
CATAPULT VECTOR
ENGINEERED FOR
PERFORMANCE
VECTOR DATA INTEGRITY
CATAPULTSPORTS.COM

VECTOR / VICON

CONCURRENT VALIDITY PREVIEW

VECTOR CONCURRENT VALIDITY

CATAPULT PREVIEW

PURPOSE

- The following slides are a **preview** of the current analysis taking place for the concurrent validity of Vector against a gold standard motion capture system (Vicon – Nexus)

Please note this is a part of Catapult' Vector internal validation works and all data has been processed by catapult staff.

METHODS

- Data collection took place at night under optimal and consistent lighting conditions
- Four Vector devices were chosen at random from a population of 24 and were placed in the middle of the testing area for 15 minutes prior to data collection
- Catapult Clearsky 2.0 was set up around the testing area with 21 anchors.
- A 20 camera Vicon system was set up (outdoors) with a total capture area of 20m x 15m. The Vicon system was calibrated and operated by experienced staff from the Victoria University biomechanics lab.
- Reflective markers were placed on each shoulder and the assigned device of each participant for data capture.

- Participants completed the following trials:

  - 5m Sprint [3]
  - 10m Sprint [3]
  - 20m Sprint [3]
  - 45 deg change of direction [3]
  - 90 deg change of direction [3]
  - Sport simulation [3]

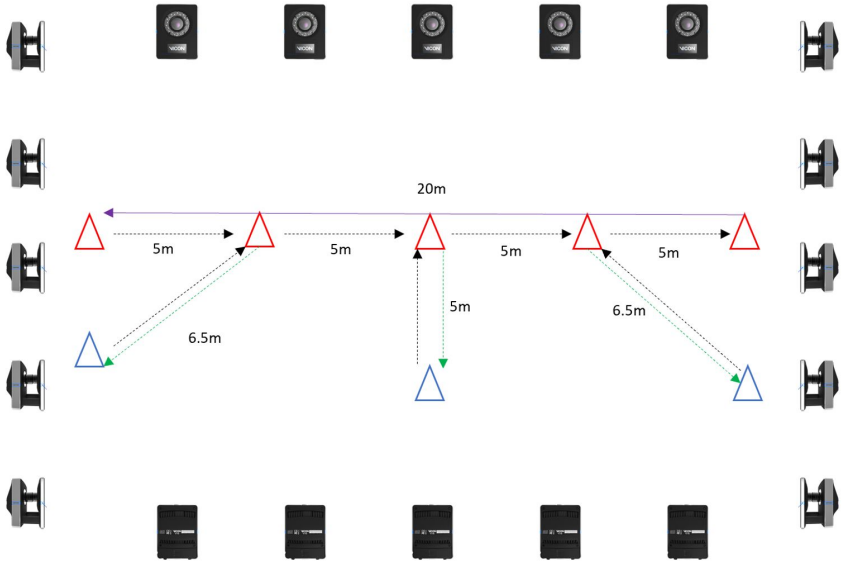


Fig 1 – Vicon camera layout and and trial setup within testing area.

VECTOR CONCURRENT VALIDITY

DATA ANALYSIS

- Vicon data down sampled from 250 Hz to 10 Hz (the sampling frequency of Vector technology) in accordance with previous studies [1]
- Vicon data was appropriately filtered to ensure the removal of the effects of centre of mass displacement during locomotion, as this is not present in Catapult data.
- Each trial was isolated within the respective GPS and LPS 10Hz data exports from the OpenField software (ver 2.0)
- Data was processed within R [3.0.6] statistical computing software and initial comparisons made using a cross correlation methodology, from which the following graphs were prepared.

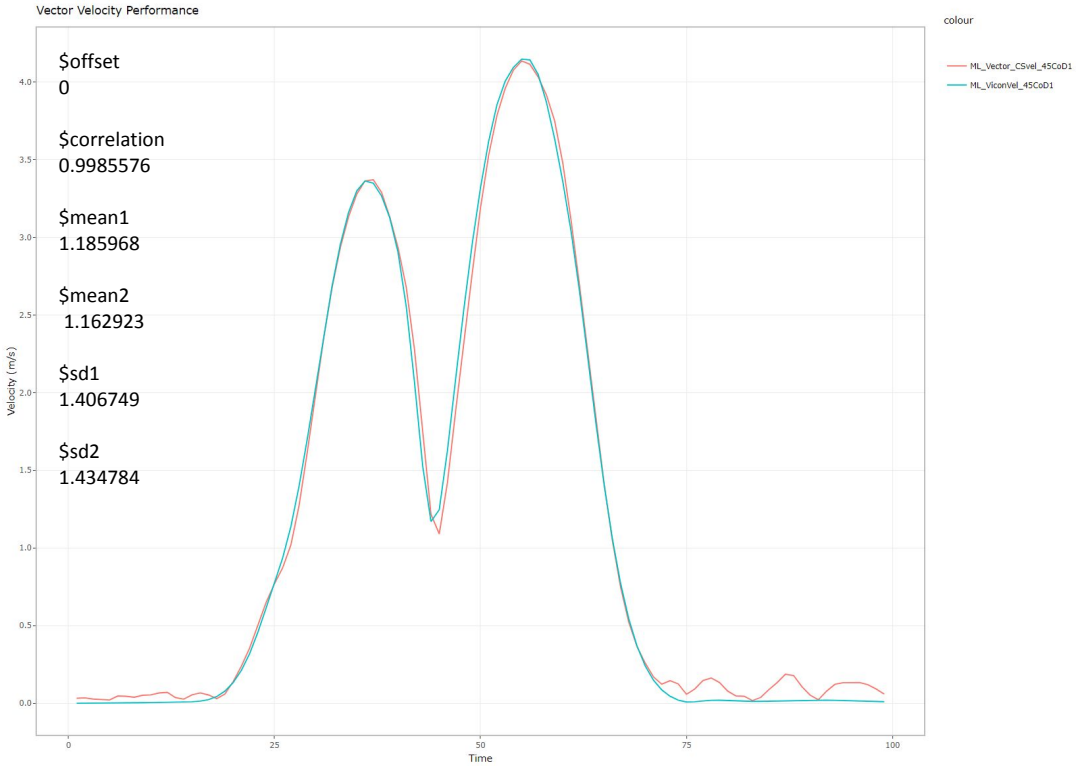


Fig 2. Vector LPS (red) vs Vicon (blue) *Velocity* – 45 degree change of direction task

