Preliminary Analysis of the Men's 100 m Final

IAAF World Championships 2017

Saturday 5th August

IAAF World Championships LONDON 2017 04-13 AUGUST

IAAF Athletics

IAAF World Championships LONDON 2017

LEEDS BECKETT UNIVERSITY

Brief Data Capture Details

- Eighteen high-speed digital video cameras were placed at multiple positions overlooking the home straight to record 10m splits and 3D motion analysis data. The cameras recorded at between 100 and 250 frames per second with all finalists filmed from a range of different angles.
- For the purposes of this flash report, **selected variables** have been included while a more detailed report is being prepared.
- Split times are presented for all athletes with a selection of biomechanical variables presented for the three medallists.

Results – 10m Splits (seconds)

Posn.	Athlete	Reaction Time	0-10m	10-20m	20-30m	30-40m	40-50m	50-60m	60-70m	70-80m	80-90m	90-100m	0-100m
1	Gatlin	0.138	1.74	1.02	0.91	0.90	0.88	0.86	0.86	0.87	0.87	0.87	9.92
2	Coleman	0.123	1.75	1.00	0.90	0.88	0.87	0.86	0.88	0.88	0.88	0.92	9.94
3	Bolt	0.183	1.78	1.02	0.90	0.88	0.88	0.85	0.85	0.86	0.86	0.89	9.95
4	Blake	0.137	1.74	1.02	0.91	0.90	0.89	0.88	0.87	0.88	0.87	0.89	9.99
5	Simbine	0.141	1.78	1.03	0.92	0.92	0.87	0.84	0.86	0.87	0.88	0.9	10.01
6	Vicaut	0.152	1.80	1.03	0.90	0.89	0.87	0.87	0.88	0.89	0.90	0.9	10.08
7	Prescod	0.145	1.89	1.05	0.92	0.92	0.89	0.86	0.86	0.87	0.88	0.88	10.17
8	Su	0.224	1.81	1.03	0.92	0.91	0.89	0.89	0.89	0.89	0.90	0.92	10.27

Fastest Split

Results – Ranking Progression

Position	10 m	20 m	30 m	40 m	50 m	60 m	70 m	80 m	90 m	100 m
1	Coleman	Coleman	Coleman	Coleman	Coleman	Coleman	Coleman	Coleman	Coleman	Gatlin
2	Blake	Blake	Blake	Blake	Gatlin	Gatlin	Gatlin	Gatlin	Gatlin	Coleman
3	Gatlin	Gatlin	Gatlin	Gatlin	Blake	Blake	Bolt	Bolt	Bolt	Bolt
4	Simbine	Simbine	Simbine	Bolt	Vicaut	Bolt	Blake	Blake	Blake	Blake
5	Vicaut	Vicaut	Vicaut	Vicaut	Bolt	Simbine	Simbine	Simbine	Simbine	Simbine
6	Bolt	Bolt	Bolt	Simbine	Simbine	Vicaut	Vicaut	Vicaut	Vicaut	Vicaut
7	Su	Su	Su	Su	Su	Su	Prescod	Prescod	Prescod	Prescod
8	Prescod	Prescod	Prescod	Prescod	Prescod	Prescod	Su	Su	Su	Su

IAAF World Championships LONDON 2017 04-13 AUGUST

IAAF Athletics

IAAF World Championships LONDON 2017

LEEDS BECKETT UNIVERSITY

Results – Early Phase (Medallists)

Athlete	Reaction Time (s)	Time - 1st Step (s)	Time - 2nd Step (s)	Time - 3rd Step (s)	Time – 4th Step (s)	Time - 10m (s)	Time – 100m (s)
Gatlin	0.138	0.59	0.83	1.06	1.29	1.88	9.92
Coleman	0.123	0.59	0.82	1.07	1.29	1.87	9.94
Bolt	0.183	0.69	0.94	1.20	1.45	1.96	9.95

