

2021 Men's 400m Hurdles World Record Season

Karsten Warholm (NOR) - 45.94

Hurdle Touchdown Times



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Notes:

- The times listed as TV Analysis are taken from [youtube.com](https://www.youtube.com) videos and generally coming from Television broadcasts. These are not always the best angles or coverage for getting times. They are often trying to tell a story by focusing on one athlete, and sometimes while shifting camera angles an extra frame can get added or removed.
- Where times are taken from the first movement, instead of the gun, there is at least a ± 0.12 second difference/error. This will show up from the start to the first hurdle and then from hurdle 10 to the finish. The between hurdle intervals should be fairly consistent, but there is still the usual ± 0.03 second
- Data errors, missing data, spelling mistakes, anything that need correction - please let me know. As always, I try to put together the most complete and accurate report possible.
- I have done the best I could, I hope people find it useful or at least interesting.

2021 Men's 400m Hurdles World Record Season - Kasten Warholm (NOR) (1996)

2021 Trond Mohn Games (Bergen, NOR) (300m)

FINAL		date	18-Sep-21	50m	100m	150m	200m	250m	300m	Official Time	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time									32.49	/ 1			
	reaction time									NR PB				
	interval									12.31				
	velocity													
				No Information Available										

2021 ISTAF (Berlin, GER) (TV Analysis)

FINAL		date	12-Sep-21	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	Official Time	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time			5.76	9.28	12.96	16.70	20.56	24.56	28.76	33.12	37.80	42.54		48.08	7 / 1			
	reaction time	0.189												5.54			10.94	12.06	13.78
	interval			3.52	3.68	3.74	3.86	4.00	4.20	4.36	4.68	4.74					9.60	8.71	7.62
	velocity			7.81	9.94	9.51	9.36	9.07	8.75	8.33	8.03	7.48	7.38	7.22	8.32				
	H1 lead leg	L		20	13	13	13	13	13	13	13	15	15	18.5	159.5				

2021 Weltklasse (Zürich, SUI) (TV Analysis)

FINAL		date	09-Sep-21	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	Official Time	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time			5.72	9.28	12.96	16.72	20.56	24.56	28.68	32.88	37.44	42.08		47.35	7 / 1			
	reaction time	0.150												5.27			11.00	11.96	13.40
	interval			3.56	3.68	3.76	3.84	4.00	4.12	4.20	4.56	4.64					9.55	8.78	7.84
	velocity			7.87	9.83	9.51	9.31	9.11	8.75	8.50	8.33	7.68	7.54	7.59	8.45				
	H1 lead leg	L		20	13	13	13	13	13	13	13	15	15	18	159				

2021 Athletissima (Lausanne, SUI)

FINAL		date	26-Aug-21	50m	100m	150m	200m	250m	300m	350m	400m	Official Time	Lane / Place
Warholm, Karsten (NOR) (1996)	time			6.1	11.1	16.2	21.5	27.1	32.9	39.0	45.51	45.51	7 / 4
	reaction time	0.136			5.00	5.10	5.30	5.60	5.80	6.10	6.51		# of strides
	interval												170.2
	velocity			8.20	10.00	9.80	9.43	8.93	8.62	8.20	7.68	8.79	

2020 Olympic Games (Tokyo, JPN) (TV Analysis)

FINAL		date	03-Aug-21	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	Official Time	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time			5.60	9.08	12.62	16.28	19.96	23.86	27.92	32.04	36.32	40.76		45.94	6 / 1			
	reaction time	0.145			3.48	3.54	3.66	3.68	3.90	4.06	4.12	4.28	4.44	5.18	WR		10.68	11.64	12.84
	interval			8.04	10.06	9.89	9.56	9.51	8.97	8.62	8.50	8.18	7.88	7.72	8.71		9.83	9.02	8.18
	velocity																		
	H1 lead leg	L		20	13	13	13	13	13	13	13	13	15	18	157				

Semi-Final 1

Semi-Final 1		date	01-Aug-21	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	Official Time	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time			5.60	9.14	12.76	16.51	20.42	24.42	28.59	32.93	37.32	42.07		47.30	7 / 1			
	reaction time	0.156			3.54	3.62	3.75	3.91	4.00	4.17	4.34	4.39	4.75	5.23			10.91	12.08	13.48
	interval			8.04	9.89	9.67	9.33	8.95	8.75	8.39	8.06	7.97	7.37	7.65	8.46		9.62	8.69	7.79
	velocity																		
	H1 lead leg	L		20	13	13	13	13	13	13	13	13	15	17.5	156.5				

Heat 3

Heat 3		date	30-Jul-21	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	Official Time	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time			5.67	9.31	13.04	16.98	21.02	25.16	29.36	33.66	38.30	43.02		48.65	8 / 1			
	reaction time	0.157			3.64	3.73	3.94	4.04	4.14	4.20	4.30	4.64	4.72	5.63			11.31	12.38	13.66
	interval			7.94	9.62	9.38	8.88	8.66	8.45	8.33	8.14	7.54	7.42	7.10	8.22		9.28	8.48	7.69
	velocity																		
	H1 lead leg	L		20	13	13	13	13	13	13	13	15	15	17	158				

2021 Herculis Meeting International d'Athletisme (Monaco, MON) (TV Analysis)

FINAL		date	09-Jul-21	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	Official Time	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time			5.62	9.12	12.74	16.51	20.38	24.36	28.49	32.74	37.17	41.87		47.08	7 / 1			
	reaction time	0.150			3.50	3.62	3.77	3.87	3.98	4.13	4.25	4.43	4.70	5.21			10.89	11.98	13.38
	interval			8.01	10.00	9.67	9.28	9.04	8.79	8.47	8.24	7.90	7.45	7.68	8.50		9.64	8.76	7.85
	velocity																		
	H1 lead leg	L		20	13	13	13	13	13	13	13	13	15	18	157				

2021 Bislett Games (Oslo, NOR) (TV Analysis)

FINAL		date	01-Jul-21	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	Official Time	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time			5.58	9.10	12.70	16.34	20.16	24.08	28.18	32.38	36.78	41.44		46.70	7 / 1			
	reaction time	0.163			3.52	3.60	3.64	3.82	3.92	4.10	4.20	4.40	4.66	5.26	WR		10.76	11.84	13.26
	interval			8.06	9.94	9.72	9.62	9.16	8.93	8.54	8.33	7.95	7.51	7.60	8.57		9.76	8.87	7.92
	velocity																		
	H1 lead leg	L		20	13	13	13	13	13	13	13	13	13	18	155				

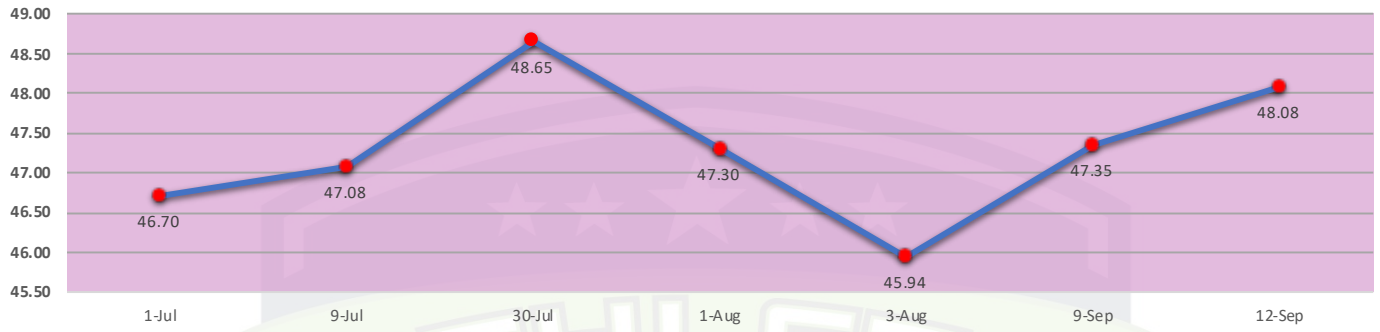
2021 Bislett Night of Highlights (Oslo, NOR) (TV Analysis) (300m Hurdles)