VECTOR CONCURRENT VALIDITY

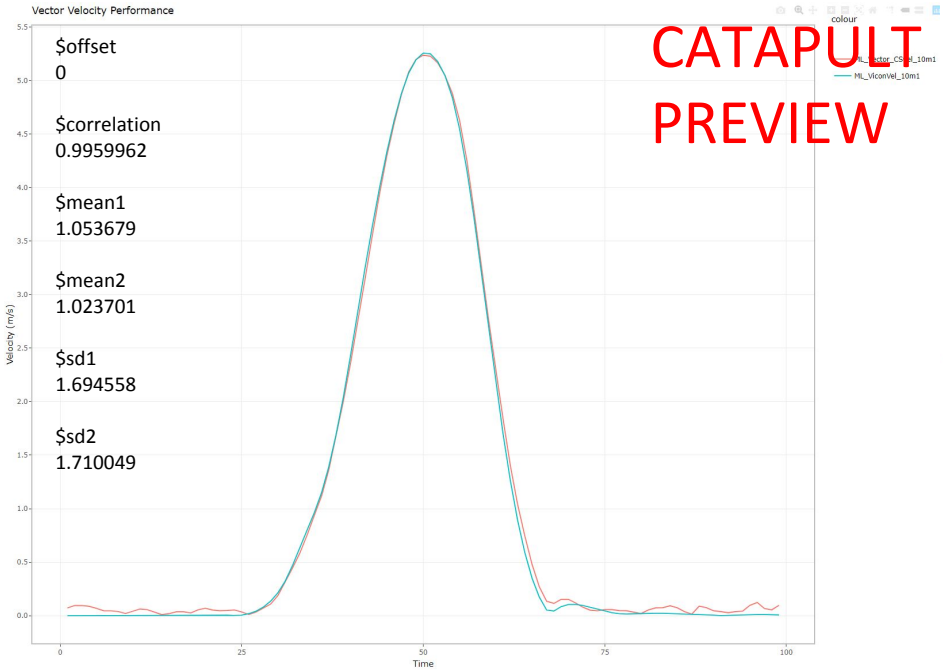


Fig 3 . Vector **LPS** (red) vs Vicon (blue) ***Velocity*** – 10m Linear Sprint task.

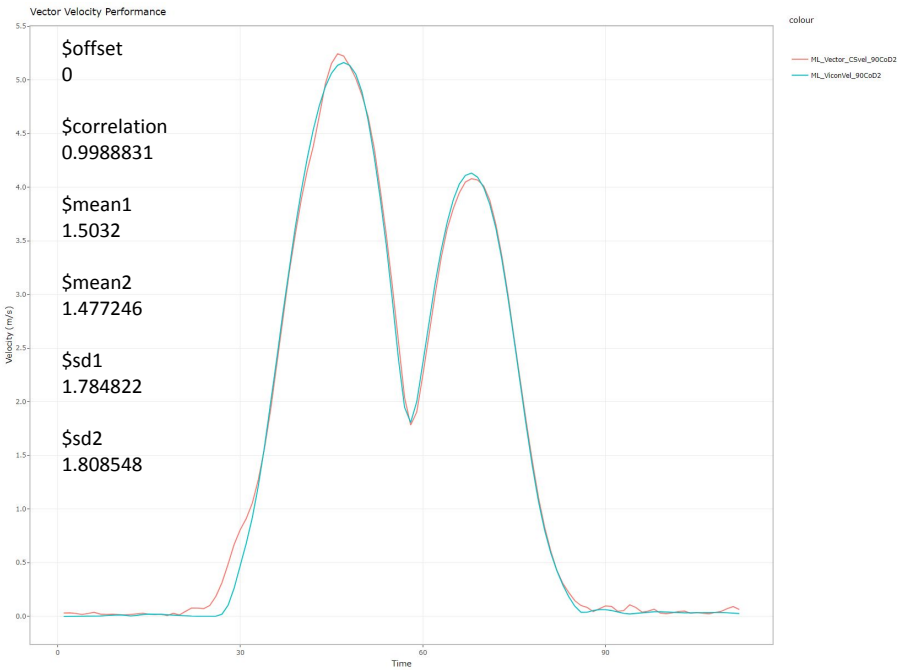


Fig 4 . Vector **LPS** (red) vs Vicon (blue) ***Velocity*** – 90 degree CoD task.

VECTOR CONCURRENT VALIDITY

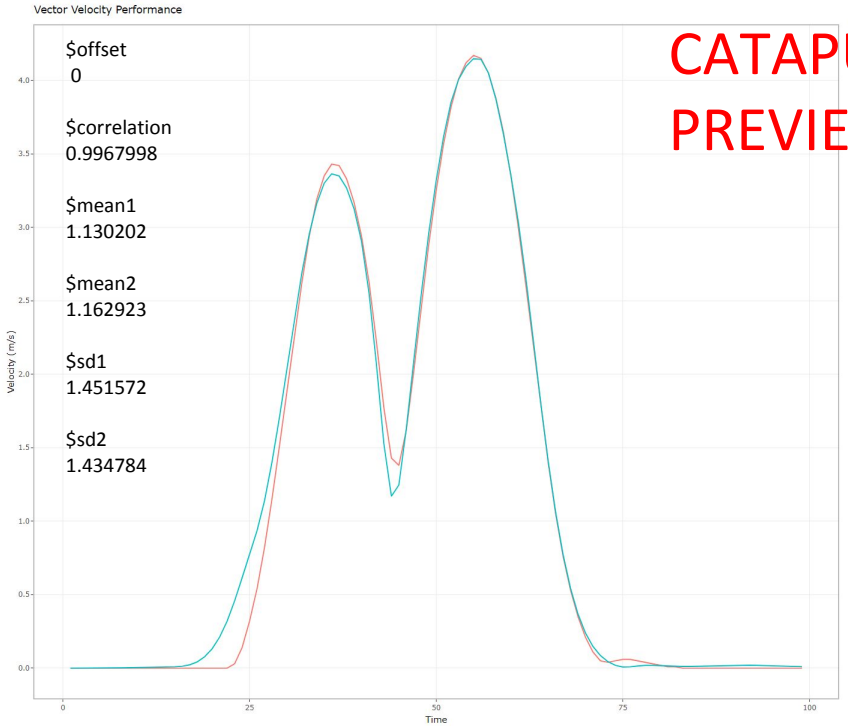


Fig 5. Vector **GPS** (red) vs Vicon (blue) ***Velocity*** – 45 degree change of direction task

