Workload Demands during Ball-in-Play Periods: A Comparative Study of Locomotive and Contact Metrics in Professional Male and Female Rugby Union Players.

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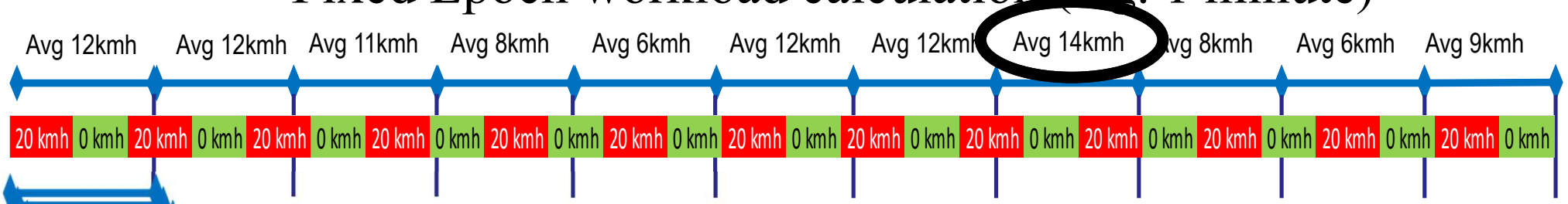
MATCH WORKLOAD ANALYSIS EPOCH vs BiP

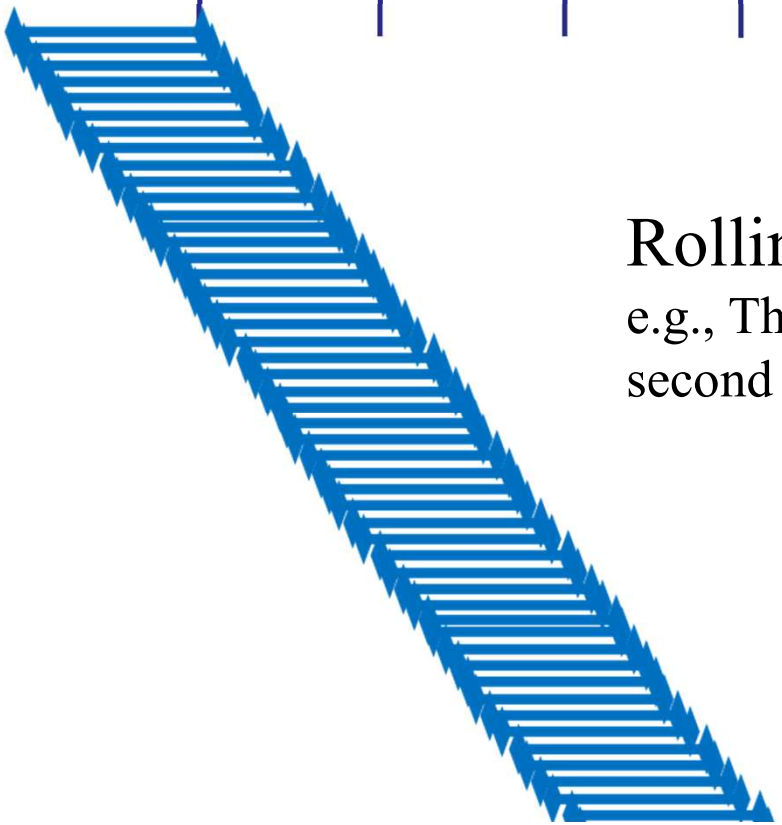
Simple workload calculation (full match or half)

Average = 10kmh. WCS ??

Fixed Epoch workload calculation (e.g. 1 minute)