FINAL		date	04-Jun-21	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	Official Time	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time			6.12	9.60	13.16	16.78	20.60	24.52	28.58					33.26	7 / 1			
	reaction time				3.48	3.56	3.62	3.82	3.92	4.06				4.68	WB		10.66	11.80	
	interval			8.17	10.06	9.83	9.67	9.16	8.93	8.62				8.55	9.02		9.85	8.90	
	velocity																		
	H1 lead leg	L		23	13	13	13	13	13	13				17	118				

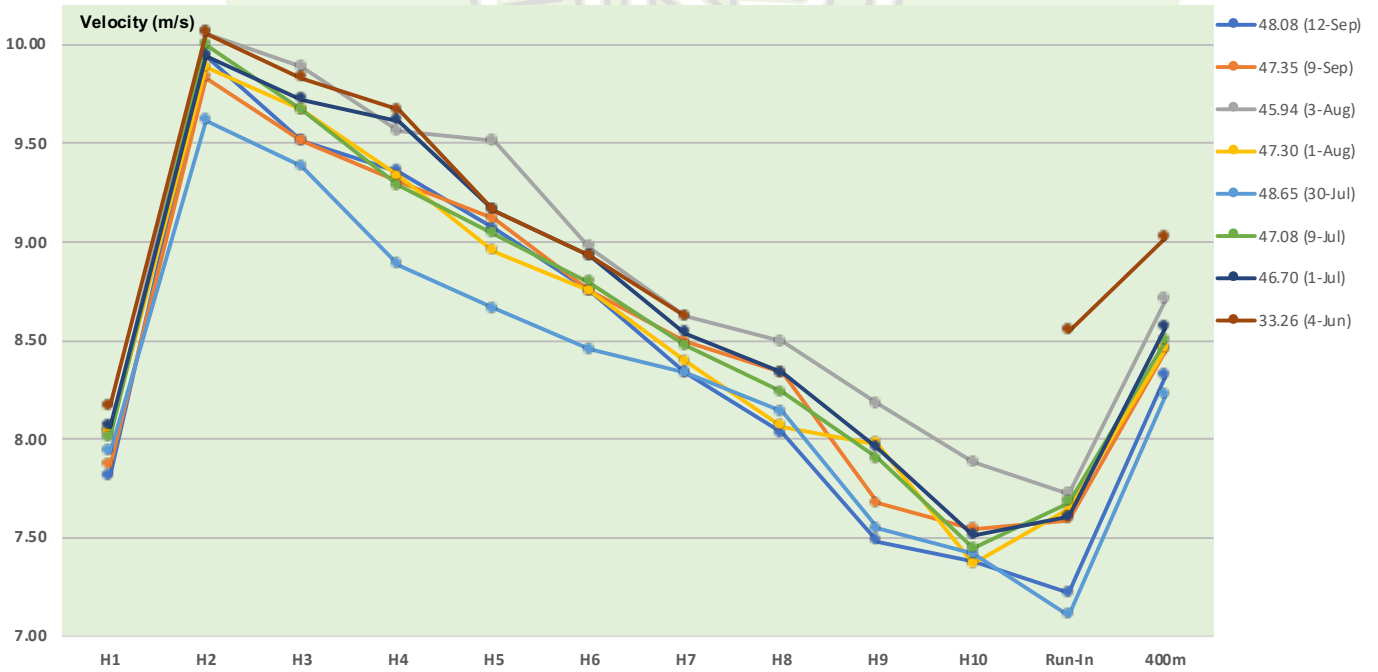
2021 Klubbstevne 3 (Bærun, NOR) (Indoor) (300m)

FINAL		date	28-Feb-21	50m	100m	150m	200m	250m	300m	Official Time	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time									32.47	/ 1			
	reaction time									PB				
	interval									12.32				
	velocity													
				No Information Available										

Karsten Warholm 2021

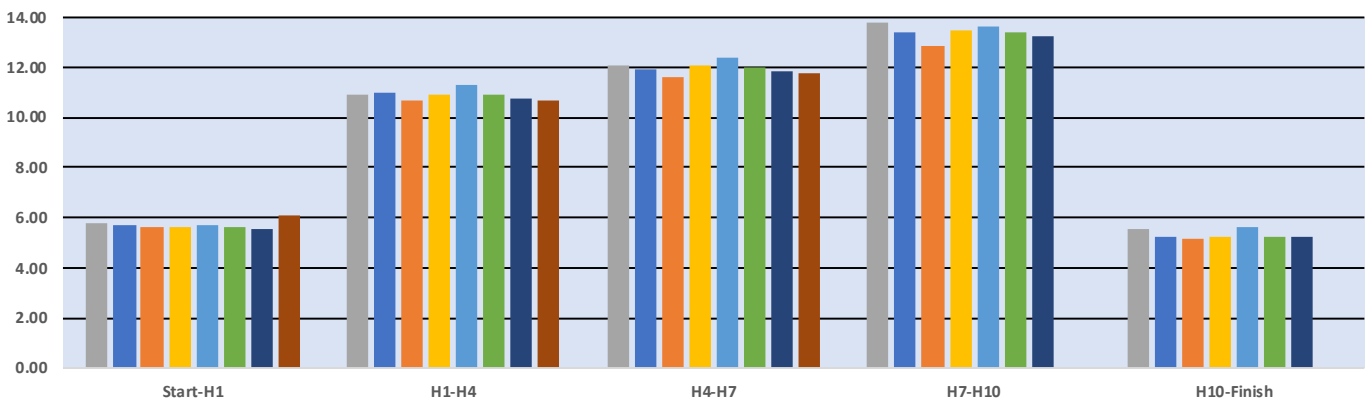


Hurdle Rhythmic Units



Time Intervals (s)

Hurdle Phases



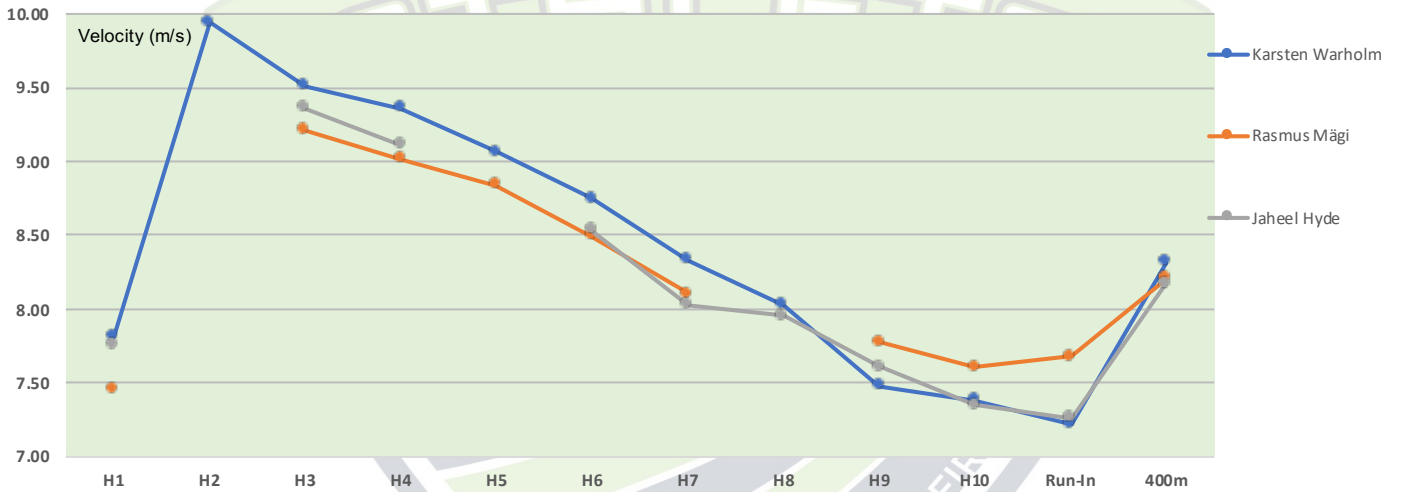
2021 ISTAF (Berlin, GER) (TV Analysis)