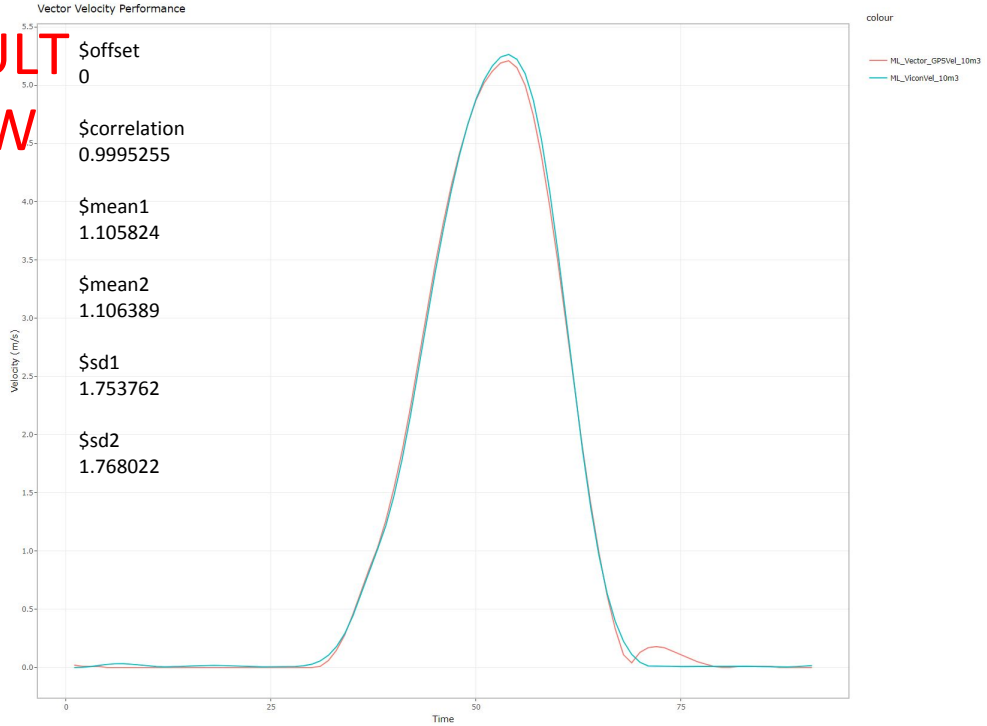


Fig 6 . Vector **GPS** (red) vs Vicon (blue) ***Velocity*** – 10m Linear Sprint task.

VECTOR CONCURRENT VALIDITY

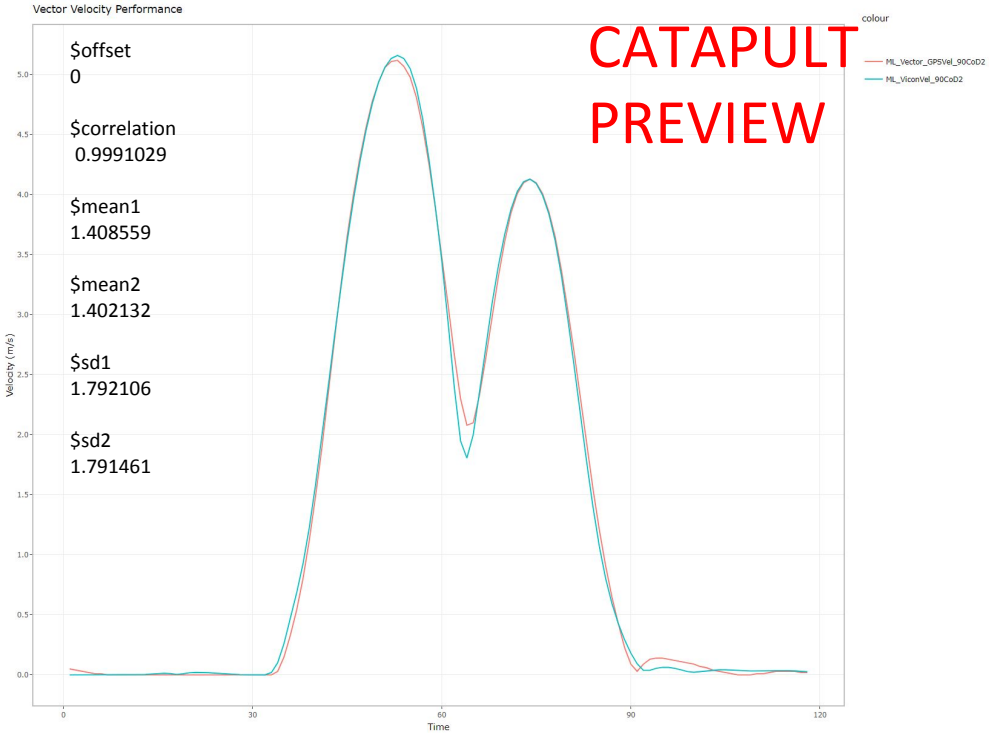


Fig 7 . Vector **GPS** (red) vs Vicon (blue) ***Velocity*** – 90 degree CoD task.

SUMMARY

Early stage analysis indicates a very close relationship between Vector and Vicon, for both linear and multi directional trials.

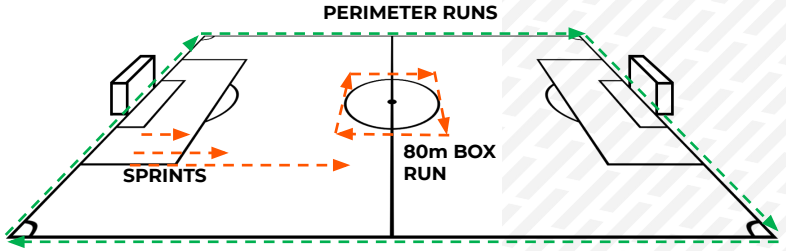
Larger scale regression analysis is currently in progress for the entire dataset, consisting of 72 total trials over 6 tasks and 4 participants .

[1] Serpiello et al. (2017). Validity of an ultra-wideband local positioning system to measure locomotion in indoor sports. *JSS*

TRAINING GROUND VALIDATION

VECTOR *TRAINING GROUND VALIDATION*

'Data integrity is the core of the Catapult Elite Wearable athlete tracking solution. We don't want you to just believe we have the highest quality data possible, we want to show you...'

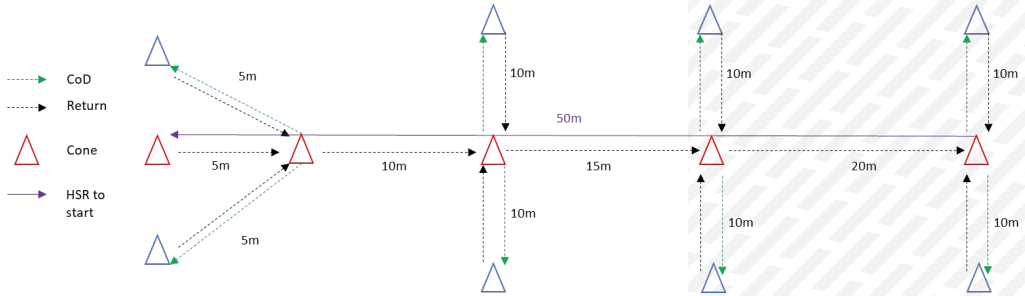


AIMS

1. Assessment of the **validity** and **reliability** of the Vector S7 device in a training ground environment

PROTOCOL

1. 4 team sport athletes
2. Distance measurements compared with tape
3. Speed measurements compared with Stalker ATS II (radar)
4. Trials:
   - I. Pitch perimeter runs [16]
   - II. 80m box run [40]
   - III. 5m sprint [16]
   - IV. 10m sprint [16]
   - V. 30m sprint [12] – (*Radar)*
   - VI. Sport simulation [6]
   - VII. Multi-device sled assessment [24]