Average = 10kmh. WCS = 14kmh

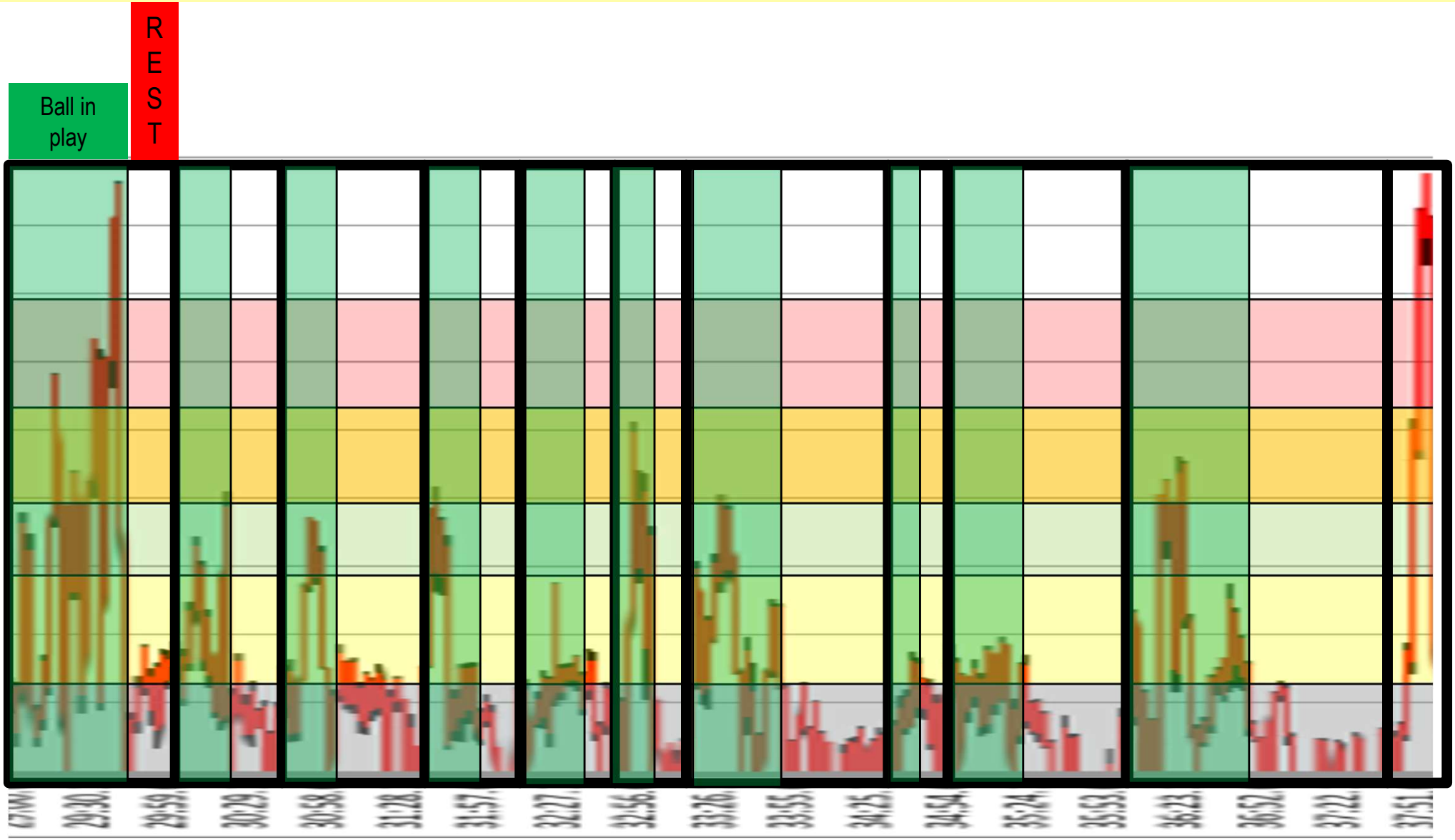


Rolling Epoch workload calculation

e.g., The start time for each successive epoch increases by 1 second

Average = 10kmh. WCS = 20kmh

RUGBY MATCH LOAD IS NOT AN AVERAGE OVER 80 MINUTES
IT IS THE ABILITY TO PERFORM INTENSIVE BURSTS
Q1: WHAT DOES THIS LOOK LIKE?
Q2: HOW DO WE TRAIN FOR THIS



- This pilot study compared Ball-in-Play (BiP) contact and KPI GPS workload metrics between female and male rugby players during four national provincial championship matches for each team at the same relative time of the season.
- 60 professional male and female rugby players participated from a female provincial championship team and a male provincial championship team.
- All participants wore GPS units (Apex Pro Pod, STATSport, Newry, NIR) during matches.
- The match contact events were manually coded in Sportscode (Sportscode 12.4.3, Sportstec, Australia) using a procedure developed and validated by Chittenden (2023).
- The BiP periods were coded in Sportscode and applied to the GPS and contact data within a custom-made online database.
- Differences between the sexes for each metric were analysed using Welch's t-test with the level of significance set at $P<0.05$ and the magnitudes of the standardised differences were calculated using effect sizes determined by Cohen's d (Hopkins, 2009, 2017).
- Tests for equality of variances, normality, and the examination of outliers were conducted in IBM SPSS Statistics (Version 27) and the metrics that failed normality testing were log-transformed.