Men's 400m Hurdles

Date 2021.09.12

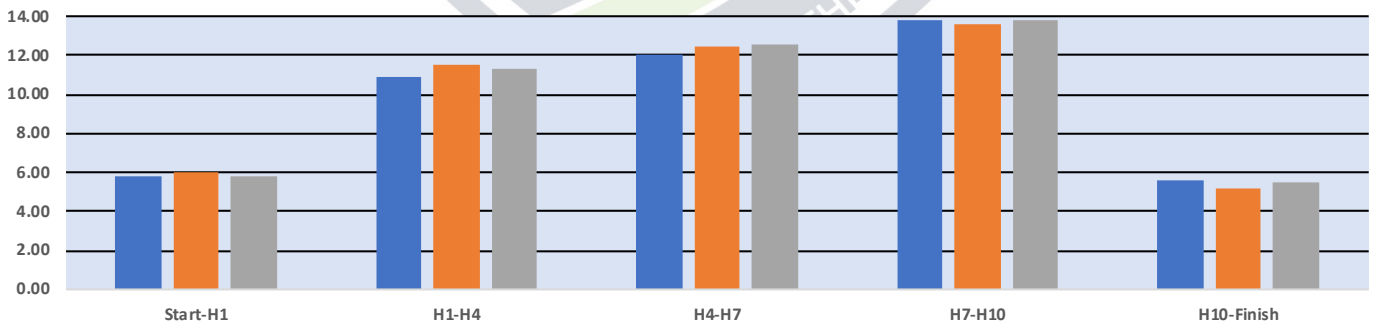
FINAL

		H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	400m	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time	5.76	9.28	12.96	16.70	20.56	24.56	28.76	33.12	37.80	42.54		48.08	7 / 1			
	reaction time	0.189															
	interval		3.52	3.68	3.74	3.86	4.00	4.20	4.36	4.68	4.74	5.54			10.94	12.06	13.78
	velocity		7.81	9.94	9.51	9.36	9.07	8.75	8.33	8.03	7.48	7.38	7.22	8.32		9.60	8.71
H1 lead leg	L																
	strides		20	13	13	13	13	13	13	15	15	18.5	159.5				
Mägi, Rasmus (EST) (1992)	time	6.04		13.64	17.52	21.48	25.60	29.92		38.92	43.52		48.73	6 / 2			
	reaction time	0.191															
	interval			7.60	3.88	3.96	4.12	4.32		9.00	4.60	5.21			11.48	12.40	13.60
	velocity			7.45	9.21	9.02	8.84	8.50	8.10		7.78	7.61	7.68	8.21		9.15	8.47
H1 lead leg	R																
	strides				20		13	13	14		14	17	104				
Hyde, Jaheel (JAM) (1997)	time	5.80		13.28	17.12		25.32	29.68	34.08	38.68	43.44		48.95	4 / 3			
	reaction time	0.180															
	interval			7.48	3.84		8.20	4.36	4.40	4.60	4.76	5.51			11.32	12.56	13.76
	velocity			7.76	9.36	9.11		8.54	8.03	7.95	7.61	7.35	7.26	8.17		9.28	8.36
H1 lead leg	L																
	strides				21		13		14	14	15	18	95				



Time Intervals (s)

Hurdle Phases



Evaluated with: ObjectusVideo

Quality & Frame Rate: 1920 x 1080 @ 25fps

Timing From: First Movement

Source: <https://www.youtube.com/watch?v=WnwlXqMzib0&t=8s>

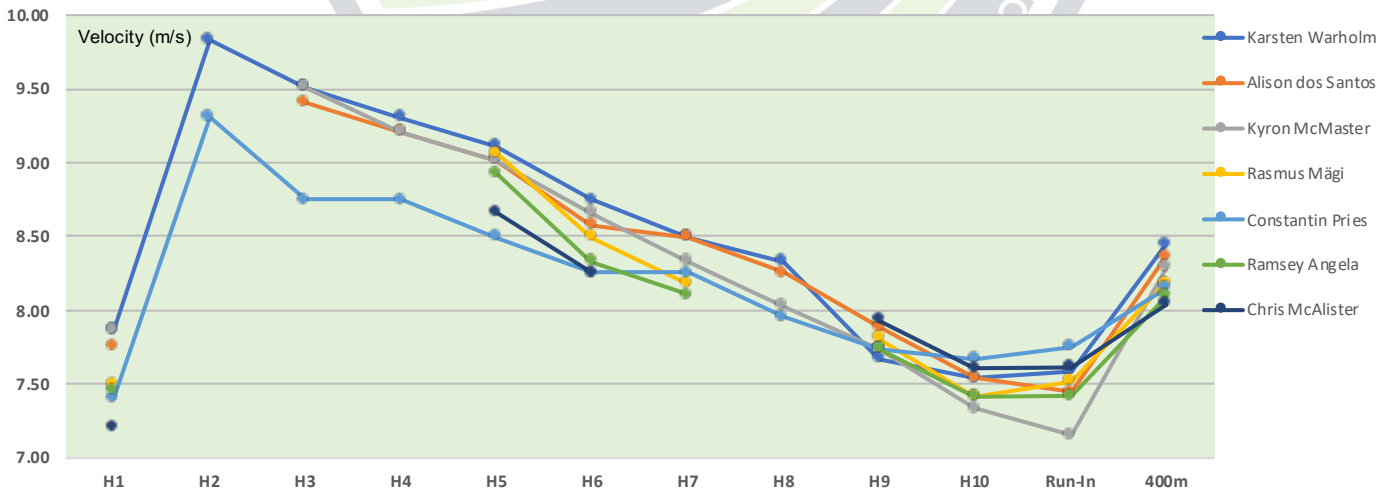
2021 Weltklasse (Zürich, SUI) (TV Analysis)

