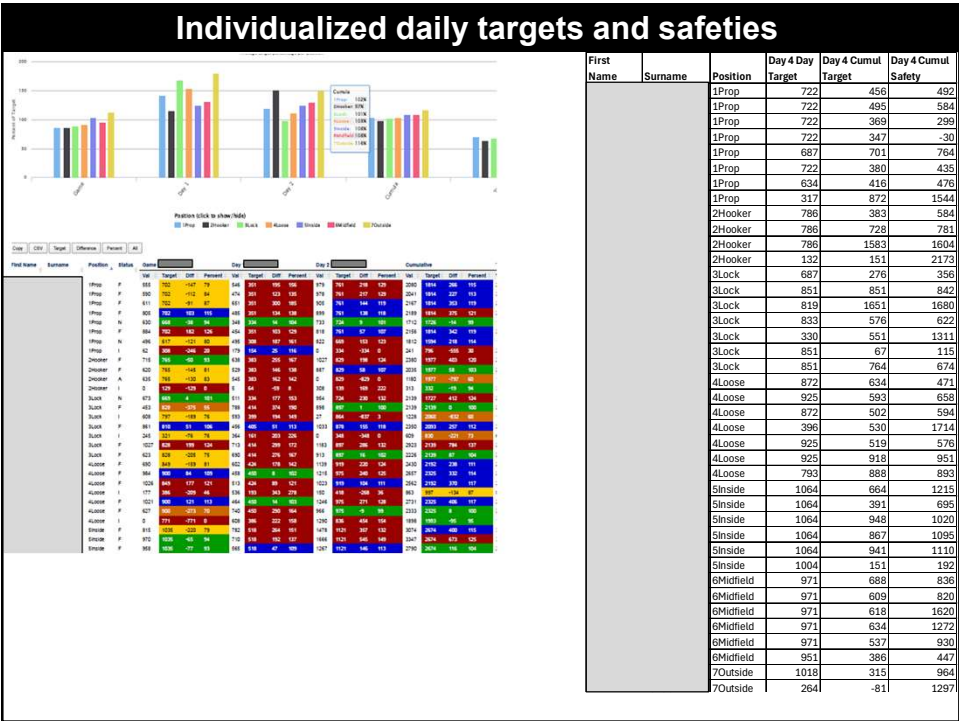
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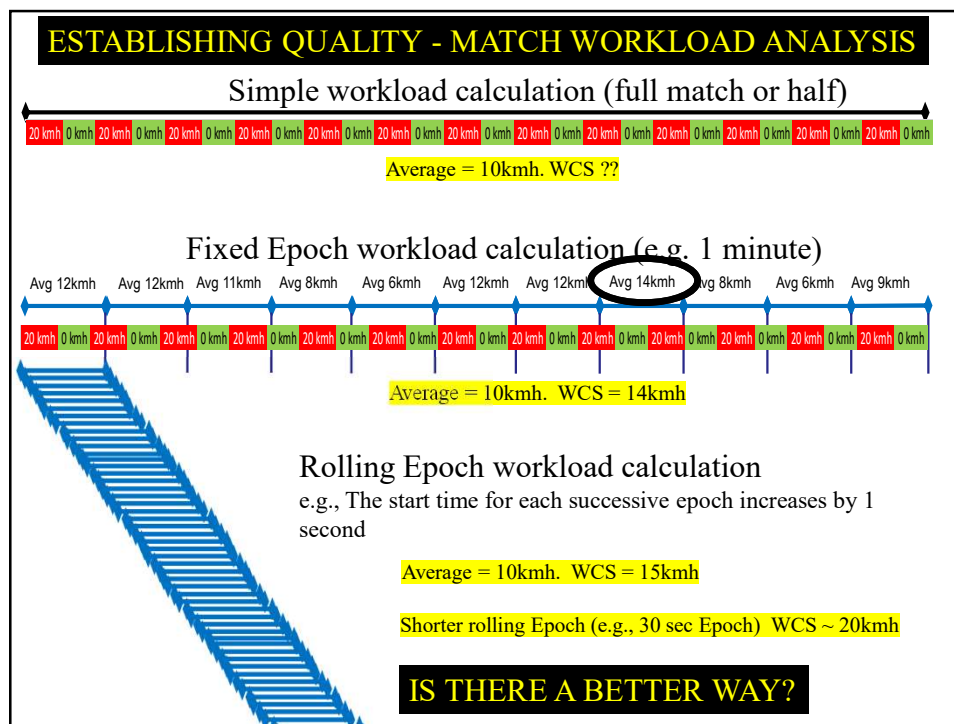
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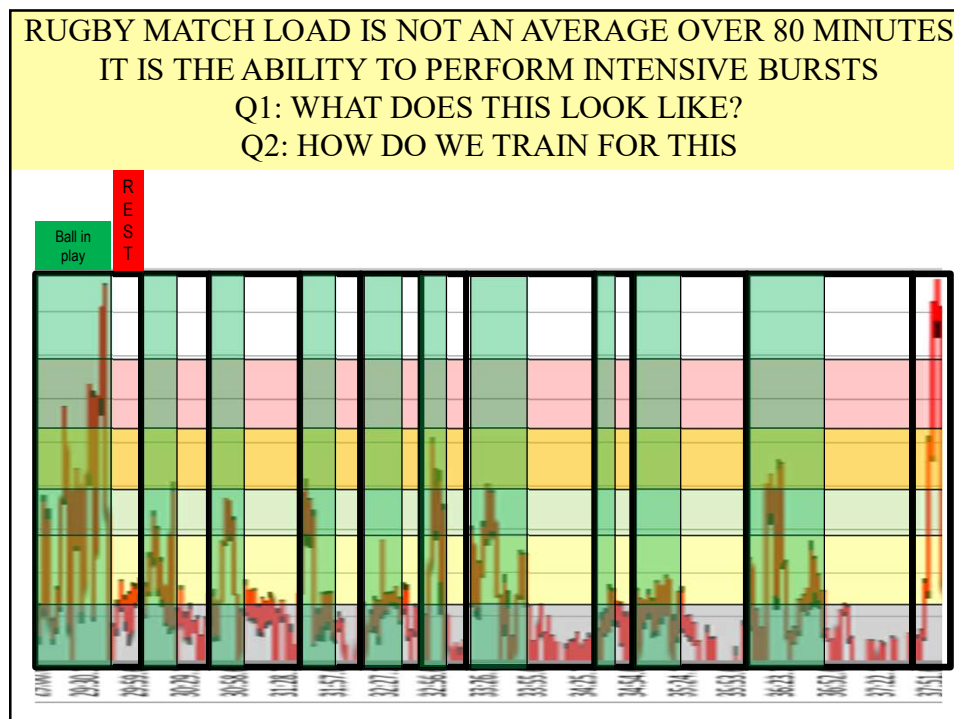
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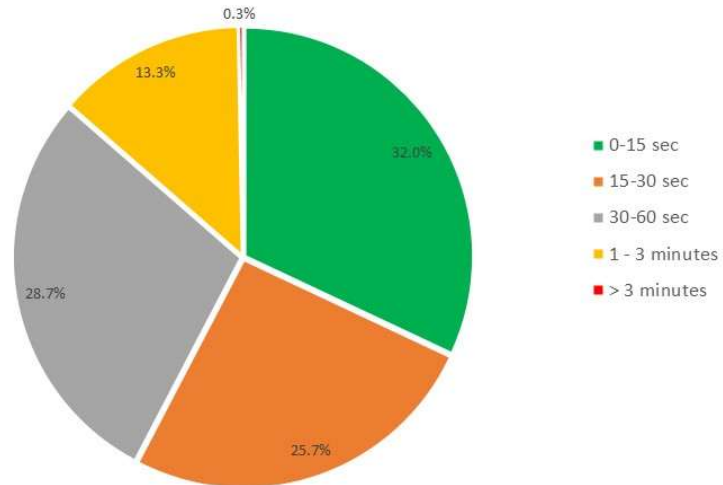
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Match analysis: Ball in Play (BiP) versus Ball out of Play (BoP)