KEY VOLUME METRIC SUMMARY

	Women	Men		Significance	Standardised difference	Magnitude
	Average	Average	P value			
DISTANCE	1922 ± 884	3968 ± 3096	0.000	P<0.05	-0.866	Moderate
HMLD	336.5 ± 256.4	821.3 ± 739.5	0.000	P<0.05	-0.847	Moderate
SPMLD	54.9 ± 57.3	208.3 ± 228.9	0.000	P<0.05	-0.885	Moderate
ACCELERATIONS	14.6 ± 11.4	43.0 ± 36.5	0.000	P<0.05	-1.010	Moderate
DECELERATIONS	14 ×/÷ 2.4	29.2 ×/÷ 2.8	0.000	P<0.05	-0.704	Moderate
CONTACT	54.8 ± 46.8	51.0 ± 42.4	0.311	NS	0.086	Trivial
DSL	55.6 ×/÷ 2.1	141.2 ×/÷ 3.1	0.000	P<0.05	-0.954	Moderate
TOTAL BiP Time	28.6 ± 10.7	23.2 ± 14.5	0.004	P<0.05	0.423	Small

Footnote: When data log is transformed for analysis, the values are back-transformed geometric mean ×/÷ standard deviation as a factor, otherwise values are mean ± standard deviation. NS is non-significant (P > 0.05). Magnitudes were determined from Cohen's d. HMLD = Distance > 25.5 w/kg (m), SPMLD = Distance > 50 w/kg (m), Accelerations = Count of events > 2 m/s/s, Decelerations = Count of events < -2 m/s/s, Contact = Modified RPE Scale (Chittenden 2021), DSL = Dynamic Stress Load weighted impacts, Total BiP Time = Total BiP time per player (minutes)

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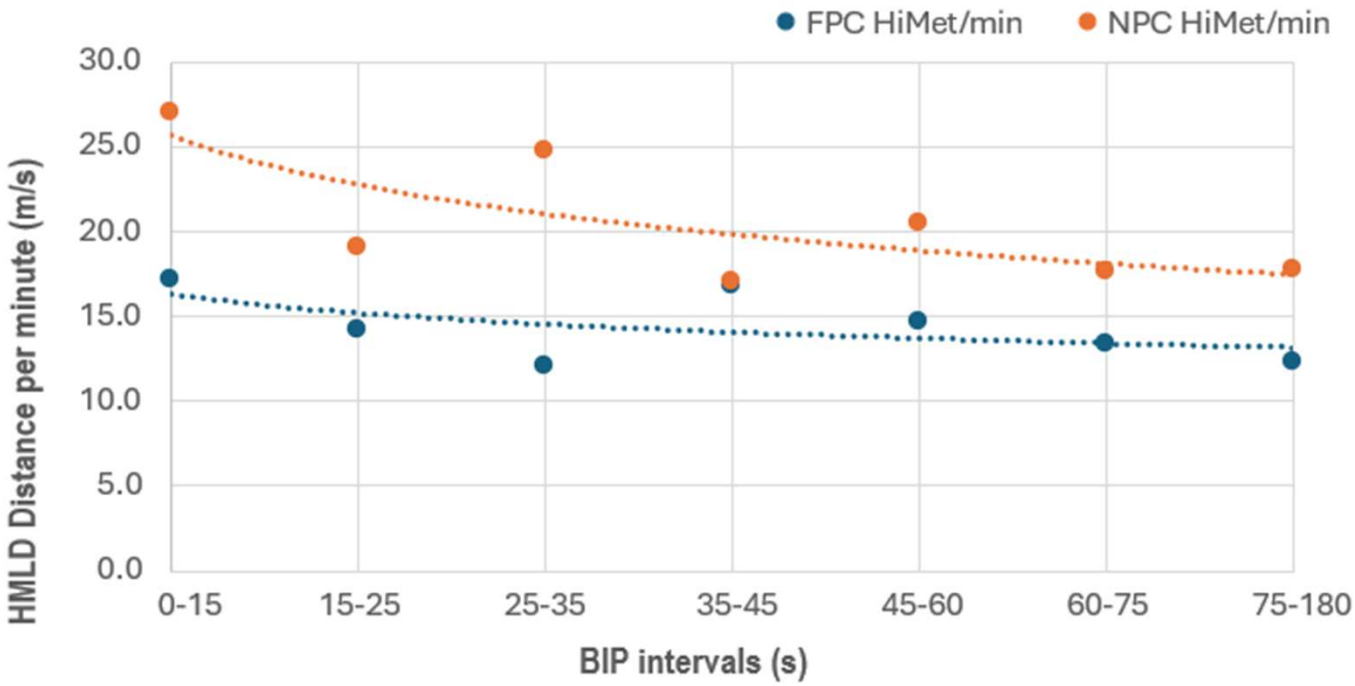
KEY INTENSITY METRIC SUMMARY (METRIC PER MINUTE)