Men's 400m Hurdles

Date 2021.09.09

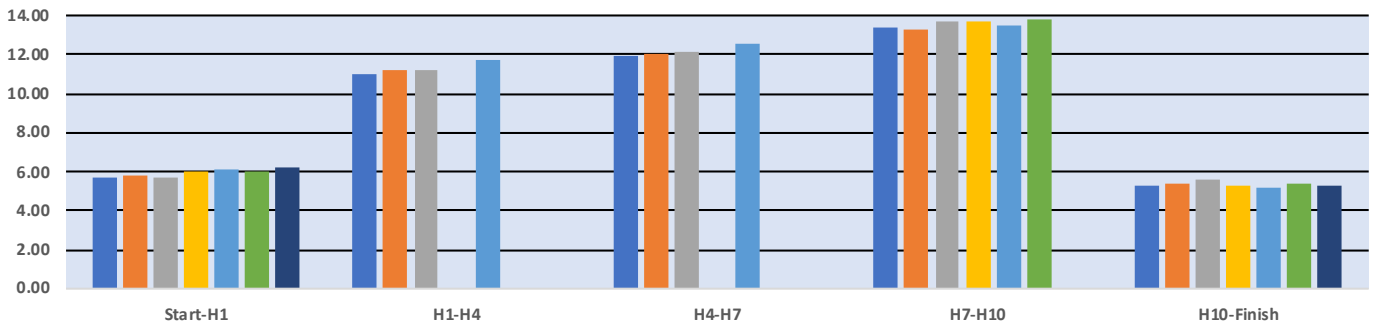
FINAL

		H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	400m	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time	5.72	9.28	12.96	16.72	20.56	24.56	28.68	32.88	37.44	42.08		47.35	7 / 1			
	reaction time	0.150															
	interval		3.56	3.68	3.76	3.84	4.00	4.12	4.20	4.56	4.64	5.27			11.00	11.96	13.40
	velocity	7.87	9.83	9.51	9.31	9.11	8.75	8.50	8.33	7.68	7.54	7.59	8.45		9.55	8.78	7.84
H1 lead leg	L																
	strides	20	13	13	13	13	13	13	13	15	15	18	159				
dos Santos, Alison (BRA) (2000)	time	5.80		13.24	17.04	20.92	25.00	29.12	33.36	37.80	42.44		47.81	6 / 2			
	reaction time	0.181															
	interval		7.44	3.80	3.88	4.08	4.12	4.24	4.44	4.64	5.37				11.24	12.08	13.32
	velocity	7.76		9.41	9.02	8.58	8.50	8.25	7.88	7.54	7.45	8.37			9.34	8.69	7.88
H1 lead leg	L																
	strides	20		12	12	13	13	13	13	14	16.5	126.5					
McMaster, Kyron (IVB) (1997)	time	5.72		13.08	16.88	20.76	24.80	29.00	33.36	37.88	42.65		48.24	5 / 3			
	reaction time	0.160															
	interval		7.36	3.80	3.88	4.04	4.20	4.36	4.52	4.77	5.59				11.16	12.12	13.65
	velocity	7.87		9.51	9.21	9.02	8.66	8.33	8.03	7.74	7.34	7.16	8.29		9.41	8.66	7.69
H1 lead leg	L																
	strides	21		13	13	13	14	14	14	14	14	17.5	133.5				
Mägi, Rasmus (EST) (1992)	time	6.00				21.44	25.56	29.84		38.80	43.52		48.84	3 / 4			
	reaction time	0.158				15.44	4.12	4.28		8.96	4.72	5.32					
	interval					9.07	8.50	8.18		7.81	7.42	7.52	8.19				13.68
	velocity	7.50				13	13			7.81	7.42	7.52	8.19				7.68
H1 lead leg	R																
	strides	20										17	77				
Preis, Constantin (GER) (1998)	time	6.08	9.84	13.84	17.84	21.96	26.20	30.44	34.84	39.36	43.92		49.08	8 / 5			
	reaction time	0.259															
	interval		3.76	4.00	4.00	4.12	4.24	4.24	4.40	4.52	4.56	5.16			11.76	12.60	13.48
	velocity	7.40	9.31	8.75	8.75	8.50	8.25	8.25	7.95	7.74	7.68	7.75	8.15		8.93	8.33	7.79
H1 lead leg	L																
	strides	21	13	14	14	14	14	15	15			120					
Angela, Ramsey (NED) (1999)	time	6.04				21.72	25.92	30.24		39.28	44.00		49.39	2 / 6			
	reaction time	0.167				15.68	4.20	4.32		9.04	4.72	5.39					
	interval					8.93	8.33	8.10		7.74	7.42	7.42	8.10				13.76
	velocity	7.45				15	15			7.74	7.42	7.42	8.10				7.63
H1 lead leg	R																
	strides	22										18	70				
McAlister, Chris (GBR) (1995)	time	6.24				22.40	26.64			39.88	44.48		49.73	1 / 7			
	reaction time	0.168				16.16	4.24			13.24	4.60	5.25					
	interval					8.66	8.25			7.93	7.61	7.62	8.04				
	velocity	7.21															
H1 lead leg	R																
	strides	22					14				15	51					



Time Intervals (s)

Hurdle Phases



Evaluated with: ObjectusVideo
 Quality & Frame Rate: 1920 x 1080 @ 25fps
 Timing From: First Movement

Source: <https://www.youtube.com/watch?v=dzg9ik8r4kA>

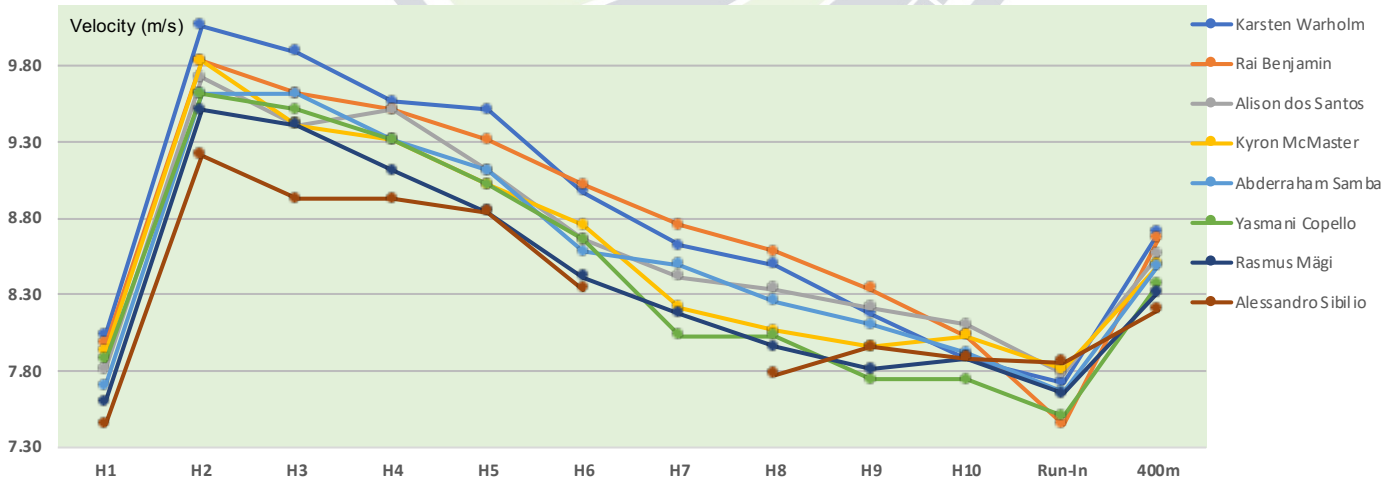
2020 Olympic Games (Tokyo, JPN) (TV Analysis)