SPORT SIMULATION – A multi-speed, multi-directional circuit designed to challenge positional technology in a range of high intensity sport specific movements. Participants complete 1 side of the circuit per trial

VECTOR *TRAINING GROUND VALIDATION*

RESULTS

- Total Distance mean bias (%) for all trials was **1%** or less, indicating an excellent level of accuracy during both linear and multi-directional tasks
- Root Mean Square Error (m) shows the standard deviation for the prediction errors (Vector vs. Reference). All trials displayed a **very low** RMSE
- Inter-unit reliability, for the multi-directional and multi-speed sled based trial garnered a CV% of **0.4%** and is considered ***excellent.*** Multi-device sport simulation trials produced a CV% of **1.3%** and is also considered ***excellent.***
- Peak speeds as measured against radar shows a mean bias of **-0.5%**.

SUMMARY

- Measurements of max velocity and distance covered are valid and reliable with Vector GPS
- As speed and change of direction increased there were no decreases in validity or reliability
- Inter-unit reliability was high in complex, multi-directional trials
- The Catapult Vector device is considered both a **valid** and **reliable** GPS device, within a training ground environment, for both linear and multi-directional activities.

Total Distance	5m	10m	30m	80m Box	Perimeter	Sport Sim
Mean ± SD	5.01 ± 0.1	10.1 ± 0.3	30.1 ± 0.4	79.62 ± 0.6	319.1 ± 2.3	168.7 ± 2.3
REF	5	10	30	80	321	170
Mean Bias	0.01	0.10	0.17	-0.38	-2.08	-1.3
Mean Bias %	0.2%	1.0%	0.6%	-0.5%	-0.6%	-0.8%
RMSE	0.2	0.3	0.36	0.72	2.9	2.6

Table 1 – Distance (m) covered compared with a reference value for 6 different trials

Total Distance	Sled Test	Sport Sim
Mean ± SD	755.9 ± 2.8	168.7 ± 2.2
CV%	0.4%	1.3%

Table 2 – Inter-unit reliability for distance covered in 2 different multi-directional and multi-speed trials

	30m Sprint		10m Sprint	
Maximum Velocity (m/s)	Vector	Stalker	Vector	Stalker
Mean ± SD	7.5 ± 0.07	7.5 ± 0.09	5.2 ± 0.1	5.4 ± 0.2
Typical Error	0.01		0.05	
r	1.0		0.96	

Table 3 – Concurrent validity of maximum velocity in meters per second. Vector GPS is validated against the Stalker radar gun

STADIUM VALIDATION

VECTOR GPS STADIUM PERFORMANCE [MCG]

OUTLINE

In stadium performance of GPS technology is of high importance for matchday load monitoring. This is a summary of Vector GNSS performance within a large, moderately obstructed stadium environment.

Although a large stadium in capacity and stand height, the MCG would be classified as a moderately obstructed environment due to the dimensions of the pitch and the field to stand clearance

AIM

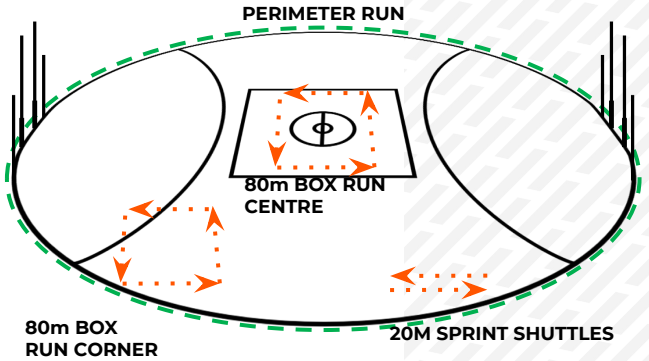
- Assessment of the **validity** and **reliability** of the Vector S7 GPS data in a stadium environment.

STADIUM

- 100,024 seat oval stadium
- Field dimensions - 171 x 146m
- Stand height - 45m
- Pitch to stand clearance - 5 m

PROTOCOL

1. 3 team sport athletes
2. Distance measurements compared with total-station (laser)
3. Single device worn in purpose-built Vector garment
4. GPS derived distance and efforts exported from OF 2.0 software
5. Corner field trials were placed close to the sideline and underneath the stadium's tallest stand
6. Trials:
    I. Pitch perimeter runs [12]
    II. 80m box run centre field [30] (Offset)
    III. 80m box run corner field [30]
    IV. 20m sprint shuttles [12]



VECTOR GPS STADIUM PERFORMANCE [MCG]

RESULTS

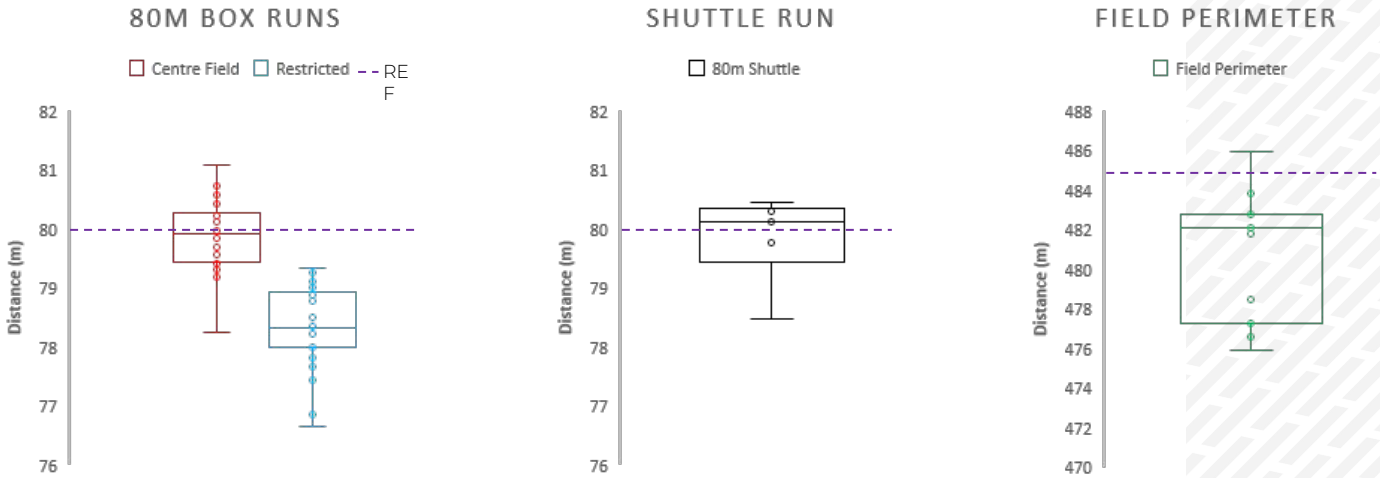


Fig 1 – Trial box plots showing the distribution of data (m) for Vector GPS within a stadium environment