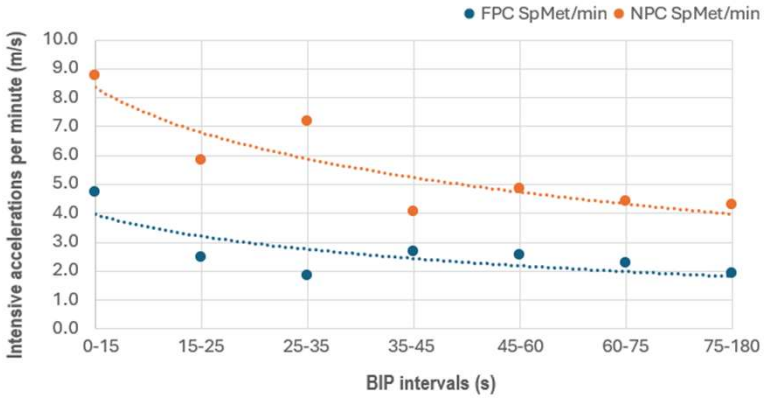
	Women	Men		Significance	Standardised difference	Magnitude
	Average	Average	P value			
DISTANCE/MIN	61.8 ×/÷ 1.7	61.9 ×/÷ 1.6	0.488	NS	-0.005	Trivial
HMLD/MIN	9.2 ×/÷ 2.1	12.5 ×/÷ 1.9	0.005	P<0.05	-0.423	Small
SPMLD/MIN	1.5 ×/÷ 2.2	2.9 ×/÷ 2.1	0.000	P<0.05	-0.731	Moderate
ACCELERATIONS/MIN	0.5 ×/÷ 1.7	0.7 ×/÷ 1.7	0.001	P<0.05	-0.494	Small
DECELERATIONS/MIN	0.7 ×/÷ 1.7	0.9 ×/÷ 2	0.075	NS	-0.354	Small
CONTACT/MIN	1.6 ×/÷ 2.5	1.2 ×/÷ 2	0.044	P<0.05	0.327	Small
DSL/MIN	2 ×/÷ 1.7	3.1 ×/÷ 1.9	0.000	P<0.05	-0.715	Moderate
TOTAL BiP Time	28.6 ± 10.7	23.2 ± 14.5	0.004	P<0.05	0.423	Small

Footnote: When data log is transformed for analysis, the values are back-transformed geometric mean ×/÷ standard deviation as a factor, otherwise values are mean ± standard deviation. NS is non-significant (P > 0.05). Magnitudes were determined from Cohen's d. HMLD = Distance > 25.5 w/kg (m), SPMLD = Distance > 50 w/kg (m), Accelerations = Count of events > 2 m/s/s, Decelerations = Count of events < -2 m/s/s, Contact = Modified RPE Scale (Chittenden 2021), DSL = Dynamic Stress Load weighted impacts, Total BiP Time = Total BiP time per player (minutes)

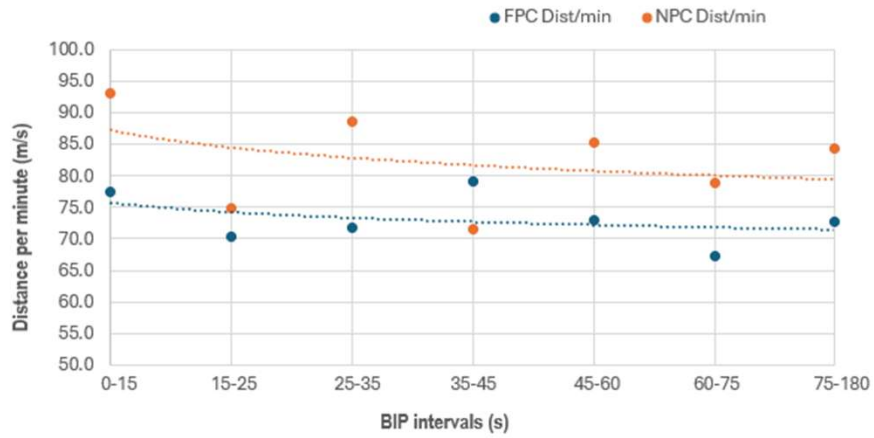
FPC vs NPC HMLD distance per minute for the various BIP intervals