Men's 400m Hurdles

Date 2021.08.03

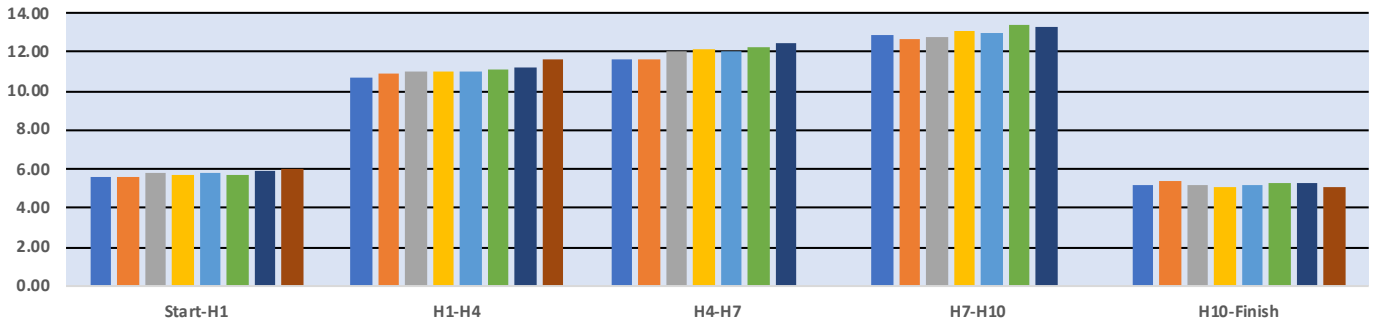
FINAL

		H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	400m	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time	5.60	9.08	12.62	16.28	19.96	23.86	27.92	32.04	36.32	40.76		45.94	6 / 1			
	reaction time	0.145															
	interval		3.48	3.54	3.66	3.68	3.90	4.06	4.12	4.28	4.44	5.18	WR		10.68	11.64	12.84
	velocity	8.04	10.06	9.89	9.56	9.51	8.97	8.62	8.50	8.18	7.88	7.72	8.71		9.83	9.02	8.18
H1 lead leg	L																
Benjamin, Rai (USA) (1997)	time	5.64	9.20	12.84	16.52	20.28	24.16	28.16	32.24	36.44	40.80		46.17	5 / 2			
	reaction time	0.168															
	interval		3.56	3.64	3.68	3.76	3.88	4.00	4.08	4.20	4.36	5.37	AR		10.88	11.64	12.64
	velocity	7.98	9.83	9.62	9.51	9.31	9.02	8.75	8.58	8.33	8.03	7.45	8.66		9.65	9.02	8.31
H1 lead leg	R																
dos Santos, Alison (BRA) (2000)	time	5.76	9.36	13.08	16.76	20.60	24.64	28.80	33.00	37.26	41.58		46.72	7 / 3			
	reaction time	0.156															
	interval		3.60	3.72	3.68	3.84	4.04	4.16	4.20	4.26	4.32	5.14	AR		11.00	12.04	12.78
	velocity	7.81	9.72	9.41	9.51	9.11	8.66	8.41	8.33	8.22	8.10	7.78	8.56		9.55	8.72	8.22
H1 lead leg	L																
McMaster, Kyron (IVB) (1997)	time	5.68	9.24	12.96	16.72	20.60	24.60	28.86	33.20	37.60	41.96		47.08	4 / 4			
	reaction time	0.157															
	interval		3.56	3.72	3.76	3.88	4.00	4.26	4.34	4.40	4.36	5.12	NR PB		11.04	12.14	13.10
	velocity	7.92	9.83	9.41	9.31	9.02	8.75	8.22	8.06	7.95	8.03	7.81	8.50		9.51	8.65	8.02
H1 lead leg	R																
Samba, Abderrahman (QAT) (1995)	time	5.84	9.48	13.12	16.88	20.72	24.80	28.92	33.16	37.48	41.90		47.12	8 / 5			
	reaction time	0.186															
	interval		3.64	3.64	3.76	3.84	4.04	4.12	4.24	4.32	4.42	5.22			11.04	12.04	12.98
	velocity	7.71	9.62	9.62	9.31	9.11	8.58	8.50	8.25	8.10	7.92	7.66	8.49		9.51	8.72	8.09
H1 lead leg	R																
Copello, Yasmani (TUR) (1987)	time	5.72	9.36	13.04	16.80	20.68	24.72	29.08	33.44	37.96	42.48		47.81	3 / 6			
	reaction time	0.166															
	interval		3.64	3.68	3.76	3.88	4.04	4.36	4.36	4.52	4.52	5.33	NR = PB		11.08	12.28	13.40
	velocity	7.87	9.62	9.51	9.31	9.02	8.66	8.03	8.03	7.74	7.74	7.50	8.37		9.48	8.55	7.84
H1 lead leg	R																
Mägi, Rasmus (EST) (1992)	time	5.92	9.60	13.32	17.16	21.12	25.28	29.56	33.96	38.44	42.88		48.11	9 / 7			
	reaction time	0.167															
	interval		3.68	3.72	3.84	3.96	4.16	4.28	4.40	4.48	4.44	5.23	NR PB		11.24	12.40	13.32
	velocity	7.60	9.51	9.41	9.11	8.84	8.41	8.18	7.95	7.81	7.88	7.65	8.31		9.34	8.47	7.88
H1 lead leg	L																
Sibilio, Alessandro (ITA) (1999)	time	6.04	9.84	13.76	17.68	21.64	25.84		34.84	39.24	43.68		48.77	2 / 8			
	reaction time	0.144															
	interval		3.80	3.92	3.92	3.96	4.20		9.00	4.40	4.44	5.09			11.64		
	velocity	7.45	9.21	8.93	8.93	8.84	8.33		7.78	7.95	7.88	7.86	8.20		9.02		
H1 lead leg	R																



Time Intervals (s)

Hurdle Phases



Evaluated with: ObjectusVideo

Quality & Frame Rate: 1920 x 1080 @ 25fps

Timing From: First Movement

Source: <https://www.youtube.com/watch?v=mGzBtclnfyw>

2020 Olympic Games (Tokyo, JPN) (TV Analysis)

Men's 400m Hurdles

Date 2021.08.01

Semi-Final 1

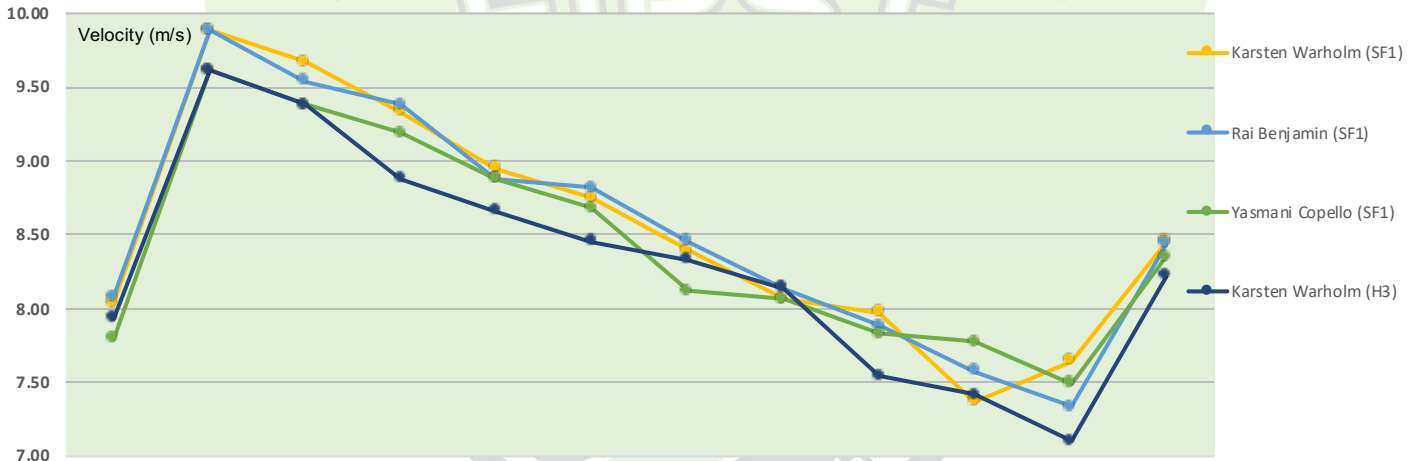
		H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	400m	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time	5.60	9.14	12.76	16.51	20.42	24.42	28.59	32.93	37.32	42.07		47.30	7 / 1			
	reaction time	0.156															
	interval		3.54	3.62	3.75	3.91	4.00	4.17	4.34	4.39	4.75	5.23			10.91	12.08	13.48
	velocity	8.04	9.89	9.67	9.33	8.88	8.75	8.39	8.06	7.97	7.37	7.65	8.46		9.62	8.69	7.79
H1 lead leg	L	20	13	13	13	13	13	13	13	13	15	17.5	156.5				
Benjamin, Rai (USA) (1997)	time	5.57	9.11	12.78	16.51	20.45	24.42	28.56	32.86	37.30	41.92		47.37	5 / 2			
	reaction time	0.184															
	interval		3.54	3.67	3.73	3.94	3.97	4.14	4.30	4.44	4.62	5.45			10.94	12.05	13.36
	velocity	8.08	9.89	9.54	9.38	8.88	8.82	8.45	8.14	7.88	7.58	7.34	8.44		9.60	8.71	7.86
H1 lead leg	R	20	13	13	13	13	13	13	13	13	13	16.7	153.7				
Copello, Yasmani (TUR) (1987)	time	5.77	9.41	13.14	16.95	20.89	24.92	29.23	33.57	38.04	42.54		47.88	4 / 3			
	reaction time	0.183															
	interval		3.64	3.73	3.81	3.94	4.03	4.31	4.34	4.47	4.50	5.34			11.18	12.28	13.31
	velocity	7.80	9.62	9.38	9.19	8.88	8.68	8.12	8.06	7.83	7.78	7.49	8.35		9.39	8.55	7.89
H1 lead leg	R	20	13	13	13	13	13	14	14	14	14	17.2	144.2				