	Total Distance					
	Mean ± SD (m)	***Bias (m)***	***Bias %***	***RMSE (m)***	***CV (%)***	***REF (m)***
80m Box Centre Field	79.9 ± 0.5	-0.11	-0.1%	0.57	0.72	80
80m Box Restricted	78.4 ± 0.6	-1.64	-2.1%	1.78	0.75	80
4 x 20m Shuttle	79.87 ± 0.7	-0.13	-0.2%	0.67	0.90	80
Field Perimeter	480.8 ± 3.24	-4.17	-0.9%	5.2	0.70	485

Table 1 – Distance (m) covered compared with a reference value for 4 different trials

VECTOR GPS STADIUM PERFORMANCE [MCG]

RESULTS

- Results are presented as Means ± SD, Bias (mean & %) and RMSE
- Vector reliability was assessed using Coefficient of Variation (CV%)
- Box runs at center field produced a **0.1%** Bias and a Bias of only **2.1%** when performed close to the highest stand in the stadium.
- High intensity shuttle running trials produced a **0.2%** mean bias. It worth noting that during these trials performance of the turns was highly controlled for accuracy of movement.
- GPS performance was maintained around the perimeter of the stadium with only a slight underestimation of distance covered (Bias = **0.9%**)
- Positioning Quality metrics indicate a high quality of signal strength and precision, with a session average HDOP of **1.1** and **73.6 %** GNSS quality.

SUMMARY

- With low error, high reliability and high GNSS quality scores, Vector is considered a valid and reliable tool for measuring distance and position within a large, moderately obstructed stadium environment.
- Although showing marginal increases in error, performance was maintained in multiple areas of the field, at multiple orientations and speeds.
- Interunit reliability was high in all trial's CV, **< 1%**

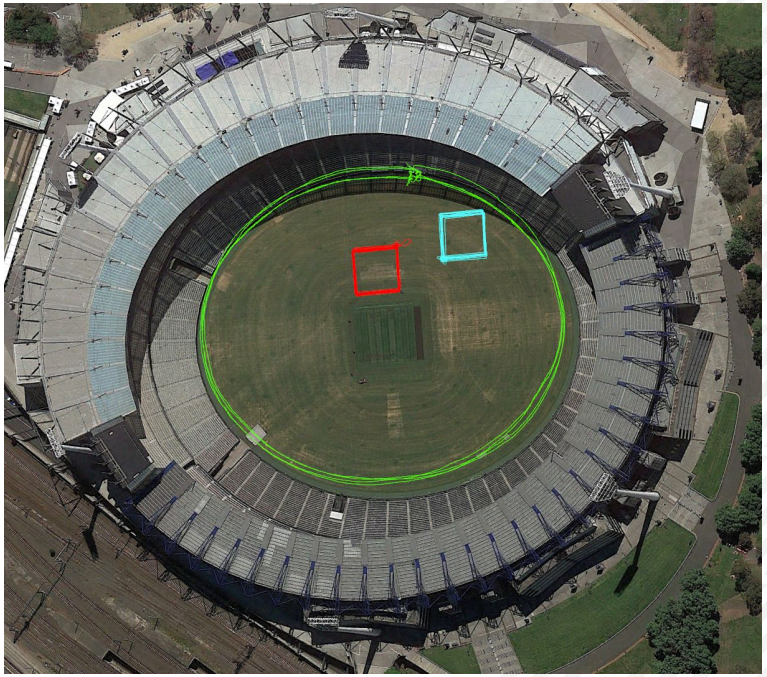


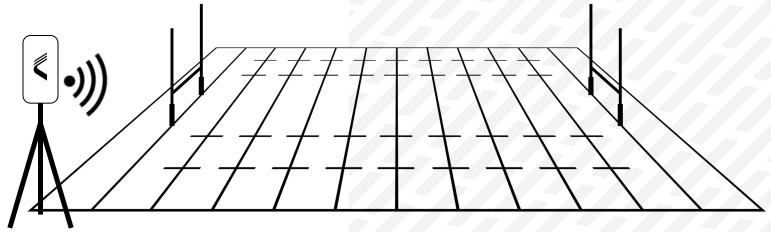
Fig 2 – Positional traces of each trial within the stadium.

	Positioning Quality	
	HDOP	***GNSS Quality (%)***
80m Box Centre Field	1.0 ± 0.0	74.8 ± 1.0
80m Box Restricted	1.0 ± 0.1	75.9 ± 2.3
4 x 20m Shuttle	1.1 ± 0.1	74.1 ± 1.8
Field Perimeter	1.4 ± 0.1	69.8 ± 2.0

LIVE DATA PERFORMANCE

LIVE vs. POST DOWNLOAD
SINGLE RECEIVER LIVE TRAINING

'With Vector we've introduced a more robust wireless data system that improves the quality of live data, giving you confidence in data driven decisions made on the field'



*Vector Receiver location (3m elevation)

AIMS

1. The assessment of '*Live*' data integrity using a **single** usb C wired connection, during a full team training session*.

PROTOCOL

1. 32 professional Rugby League athletes on field
2. Full contact session (MD – 4)
3. 10 drill splits applied in real time (total of 368 data points)
4. Live data compared to post session download data

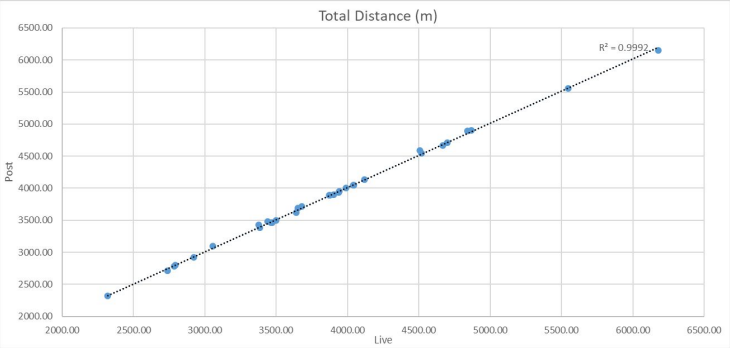
RESULTS

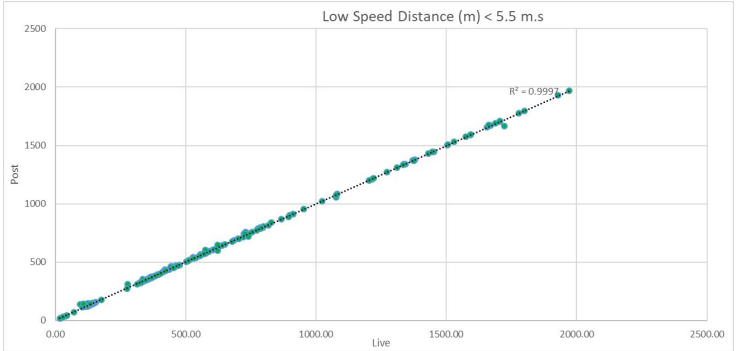
- All metrics show a very low live vs post error (*Mean Bias %)*
- Excellent agreement is shown for all metrics live vs post download