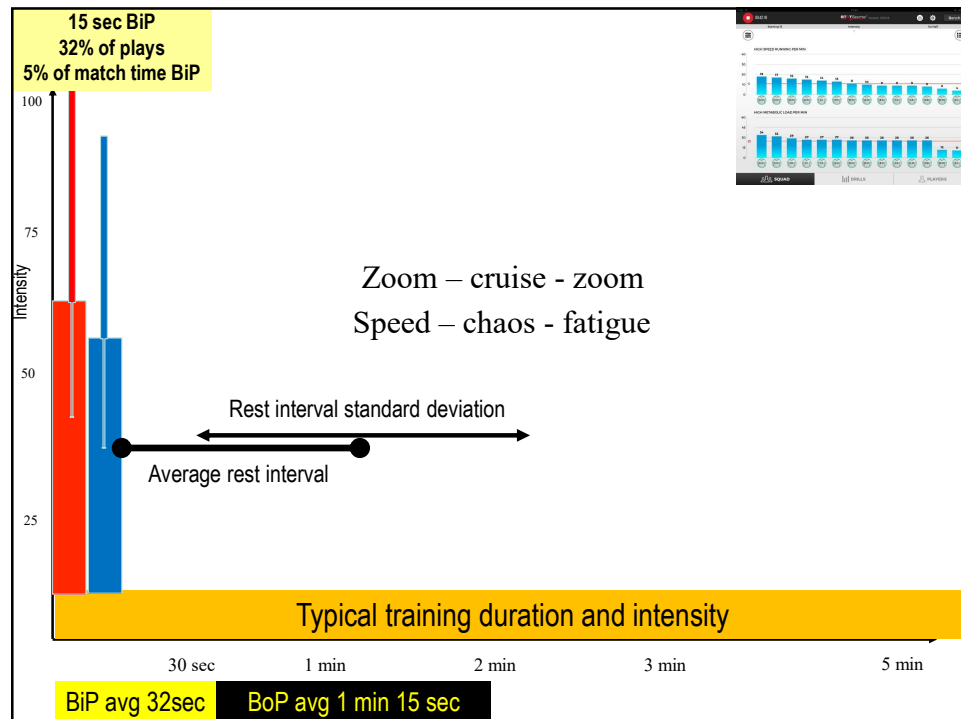
BiP avg 32sec

BoP avg 1 min 15 sec

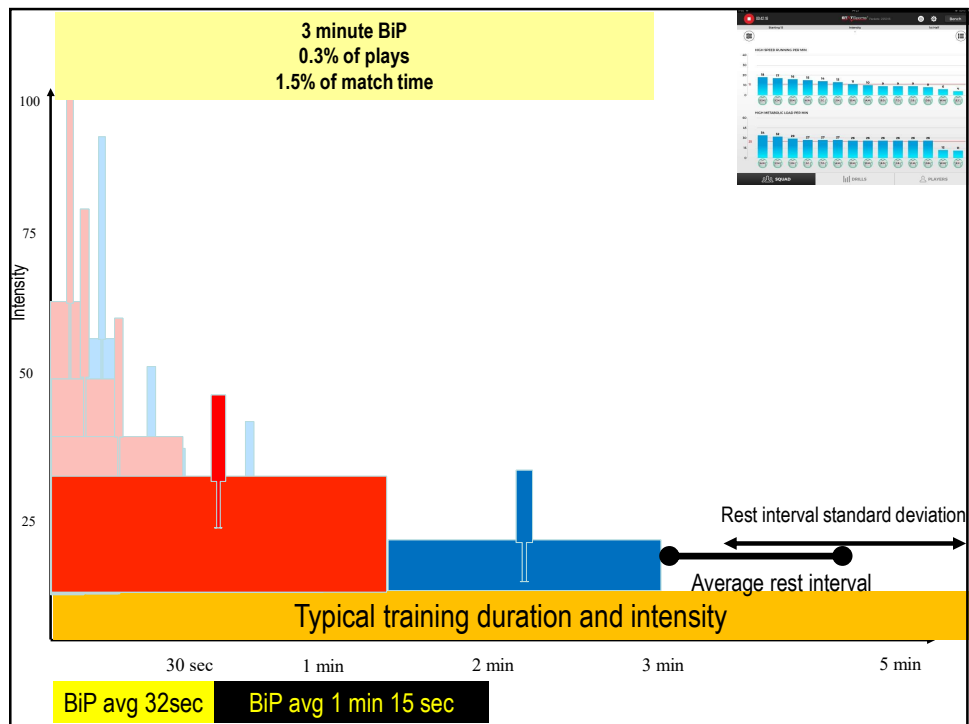
Match Ball in Play periods



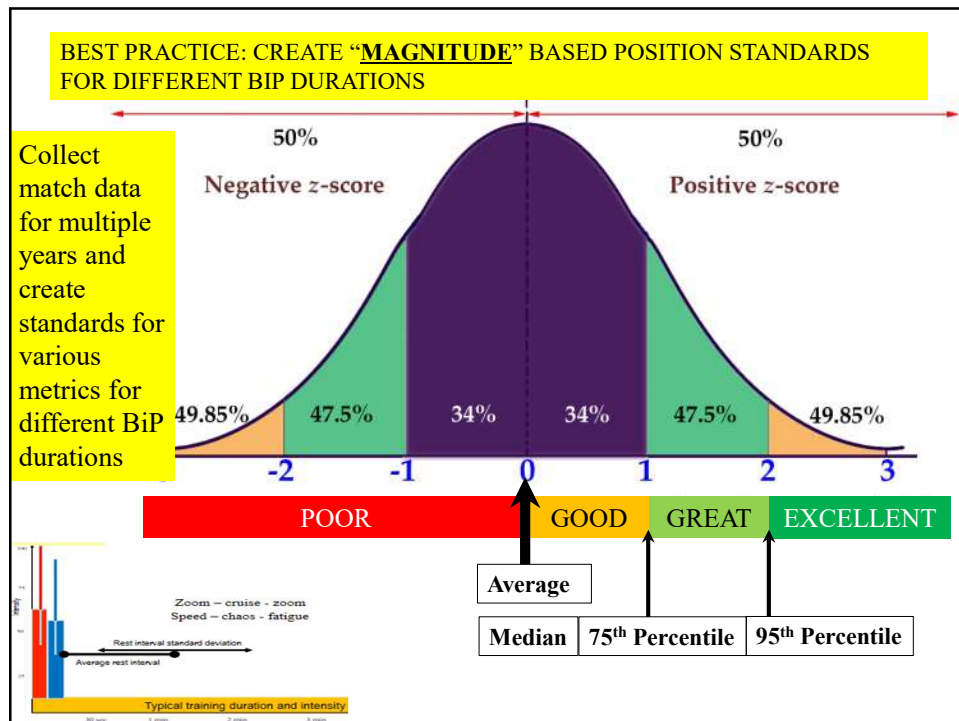
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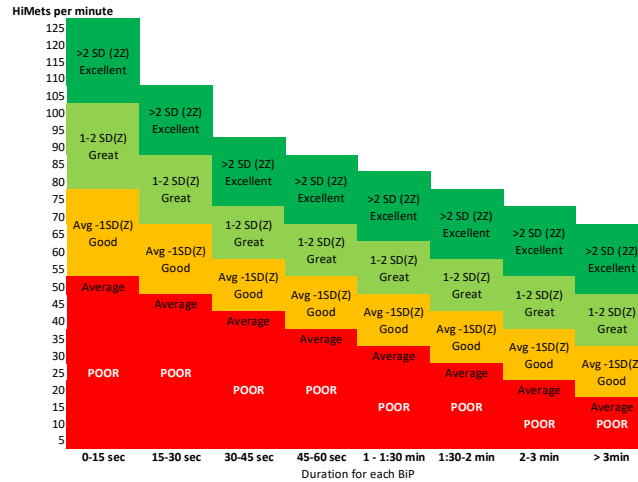
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Simple standards for BiP by position by duration