Men's 400m Hurdles

Date 2021.07.30

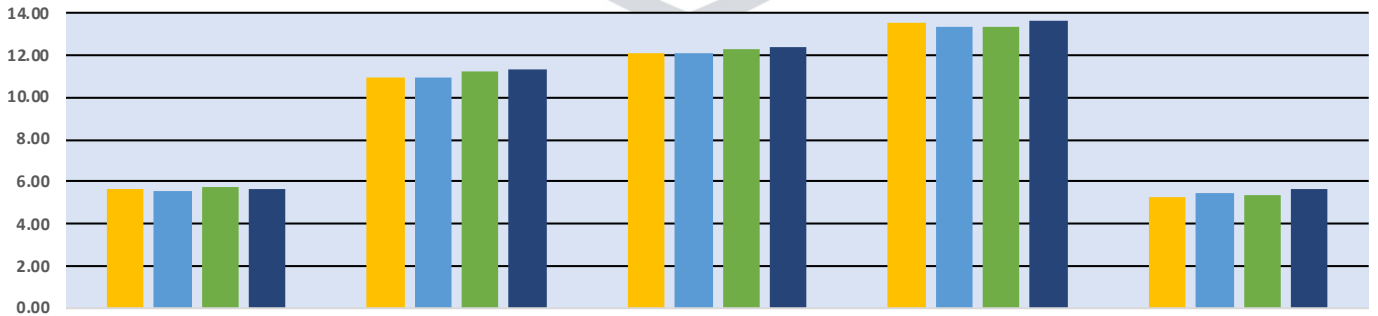
Heat 3

		H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	400m	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time	5.67	9.31	13.04	16.98	21.02	25.16	29.36	33.66	38.30	43.02		48.65	8 / 1			
	reaction time	0.157															
	interval		3.64	3.73	3.94	4.04	4.14	4.20	4.30	4.64	4.72	5.63			11.31	12.38	13.66
	velocity	7.94	9.62	9.38	8.88	8.66	8.45	8.33	8.14	7.54	7.42	7.10	8.22		9.28	8.48	7.69
H1 lead leg	L	20	13	13	13	13	13	13	13	15	15	17	158				



Hurdle Phases

Time Intervals (s)



Semi Final 1

Evaluated with: ObjectusVideo
 Quality & Frame Rate: 1920 x 1080 @ 24fps
 Timing From: First Movement
 Source: <https://www.youtube.com/watch?v=Jj8ubwFhee8>

Heat 3

Evaluated with: ObjectusVideo
 Quality & Frame Rate: 1920 x 1080 @ 24fps
 Timing From: First Movement
 Source: <https://www.youtube.com/watch?v=Khs5A4xhHL4>

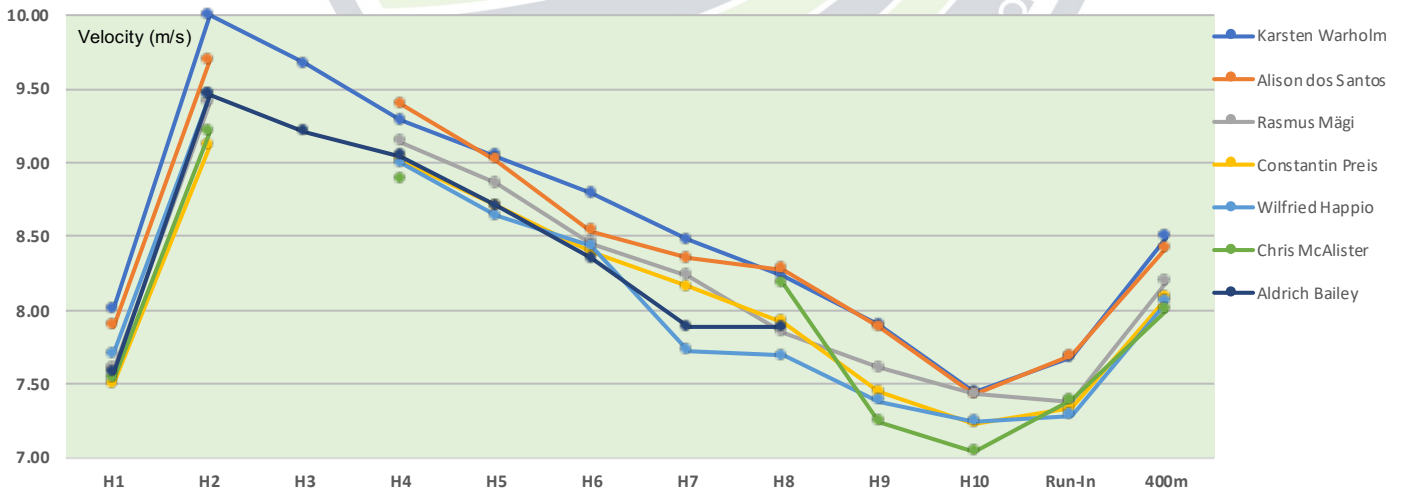
2021 Herculis Meeting International d'Athletisme (Monaco, MON) (TV Analysis)