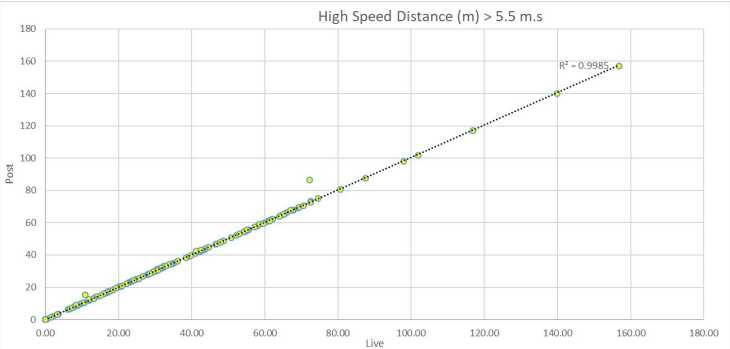
	Total Dist (m)	Player Load (au)	Max Vel (m.s)	LSR Dist < 5.5m.s (m)	HSR Dist > 5.5 m.s (m)	Sprint Dist > 7m.s (m)	Accel Load (au)
Vector Live	3868	366	7.2	3684	184	3	1231
Vector Post	3880	369	7.3	3695	185	3	1237
Mean Bias %	-0.3%	-1.0%	-1.2%	-0.3%	-0.5%	0.0%	-0.4%
RMSE	26.6	4.3	0.29	9.35	1.12	0.06	8.33
Correlation (r^2)	1.00	1.00	0.90	0.99	0.99	0.99	0.99

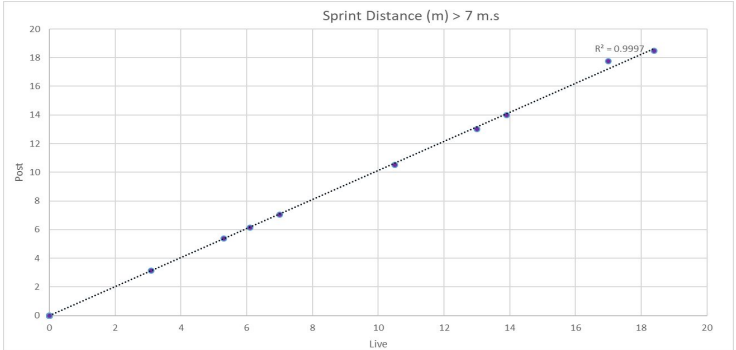
LIVE vs. POST DOWNLOAD

SINGLE RECEIVER LIVE TRAINING

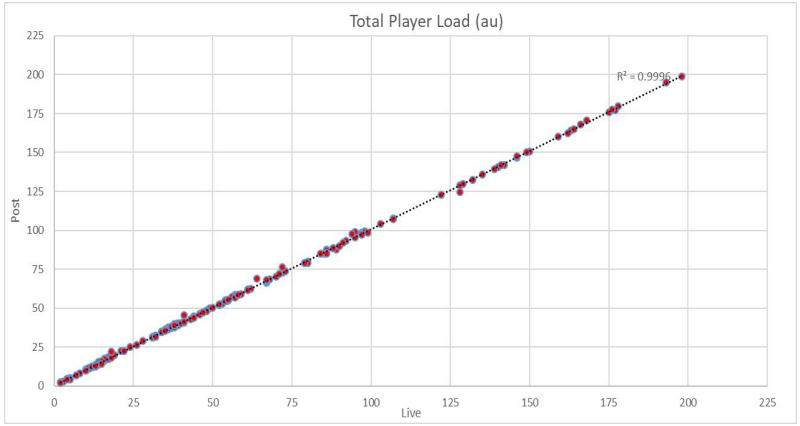


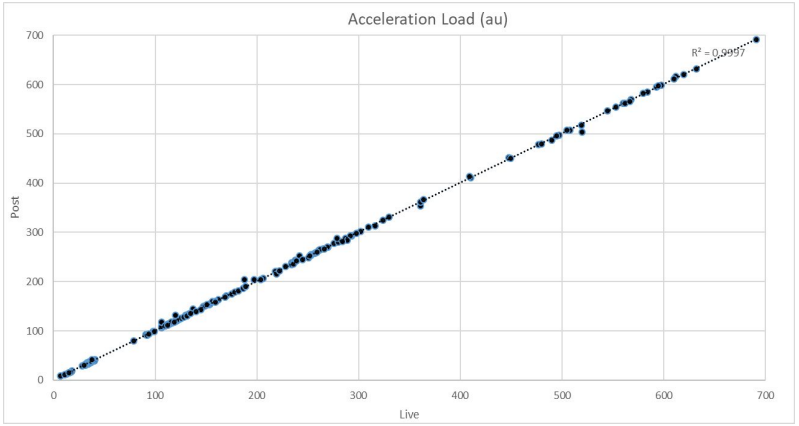






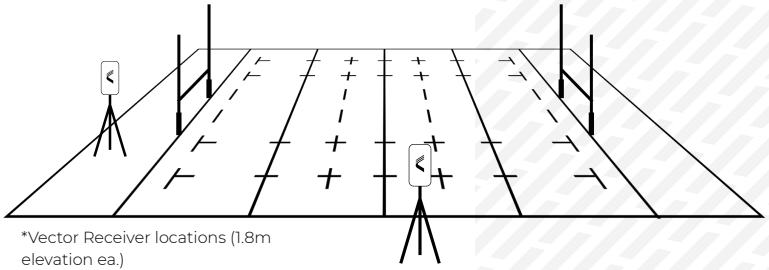
LIVE vs. POST DOWNLOAD
SINGLE RECEIVER LIVE TRAINING





LIVE vs. POST DOWNLOAD
MULTI RECEIVER LIVE TRAINING

'Vector live vs post analysis demonstrates a high level of accuracy. This is a result of the robust live communication protocol utilized by Vector (eliminating interference), in addition to the ability to use additional receivers to ensure maximal field coverage '



*Vector Receiver locations (1.8m elevation ea.)

VECTOR RECEIVER SETUP

Two vector receivers were set up as displayed in the diagram opposite and were transmitting data to the OpenField software wirelessly via Wi-Fi.