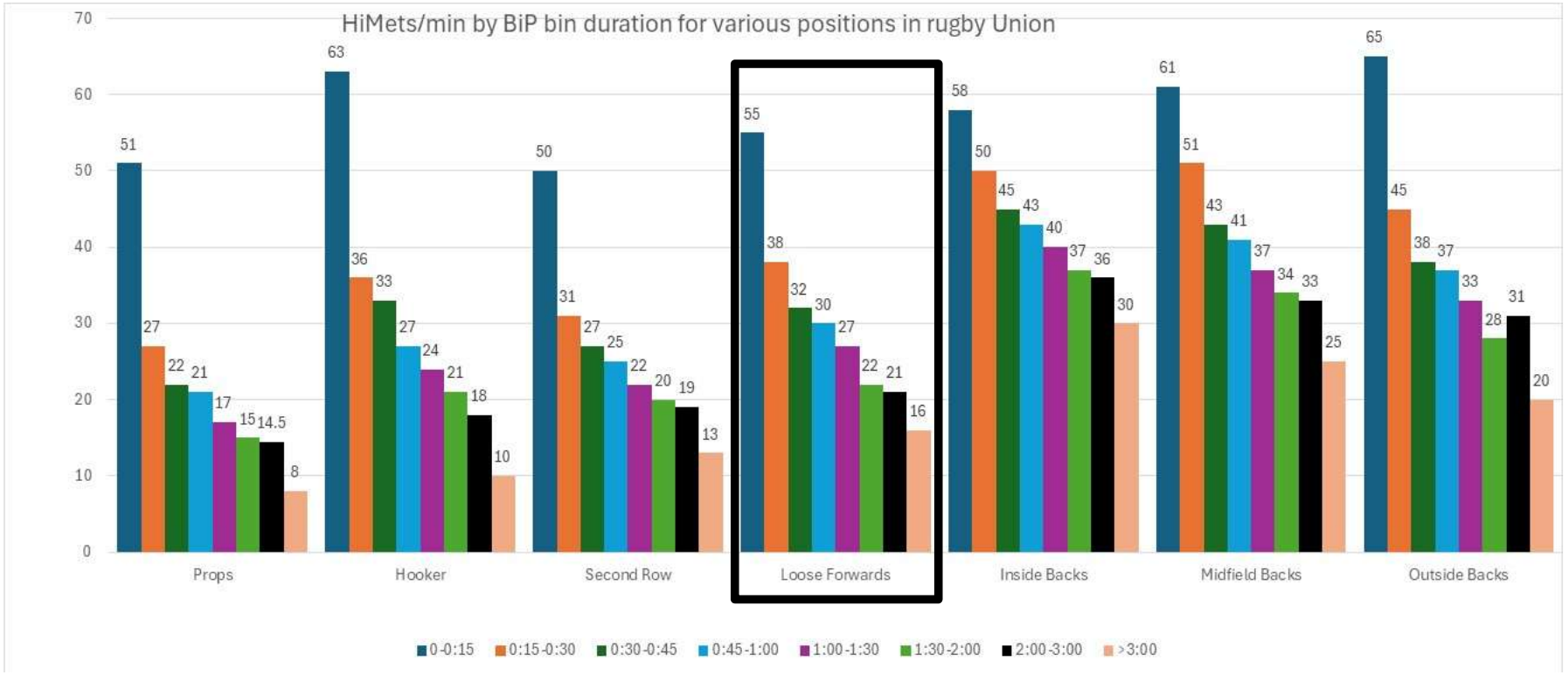


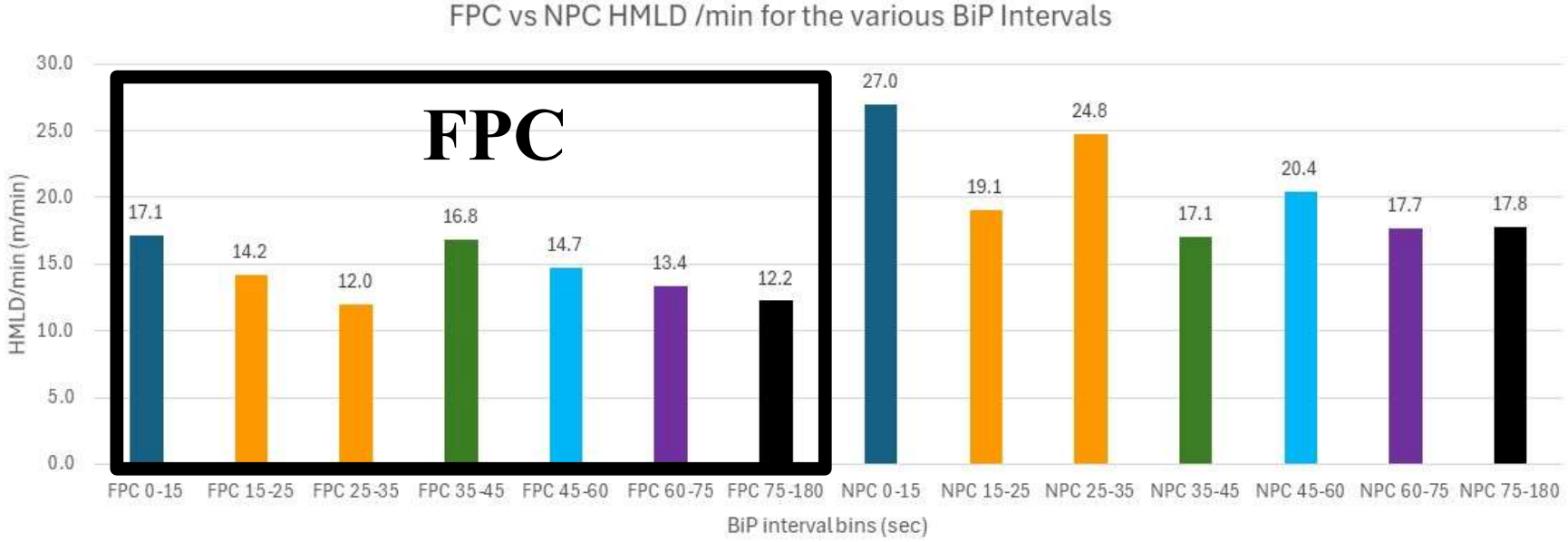
FPC vs NPC SPMLD distance per minute for the various BIP intervals



FPC vs NPC Distance per minute for the various BIP intervals




HiMets/min by BiP bin duration for various positions in rugby Union
70
60
50
40
30
20
10
0
51 27 22 21 17 15 14.5 8
63 36 33 27 24 21 18 10
50 31 27 25 22 20 19 13
55 38 32 30 27 22 21 16
58 50 45 43 40 37 36 30
61 51 43 41 37 34 33 25
65 45 38 37 33 28 31 20
Props
Hooker
Second Row
Loose Forwards
Inside Backs
Midfield Backs
Outside Backs
0-0:15
0:15-0:30
0:30-0:45
0:45-1:00
1:00-1:30
1:30-2:00
2:00-3:00
>3:00


FPC vs NPC HMLD /min for the various BiP Intervals
FPC
HMLD/min (m/min)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
17.1
14.2
12.0
16.8
14.7
13.4
12.2
27.0
19.1
24.8
17.1
20.4
17.7
17.8
FPC 0-15
FPC 15-25
FPC 25-35
FPC 35-45
FPC 45-60
FPC 60-75
FPC 75-180
NPC 0-15
NPC 15-25
NPC 25-35
NPC 35-45
NPC 45-60
NPC 60-75
NPC 75-180
BiP interval bins (sec)

Conclusions

- The Males locomotive GPS metrics were typically significantly greater than females (large to moderate differences).
- Contacts were often significantly higher for females (small to large differences), although impacts were higher for males.
- The differences between males and females were likely a combination of genetic differences, and differences in how the respective games were played, and the males in this study typically had greater full-time professional training support and resources.
- Altering female threshold standards for specific intensive locomotion metrics to suit the physical capabilities of females, may give more of an accurate representation of game demands.
- Providing greater resources to female rugby union players for similar periods to the males may reduce the differences observed in this study.

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