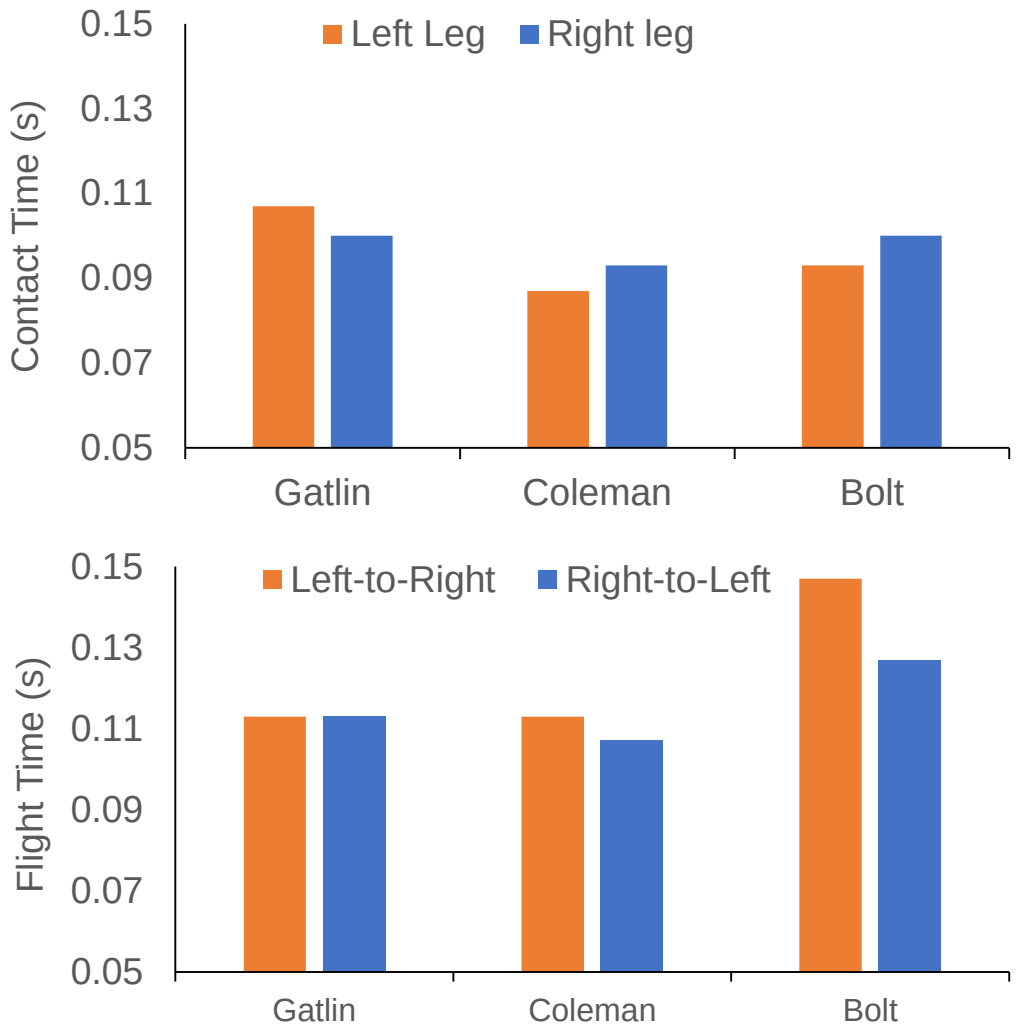
Results – Middle Phase (Medallists)

Analysis of Mid-section of Race (47-55.5m) – Sample Values (left-right average)

	Step Length (m)	Step Frequency (Hz)	Contact Time (s)	Flight Time (s)
Gatlin	2.47	4.61	0.104	0.113
Coleman	2.35	5.00	0.090	0.110
Bolt	2.69	4.27	0.097	0.137

	Max 10m Split Speed (m/s)	10m Zone of Max Speed (m)	Total Number of Steps
Gatlin	11.63	60-70	44
Coleman	11.63	50-60	47
Bolt	11.76	60-70	41