Men's 400m Hurdles

Date 2021.07.09

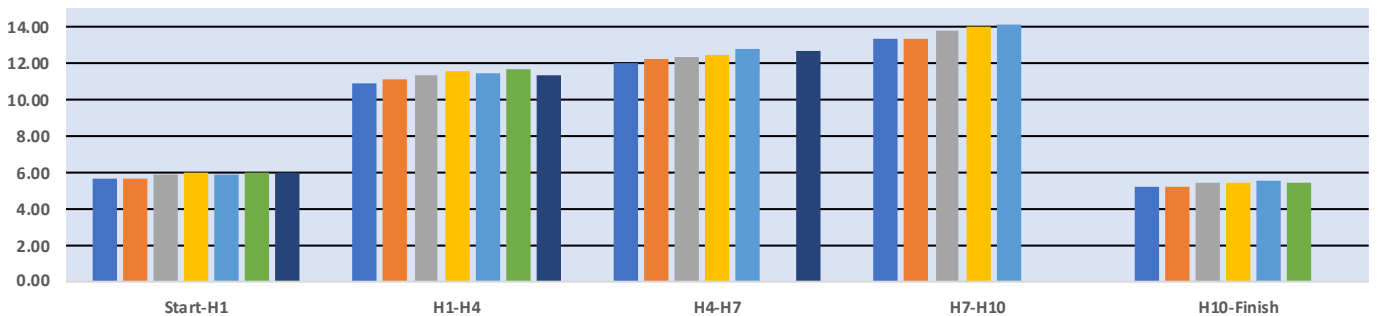
FINAL

		H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	400m	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time	5.62	9.12	12.74	16.51	20.38	24.36	28.49	32.74	37.17	41.87	47.08	47.08	7 / 1			
	reaction time	0.150															
	interval		3.50	3.62	3.77	3.87	3.98	4.13	4.25	4.43	4.70	5.21			10.89	11.98	13.38
	velocity	8.01	10.00	9.67	9.28	9.04	8.79	8.47	8.24	7.90	7.45	7.68	8.50		9.64	8.76	7.85
H1 lead leg	L																
dos Santos, Alison (BRA) (2000)	time	5.70	9.31		16.76	20.64	24.74	28.93	33.16	37.60	42.31		47.51	6 / 2			
	reaction time	0.177															
	interval		3.61		7.45	3.88	4.10	4.19	4.23	4.44	4.71	5.20			11.06	12.17	13.38
	velocity	7.89	9.70		9.40	9.02	8.54	8.35	8.27	7.88	7.43	7.69	8.42		9.49	8.63	7.85
H1 lead leg	L			13		12	13	14		15	15	16.5					
Mägi, Rasmus (EST) (1992)	time	5.92	9.64		17.30	21.25	25.39	29.64	34.10	38.70	43.41		48.83	5 / 3			
	reaction time	0.152															
	interval		3.72		7.66	3.95	4.14	4.25	4.46	4.60	4.71	5.42			11.38	12.34	13.77
	velocity	7.60	9.41		9.14	8.86	8.45	8.24	7.85	7.61	7.43	7.38	8.19		9.23	8.51	7.63
H1 lead leg	R					13	13	13	14	14	14	114					
Preis, Constantin (GER) (1998)	time	6.00	9.84		17.60	21.62	25.79	30.08	34.50	39.20	44.04		49.49	4 / 4			
	reaction time	0.231															
	interval		3.84		7.76	4.02	4.17	4.29	4.42	4.70	4.84	5.45			11.60	12.48	13.96
	velocity	7.50	9.11		9.02	8.71	8.39	8.16	7.92	7.45	7.23	7.34	8.08		9.05	8.41	7.52
H1 lead leg	L					14	15	15		16	16	112					
Happio, Wilfried (FRA) (1998)	time	5.84	9.54		17.32	21.37	25.52	30.05	34.60	39.34	44.17		49.66	3 / 5			
	reaction time	0.123															
	interval		3.70		7.78	4.05	4.15	4.53	4.55	4.74	4.83	5.49			11.48	12.73	14.12
	velocity	7.71	9.46		9.00	8.64	8.43	7.73	7.69	7.38	7.25	7.29	8.05		9.15	8.25	7.44
H1 lead leg	L					13	13	14		15	15	103					
McAlister, Chris (GBR) (1995)	time	5.97	9.77		17.65				34.77	39.60	44.57		49.98	2 / 6			
	reaction time	0.144															
	interval		3.80		7.88				17.12	4.83	4.97	5.41			11.68		
	velocity	7.54	9.21		8.88				8.18	7.25	7.04	7.39	8.00		8.99		
H1 lead leg	R									16	16	68					
Bailey, Aldrich (USA) (1994)	time	5.94	9.64	13.44	17.31	21.33	25.52	29.96	34.40				dnf	8 / --			
	reaction time	0.225															
	interval		3.70	3.80	3.87	4.02	4.19	4.44	4.44								
	velocity	7.58	9.46	9.21	9.04	8.71	8.35	7.88	7.88								
H1 lead leg	L																
H1 lead leg	L																



Time Intervals (s)

Hurdle Phases



Evaluated with: ObjectusVideo
 Quality & Frame Rate: 1920 x 1080 @ 30fps
 Timing From: First Movement
 Source: <https://www.youtube.com/watch?v=pl5zgnzUj0o>

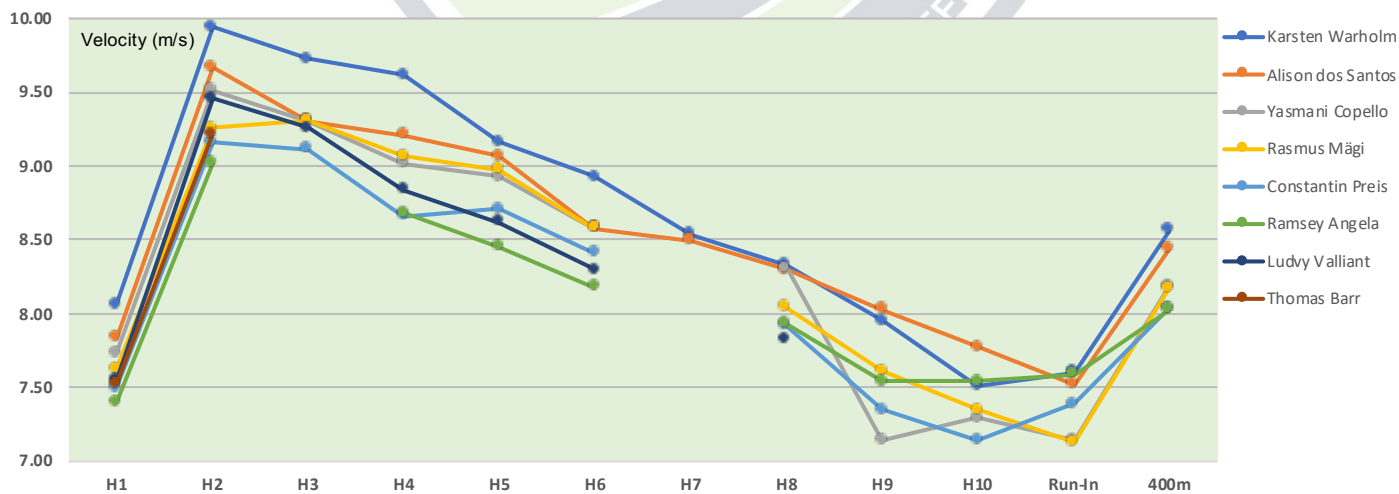
2021 Bislett Games (Oslo, NOR) (TV Analysis)