SESSION NOTES

1. Fourteen women's rugby 7's players on field with a session length of 1h 39 min
2. Portable drone used during session (Mavic – DJI)
3. Total of 4 periods created
4. OF +Live iPad, Vector Bluetooth iPhone and Vector iWatch applications used concurrently

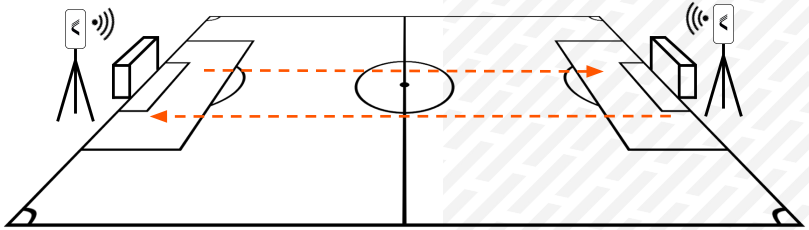
RESULTS

1. All parameters show a very low absolute and % mean bias (<1%), many of which have no differences between live and post
2. Velocity effort detection live vs post show no error
3. Acceleration effort and acceleration load analysis show almost no error between live and post.
4. Maximum velocity showed a mean bias of only 0.06 m/s for the session
5. The use of video transmitting drones had no impact on live data quality

	Total Distance	Player Load	Max Velocity	Vel 1 Dist	Vel 2 Dist	Vel 3 Dist	Vel 4 Dist	Vel 5 Dist	Vel 6 Dist	Vel B2+ Eff	Vel B3+ Eff	Vel B4+ Eff	Vel B5+ Eff	Vel B6+ Eff	Acc 1 Eff	Acc 2 Eff	Acc 3 Eff	Dec 1 Eff	Dec 2 Eff	Dec 3 Eff	Accel Load
Live	5648	486	6.97	2550	1767	908	306	115	2	185	77	24	8	0	92	39	1	43	11	3	1734
Post	5649	482	7.03	2547	1768	909	307	115	2	185	77	24	8	0	91	39	1	43	11	3	1738
Mean Bias	1	-4	0.06	-2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Mean Bias %	0.0%	-0.8%	0.9%	-0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	-0.2%	-0.3%	0.6%	0.0%	0.0%	-0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%
TEE	3.3	0.3	0.2	1.9	1.2	0.6	0.4	0.3	0.0	1.4	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
r^2	1.0	1.0	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

LIVE vs. POST DOWNLOAD
MULTI-RECEIVER TRIALS

'With Vector We have introduced wireless multi-receiver functionality, completely untethered from your PC, with the freedom to strategically position your receivers for the best on field coverage'



*Vector Receiver location (1.8m elevation)

AIMS

1. The assessment of '*Live*' data integrity using a **multi** wireless receiver connection, during a standardized protocol.

PROTOCOL

1. 2 team sport athletes
2. Soccer pitch perimeter runs [8]
3. Soccer pitch multi-speed runs [16]
4. Live data compared to post session download data

RESULTS

- All metrics show a very low live vs post error (*Mean Bias %)*
- Excellent agreement is shown for all metrics live vs post download

	Total Dist (m)	Player Load (au)	Max Vel (m.s)	LSR Dist < 5.5m.s (m)	HSR Dist > 5.5 m.s (m)	Sprint Dist > 7m.s (m)	Accel Load (au)
Vector Live	4064	356	7.7	3860	200	39	488
Vector Post	4060	354	7.7	3860	200	39	488
Mean Bias %	-0.1%	-0.6%	0.0%	0.0%	0.1%	0.3%	-0.1%
RMSE	1.5	0.7	0.04	0.10	0.04	0.04	0.6
Correlation (r^2)	1.00	1.00	1.00	1.00	1.00	1.00	1.00

UPGRADING TO VECTOR

DIFFERENCES BETWEEN VECTOR AND S5

VECTOR ADVANCEMENTS IN DATA QUALITY

'Although many GPS tracking technology providers calculate their metrics in a similar way, there are vast differences in how they filter their data, and this is a key component of data quality'

VECTOR

- Vector provides a more advanced level of hardware over the Optimeye range. As a result, we were able to redefine the way we treat our data to boost signal and reduce noise, resulting in not only cleaner data, but a much more responsive data stream, which provides an accurate and repeatable output.

DATA FILTERING

- GPS can be subject to much greater levels of noise than technologies such as LPS, where receiver position, calibration, and accuracy of the system can all be controlled. As a result, to improve the stability and quality of GPS data we must use specific filters, which ultimately enable to us to reject noise.
- With previous generations of hardware, to provide the most accurate and repeatable data we employed a level of filtering to match the technology and its capabilities.
- Vector velocity and acceleration data is filtered differently to Optimeye S5, and at its core, uses a weaker filter, garnering a significantly more responsive velocity stream.
- This means a greater detection of explosive events using Vector, such as acceleration and deceleration.
- With Vector we have additionally provided a greater agreement of GPS and LPS data streams across all core parameters, meaning interchangeable data whether training indoors or outdoors

VELOCITY DISTANCE

WHOLE SESSION

	Total Distance (m)	HSR > 5.5 $m.s^{-1}$	Sprint Distance > 7 $m.s^{-1}$	Low Speed < 5.5 $m.s^{-1}$	Total Banded Distance
S5	12253	1145	411	10694	12250
VECTOR	12253	1268	443	10538	12249
DIFF (%)	0 %	10%	7%	-1%	0%

SPRINTS 5 – 50m

	Total Distance (m)	HSR > 5.5 $m.s^{-1}$	Sprint Distance > 7 $m.s^{-1}$	Low Speed < 5.5 $m.s^{-1}$	Total Banded DIstance
S5	5203	752	411	4039	5202
VECTOR	5203	778	443	3980	5201
DIFF (%)	0%	3%	7%	-1%	0%

ROLLING SPRINTS 10 - 20m

	Total Distance (m)	HSR > 5.5 $m.s^{-1}$	Sprint Distance > 7 $m.s^{-1}$	Low Speed < 5.5 $m.s^{-1}$	Total Banded DIstance
S5	2018	272	0	1747	2018
VECTOR	2018	304	0	1714	2018
DIFF (%)	0%	11%	0%	-2%	0%

AGILITY (all < 5.5 $m.s^{-1}$)

	Total Distance (m)
S5	1453
VECTOR	1453
DIFF (%)	0%

VEL BANDS SET
VEL 1: 0 – 1.5 m/s^{-1}
VEL 2: 1.5 – 3 m/s^{-1}
VEL 3: 3– 4 m/s^{-1}
VEL 4: 4 – 5.5 m/s^{-1}
VEL 5: 5.5– 7 m/s^{-1}
VEL 5: 7– 11 m/s^{-1}

DWELL TIME: 0.6 m/s^{-1}

*All data is presented as a total metric value for 4 athletes across multiple trials

VECTOR ADVANCEMENTS IN DATA QUALITY

'A key initiative of Vector is to deliver not only technologically advanced hardware, but a data quality that does that technology justice'