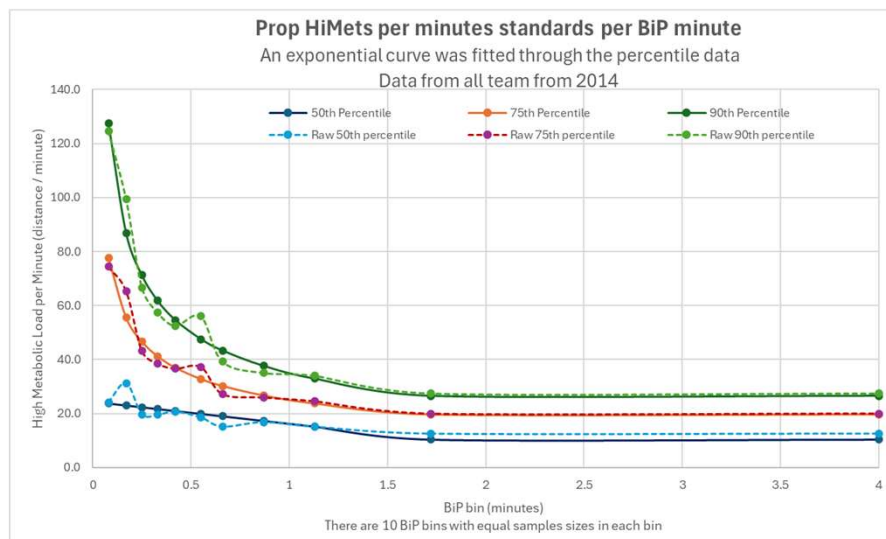
The standards achieved in matches become the standards for both match and training performance



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Metric standards for BiP by position by duration

The standards achieved in matches become the standards for both match and training performance



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Position	Fit	Mins	Quality		Himets		Int Accel		>85% Max		Max Speed		Distance		Notes
			%Min	%Drill	Metres	Rnk	Metres	Rnk	Metres	Rnk	m/s	%PB	Metres	Rnk	
1Prop	N	00:12:14	62%	54%	578	1	65	3	1	2	6.8	87%	7216	1	
1Prop	N	00:09:00	46%	41%	468	2	61	4	6	1	7	89%	6168	2	
1Prop	N	00:04:30	67%	55%	446	4	89	2	0	6	6.8	79%	5427	4	
1Prop	F	00:04:30	67%	55%	446	3	89	1	0	3	6.8	79%	5427	3	
1Prop	N				293	5	35	6	0	5	6.2	68%	1988	5	Non 23
1Prop	N				282	6	44	5	0	4	6.2	79%	1469	6	Non 23
2Hooker	F	00:11:20	58%	49%	744	1	156	1	0	2	7.7	81%	6556	1	
2Hooker	F	00:05:32	83%	73%	672	2	141	2	1	3	7.3	86%	5494	2	
2Hooker	F				347	3	45	3	0	1	6	71%	1845	3	
3Lock	F	00:24:09	92%	86%	1485	1	276	1	3	1	7.3	87%	8211	1	
3Lock	F	00:16:39	73%	68%	912	2	198	2	0	5	7.5	84%	7196	2	
3Lock	N	00:12:15	62%	62%	668	3	119	4	0	3	7.3	81%	6340	3	
3Lock	F	00:06:20	95%	73%	549	4	120	3	0	2	7.1	79%	5639	4	
3Lock	F				223	5	58	5	0	4	6.9	81%	1809	5	Non 23
4Loose	N	00:16:28	68%	67%	1180	1	307	2	15	1	8.2	91%	7933	2	
4Loose	F	00:16:56	64%	58%	1140	2	308	1	7	2	9	91%	8946	1	
4Loose	F	00:03:28	98%	83%	669	3	197	3	2	3	8.1	86%	5083	3	
5Inside	F	00:23:00	88%	85%	2026	1	304	3	2	3	7.5	87%	10832	1	
5Inside	F	00:17:24	66%	62%	1595	2	382	1	7	2	8.5	90%	9261	3	
5Inside	R	00:16:04	61%	56%	1589	3	305	2	0	4	7.9	85%	9815	2	
5Inside	F	00:00:11	100%	100%	696	4	169	4	0	5	7.8	87%	4405	4	
5Inside	F				287	5	119	5	9	1	8.3	92%	2342	5	Non 23
6Midfield	N	00:16:09	71%	68%	1201	1	274	1	0	2	8.2	84%	7769	1	
6Midfield	F	00:03:16	92%	67%	581	2	195	2	0	1	7.9	82%	5215	2	
7Outside	F	00:17:12	65%	58%	1495	1	551	1	80	1	9.8	101%	9106	2	
7Outside	F	00:17:13	65%	60%	1365	2	451	2	20	4	9.9	97%	9298	1	
7Outside	F	00:11:34	53%	44%	990	3	358	3	74	2	9.4	101%	6876	3	
7Outside	F	00:02:03	46%	43%	617	4	268	4	4	5	9	90%	4757	4	
7Outside	F				373	5	162	5	25	3	9.1	95%	2111	5	Non 23