Middle Phase – Temporal Characteristics



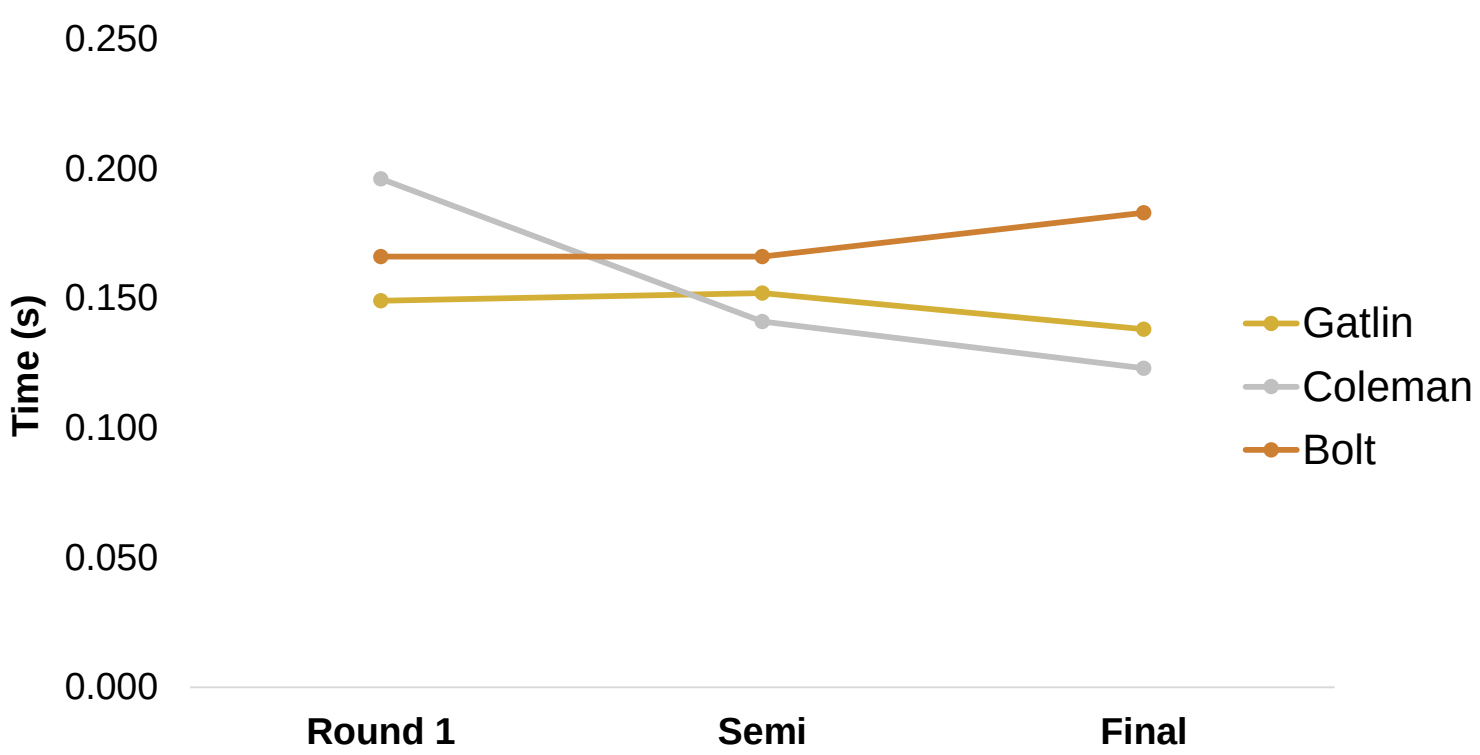
All three medallists demonstrate a slight asymmetry as characterised by differences in contact times, however Bolt displays a notable asymmetrical pattern in flight time.

Late Phase Characteristics

Analysis of Last Two Steps – Sample Values (left-right average)

	Step Length (m)	Contact Time (s)	Flight Time (s)
Gatlin	2.70	0.108	0.134
Coleman	2.67	0.106	0.144
Bolt	2.94	0.116	0.144