VELOCITY EFFORTS

WHOLE SESSION

	Total Efforts	HSR > 5.5 m.s^{-1}	Sprints > 7 m.s^{-1}	LSR Efforts > 1.5 m.s^{-1}	LSR Efforts > 3 m.s^{-1}	LSR Efforts > 4 m.s^{-1}
S5	935	93	25	257	257	303
VECTOR	999	111	26	264	287	311
DIFF (%)	6%	16%	4%	3%	10%	3%

ROLLING SPRINTS 10 - 20m

	Total Efforts	HSR > 5.5 m.s^{-1}	Sprints > 7 m.s^{-1}	LSR Efforts > 1.5 m.s^{-1}	LSR Efforts > 3 m.s^{-1}	LSR Efforts > 4 m.s^{-1}
S5	152	21	0	51	40	40
VECTOR	159	26	0	53	40	40
DIFF (%)	4%	19%	0.0 %	4%	0.0%	0.0%

SPRINTS 5 – 50m

	Total Efforts	HSR > 5.5 m.s^{-1}	Sprints > 7 m.s^{-1}	LSR Efforts > 1.5 m.s^{-1}	LSR Efforts > 3 m.s^{-1}	LSR Efforts > 4 m.s^{-1}
S5	365	55	25	131	79	75
VECTOR	380	55	26	133	91	75
DIFF (%)	4%	0%	4%	2%	13%	0%

AGILITY (all < 5.5 m.s^{-1} & < 10m)

	Total Efforts	LSR Efforts > 1.5 m.s^{-1}	LSR Efforts > 3 m.s^{-1}	LSR Efforts > 4 m.s^{-1}
S5	133	31	68	34
VECTOR	149	31	77	41
DIFF (%)	12%	0%	13%	21%

*All data is presented as a total metric value for 4 athletes across multiple trials

VECTOR ADVANCEMENTS IN DATA QUALITY

ACCELERATION EFFORTS

WHOLE SESSION

	Total Efforts	Total Dec	Total Acc	Dec -10 / - 4 m.s^2	Dec -4 / -3 m.s^2	Dec -3 / -2 m.s^2	Acc 2 / 3 m.s^2	Acc 3 / 4 m.s^2	Acc 4 / 10 m.s^2
S5	490	272	218	55	73	144	93	121	4
VECTOR	671	338	333	99	98	141	165	140	28
DIFF (%)	37%	24%	53%	80%	34%	-2%	77%	16%	600%

SPRINTS 5 – 50m

	Total Efforts	Total Dec	Total Acc	Dec -10 / - 4 m.s^2	Dec -4 / -3 m.s^2	Dec -3 / -2 m.s^2	Acc 2 / 3 m.s^2	Acc 3 / 4 m.s^2	Acc 4 / 10 m.s^2
S5	189	94	95	32	41	21	7	84	4
VECTOR	189	94	95	58	34	2	2	78	15
DIFF (%)	0%	0%	0%	81%	-17%	-90%	-71%	-7.0%	275%

ROLLING SPRINTS 10 - 20m

	Total Efforts	Total Dec	Total Acc	Dec -10 / - 4 m.s^2	Dec -4 / -3 m.s^2	Dec -3 / -2 m.s^2	Acc 2 / 3 m.s^2	Acc 3 / 4 m.s^2	Acc 4 / 10 m.s^2
S5	80	40	40	23	16	1	40	0	0
VECTOR	80	40	40	32	8	0	39	1	0
DIFF (%)	0%	0%	0%	39%	-50%		-3%		

AGILITY (all < 4 m.s^{-2} & < 10m)

	Total Efforts	Total Dec	Total Acc	Dec -10 / - 4 m.s^2	Dec -4 / -3 m.s^2	Dec -3 / -2 m.s^2	Acc 2 / 3 m.s^2	Acc 3 / 4 m.s^2	Acc 4 / 10 m.s^2
S5	94	57	37	0	12	45	20	17	0
VECTOR	176	90	86	9	43	38	39	35	12
DIFF (%)	87%	58%	132%		258%	-16%	95%	106%	

ACCEL BANDS SET
DEC 3: -10 / - 4 m.s^2
DEC 2: -10 / - 4 m.s^2
DEC 1: -10 / - 4 m.s^2
ACC 1: 2 / 3 m.s^2
ACC 2: 3 / 4 m.s^2
ACC 3: 4 / 10 m.s^2

SPEED REJECTION THRESHOLD: 0.1 M/S^{-1}

DATA INTEGRITY | VECTOR

*All data is presented as a total metric value for 4 athletes across multiple trials

SUMMARY

- Vector produces no change in total and a small change in low speed running distances compared with S5
- Vector can produce ~ 5 - 11% greater high speed running distances than S5
- Vector detects a higher number of total and high intensity efforts than S5, however only a marginally greater number of sprint efforts.
- Large differences in acceleration efforts counts are observed between Vector and S5, however this is very task dependant
- Sprint activities produce the same total acceleration and deceleration effort counts between Vector and S5, however with a significantly different distribution
- Vector produces a greater peak acceleration during event detection due to a more responsive and less filtered velocity data stream, evidenced by a greater total event detection in short agility trials

VECTOR
Long defined linear efforts = same total count different distribution

Short multi-directional efforts = different total count and distribution

ANALYTICS VALIDATION

VECTOR G7

PURPOSE

- To Validate goalkeeping V2 metrics with the Vector G7 devices. As the inertial sensors within the S5 & S7 are the same a low level test was used to confirm validity.

METHOD

Subjects
2 professional level goalkeepers from an England Championship level football club.

Protocol
Subject completed a typical training session consisting of the following drills:

- Head Tennis
- Technical Goalkeeper Work
- SSG 5v5.

The full session was recorded and coded to understand the total number of drives throughout the session using the Catapult Vision Software. This was then compared with V2 count of dives collected using a G7 device. To reduce error and for consistency the video was coded by 2 seperate analysts (Analyst 1 & 2).

RESULTS

Vector G7 and video coded results showed consistent data for both units in all drills used shown in table 1. The original results from the 2000+ dives completed in the initial analysis completed with S5 data has been included for further reference. Given there is no change in inertial sensors positioning between S5 & S7 and no reductions in the validity of the original algorithm has been seen, it was considered appropriate that a single session would be enough to provisionally validate the new unit.

Optimeye G5 Benchmark Results (>2000 dives)

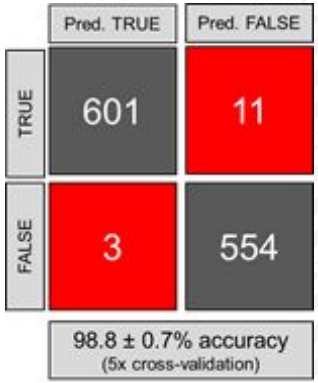


TABLE 1. TOTAL DIVE COUNT FOR G7 vs VIDEO

	Vector G7	Video
Head Tennis	1	1
Goalkeeper Specific	22	22
SSG 5v5	35	35
DIFF (%)	0%	0%