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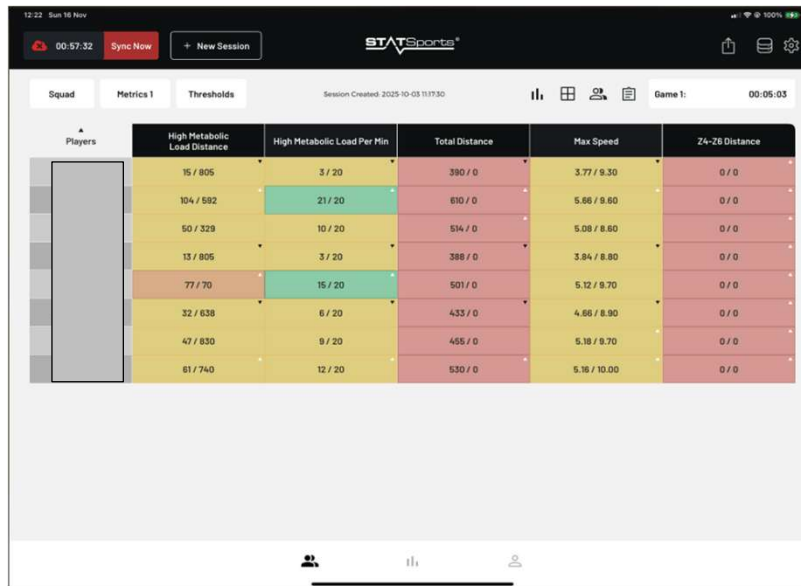
Training session analysis, drill qualities and durations