Variation in Medallists' Block Clearance

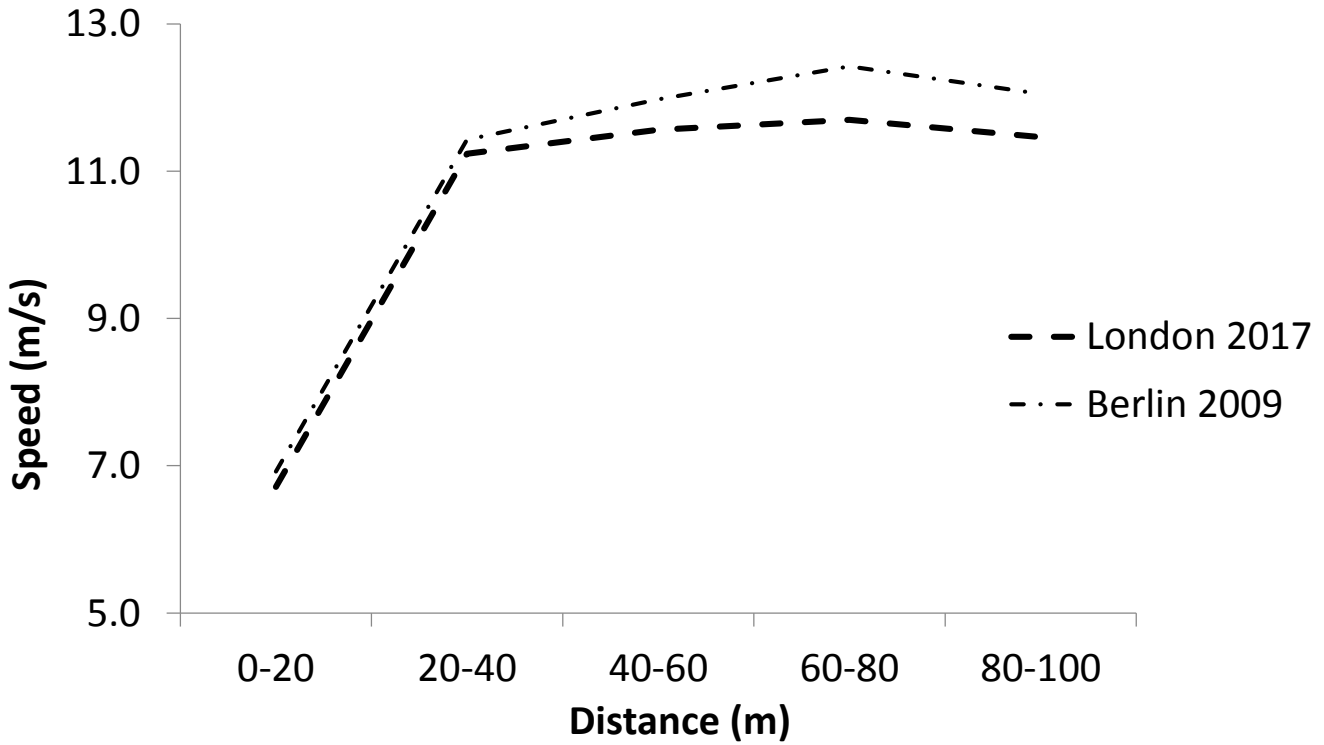


In contrast to the other medallists, Bolt's reaction times increased through the rounds. His reaction time in the final was 0.045 seconds slower than Gatlin's, which was more than the final time difference between them (0.03 seconds).

Bolt – Berlin 2009 (WR) vs London 2017

	Cumulative Times (s)	
	Berlin 2009	**London 2017**
20 m	2.89	2.98
40 m	4.64	4.76
60 m	6.31	6.49
80 m	7.92	8.20
100 m	9.58	9.95

A comparison of Bolt's 2017 performance with his World Record in 2009 (analysed over 20m splits) shows that his speed is consistently lower throughout all stages of the race including the later stages in which he usually outperforms his rivals.



Summary

- It appears that reaction time and performance in the very early stages of the race remain key determinants of race outcome.
- In addition, to achieve high running speeds athletes should place an emphasis on speed maintenance as slight reductions in speed towards the end of the race may equally determine the outcome of the race.
- Reviewing Bolt's profile from the time he set his world record suggests that elite sprinters exhibit consistent step length patterns and therefore variations in step frequency explain fluctuations in performance.
- Achieving high running speeds in the middle and late phases of the race does not always compensate for slower starts.