Drill Summary Comparison

Drill	Week	Day	Type	Label	Notes	Start	Year	Duration H:m:s	Duration Type	HiMet	HiMet/min	Qual	Distance	Distance/min	IntAcc	IntAcc/min	>85%
Drill 1 (D1):	PS09	Day 4	Team Training		Entire Session	Thu 06 Nov 09:47:06 2025	2025	02:56:51	long	902	6.1	Poor	6018	40.9	235	0	5.6
Drill 2 (D2):	PS09	Day 4	Other drill	Other	Entire Session - Live	Thu 06 Nov 09:57:18 2025	2025	02:30:28	long	902	6.6	Poor	6014	43.7	235	0	5.6
Drill 3 (D3):	PS09	Day 4	Other drill	Warm up	Warm up	Thu 06 Nov 10:19:10 2025	2025	00:06:49	long	138	20.2	Good	503	74	49.8	0	0.2
Drill 4 (D4):	PS09	Day 4	Other drill	Speed	Rugby Speed	Thu 06 Nov 10:26:32 2025	2025	00:02:29	long	227	9.1	Poor	148	59	8.1	0	0
Drill 5 (D5):	PS09	Day 4	Other drill	Units	BK Units	Thu 06 Nov 10:30:00 2025	2025	00:29:21	long	32.5	1.1	Poor	798	27.2	7	0	0
Drill 6 (D6):	PS09	Day 4	Other drill	Units	BK Units / Wide Breakdown	Thu 06 Nov 10:32:23 2025	2025	00:04:47	long	20.4	4.3	Poor	212	44.3	6.2	0	0
Drill 7 (D7):	PS09	Day 4	Other drill	Units	BK Units / KIL & Retention	Thu 06 Nov 10:38:06 2025	2025	00:02:36	long	64	24.7	Good	223	85	22.7	0	0.2
Drill 8 (D8):	PS09	Day 4	Other drill	Units	BK Units / Same way long edge	Thu 06 Nov 10:49:44 2025	2025	00:05:05	long	58	11.5	Poor	350	69	26.4	0	0.1
Drill 9 (D9):	PS09	Day 4	Other drill	Units	BK Units / Finish zone attack	Thu 06 Nov 10:55:35 2025	2025	00:03:05	long	29.6	9.6	Poor	166	54	15	0	0
Drill 10 (D10):	PS09	Day 4	Other drill	Contact	Contact	Thu 06 Nov 11:03:07 2025	2025	00:09:36	long	47.2	4.9	Poor	495	52	7.4	0	0
Drill 11 (D11):	PS09	Day 4	Conditioning drill	Kos vs Kor	KOS vs KOR / KIN	Thu 06 Nov 11:15:43 2025	2025	00:00:33	short	52	93	Excellent	109	196	11.9	0	1
Drill 12 (D12):	PS09	Day 4	Conditioning drill	Kos vs Kor	KOS vs KOR / KIN	Thu 06 Nov 11:16:49 2025	2025	00:01:07	medium	47.1	41.7	Great	155	137	9.4	0	0.1
Drill 13 (D13):	PS09	Day 4	Conditioning drill	Kos vs Kor	KOS vs KOR / KIN	Thu 06 Nov 11:18:29 2025	2025	00:00:49	short	30.6	37.4	Good	108	132	6.5	0	0
Drill 14 (D14):	PS09	Day 4	Conditioning drill	Kos vs Kor	KOS vs KOR / KIN	Thu 06 Nov 11:19:56 2025	2025	00:00:51	short	49.1	57	Great	132	155	13	0	0.9
Drill 15 (D15):	PS09	Day 4	Conditioning drill	Kos vs Kor	KOS vs KOR / KIN	Thu 06 Nov 11:21:21 2025	2025	00:00:54	short	40.9	45	Great	135	149	10.3	0	0
Drill 16 (D16):	PS09	Day 4	Conditioning drill	Kos vs Kor	KOS vs KOR / KIN	Thu 06 Nov 11:23:03 2025	2025	00:00:58	short	38	38.7	Good	124	126	10	0	0.1
Drill 17 (D17):	PS09	Day 4	Conditioning drill	15v15	Block 1.1	Thu 06 Nov 11:26:37 2025	2025	00:01:20	medium	64	47.9	Great	195	146	12.7	0	1.3
Drill 18 (D18):	PS09	Day 4	Conditioning drill	15v15	Block 1.2	Thu 06 Nov 11:28:25 2025	2025	00:00:56	short	30.6	32.7	Good	120	128	8.4	0	0
Drill 19 (D19):	PS09	Day 4	Conditioning drill	15v15	Block 1.3	Thu 06 Nov 11:30:22 2025	2025	00:00:52	short	36.1	41.4	Good	117	135	8.1	0	0
Drill 20 (D20):	PS09	Day 4	Conditioning drill	15v15	Block 1.5	Thu 06 Nov 11:33:06 2025	2025	00:00:36	short	47.6	78	Excellent	108	179	13.1	0	0
Drill 21 (D21):	PS09	Day 4	Conditioning drill	15v15	Block 1.6	Thu 06 Nov 11:34:35 2025	2025	00:00:31	short	58	111	Excellent	123	237	8.6	0	0
Drill 22 (D22):	PS09	Day 4	Conditioning drill	15v15	Block 2	Thu 06 Nov 11:35:39 2025	2025	00:01:12	medium	41	33.9	Good	163	135	8.7	0	0.2
Drill 23 (D23):	PS09	Day 4	Conditioning drill	15v15	Block 2.2	Thu 06 Nov 11:42:35 2025	2025	00:01:14	medium	30.4	24.7	Good	141	114	7.4	0	0
Drill 24 (D24):	PS09	Day 4	Conditioning drill	15v15	Block 2.3	Thu 06 Nov 11:44:37 2025	2025	00:01:42	medium	47.3	27.6	Good	193	113	10.8	0	0.2
Drill 25 (D25):	PS09	Day 4	Conditioning drill	15v15	Block 2.5	Thu 06 Nov 11:47:28 2025	2025	00:00:51	short	40.6	47.2	Great	124	144	10.9	0	2.4
Drill 26 (D26):	PS09	Day 4	Other drill	Work ons	BBA	Thu 06 Nov 11:52:45 2025	2025	00:24:43	long	43.5	2.1	Poor	661	31.9	7.5	0	0

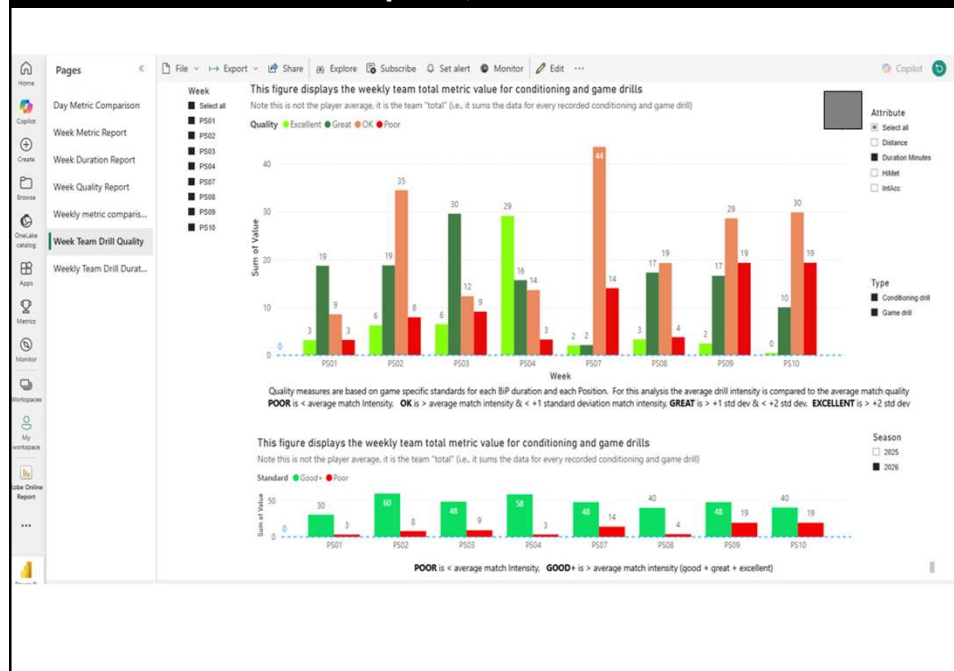
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Training session analysis, live player qualities and targets



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Week Reports, team drill totals



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The holy grail = metabolic cost of backwards and curvilinear running. Will enable directional specific power calculations



THANKS & QUESTIONS

The collage consists of 28 individual photographs. The top row features seven images: a man in a black and white tracksuit, a man in a black tracksuit, a bobsledder in action, a man in a red shirt, a man in a black and white jacket, a man in a black jacket, and a man in a white shirt. The second row includes two men in blue tracksuits, a man in a blue shirt, a man in a white shirt, a man in a black suit, a man in a black shirt, and a man in a black shirt. The third row shows two men in blue tracksuits, a man in a black shirt, a man in a black shirt, a man in a black shirt, and a man in a black shirt. The bottom section features a man in a black jacket, a man in a black shirt, a man in a black shirt, a man in a black shirt, a man in a black shirt, a man in a black shirt, and a man in a black shirt. The collage is set against a black background with the text 'THANKS & QUESTIONS' at the top.