Men's 400m Hurdles

Date 2021.07.01

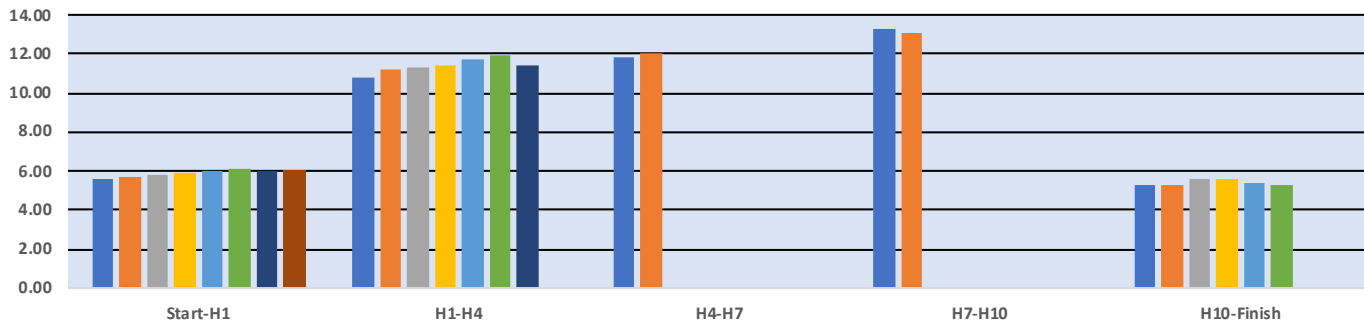
FINAL

		H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	400m	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time	5.58	9.10	12.70	16.34	20.16	24.08	28.18	32.38	36.78	41.44		46.70	7 / 1			
	reaction time	0.163															
	interval		3.52	3.60	3.64	3.82	3.92	4.10	4.20	4.40	4.66	5.26	WR		10.76	11.84	13.26
	velocity	8.06	9.94	9.72	9.62	9.16	8.93	8.54	8.33	7.95	7.51	7.60	8.57		9.76	8.87	7.92
H1 lead leg	L																
dos Santos, Alison (BRA) (2000)	time	5.74	9.36	13.12	16.92	20.78	24.86	28.98	33.20	37.56	42.06		47.38	6 / 2			
	reaction time	0.179															
	interval		3.62	3.76	3.80	3.86	4.08	4.12	4.22	4.36	4.50	5.32	AR PB		11.18	12.06	13.08
	velocity	7.84	9.67	9.31	9.21	9.07	8.58	8.50	8.29	8.03	7.78	7.52	8.44		9.39	8.71	8.03
H1 lead leg	L																
Copello, Yasmani (TUR) (1987)	time	5.82	9.50	13.26	17.14	21.06	25.14		33.56	38.46	43.26		48.86	5 / 3			
	reaction time	0.198															
	interval		3.68	3.76	3.88	3.92	4.08		8.42	4.90	4.80	5.60			11.32		
	velocity	7.73	9.51	9.31	9.02	8.93	8.58		8.31	7.14	7.29	7.14	8.19		9.28		
H1 lead leg	R																
Mägi, Rasmus (EST) (1992)	time	5.90	9.68	13.44	17.30	21.20	25.28		33.98	38.58	43.34		48.95	3 / 4			
	reaction time	0.161															
	interval		3.78	3.76	3.86	3.90	4.08		8.70	4.60	4.76	5.61			11.40		
	velocity	7.63	9.26	9.31	9.07	8.97	8.58		8.05	7.61	7.35	7.13	8.17		9.21		
H1 lead leg	R																
Preis, Constantin (GER) (1998)	time	6.00	9.82	13.66	17.70	21.72	25.88		34.72	39.48	44.38		49.79	2 / 5			
	reaction time	0.246															
	interval		3.82	3.84	4.04	4.02	4.16		8.84	4.76	4.90	5.41			11.70		
	velocity	7.50	9.16	9.11	8.66	8.71	8.41		7.92	7.35	7.14	7.39	8.03		8.97		
H1 lead leg	L																
Angela, Ramsey (NED) (1999)	time	6.08	9.96		18.02	22.16	26.44		35.26	39.90	44.54		49.81	1 / 6			
	reaction time	0.199															
	interval		3.88		8.06	4.14	4.28		8.82	4.64	4.64	5.27			11.94		
	velocity	7.40	9.02		8.68	8.45	8.18		7.94	7.54	7.54	7.59	8.03		8.79		
H1 lead leg	R																
Valliant, Ludvy (FRA) (1995)	time	5.96	9.66	13.44	17.40	21.46	25.68		34.62				dnf	8 / --			
	reaction time	0.245															
	interval		3.70	3.78	3.96	4.06	4.22		8.94								
	velocity	7.55	9.46	9.26	8.84	8.62	8.29		7.83								
H1 lead leg	R																
Barr, Thomas (IRL) (1992)	time	5.98	9.78										dnf	4 / --			
	reaction time	0.147															
	interval		3.80														
	velocity	7.53	9.21														
H1 lead leg	R																



Time Intervals (s)

Hurdle Phases



Evaluated with: ObjectusVideo

Quality & Frame Rate: 1920 x 1080 @ 50fps

Timing From: First Movement

Source: https://www.youtube.com/watch?v=QfHE_FPIDko

Biomechanical Analysis

2021 Bislett Night of Highlights (Oslo, NOR) (TV Analysis) (300m Hurdles)

Men's 300m Hurdles		Date 2021.06.04										FINAL					
		H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	400m	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time	6.12	9.60	13.16	16.78	20.60	24.52	28.58					33.26	7 / 1			
	reaction time		interval	3.48	3.56	3.62	3.82	3.92	4.06			4.68	WB PB		10.66	11.80	
	velocity	8.17	10.06	9.83	9.67	9.16	8.93	8.62				8.55	9.02		9.85	8.90	
	H1 lead leg	L	strides	23	13	13	13	13	13	13		17	118				

2020 Impossible Games (Oslo, NOR) (TV Analysis) (300m Hurdles)

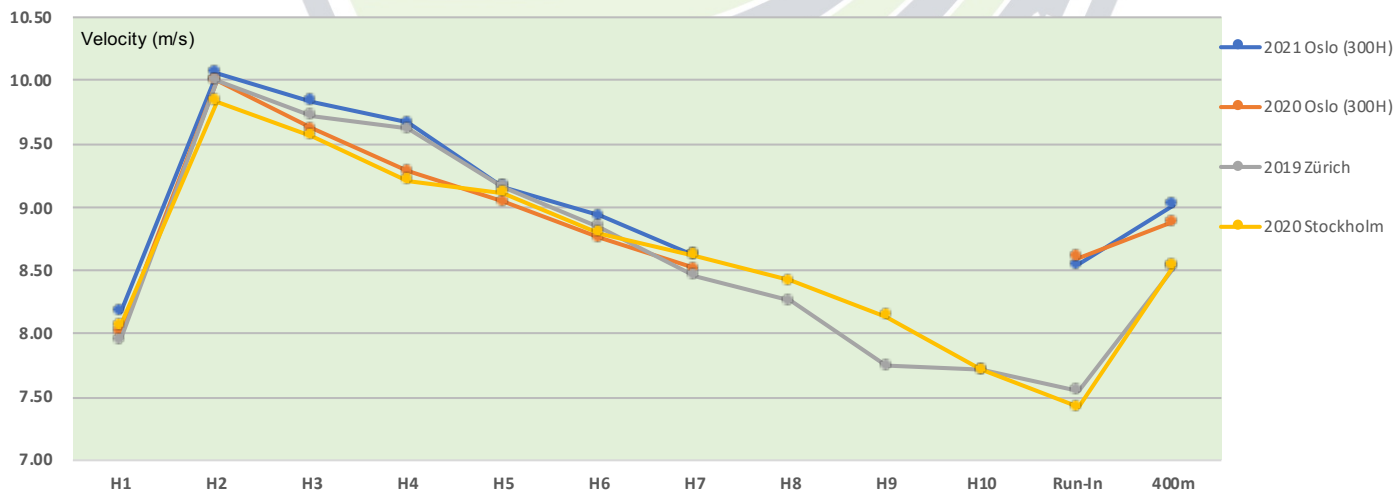
Men's 300m Hurdles		Date 2020.06.11										FINAL					
		H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	400m	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time	6.24	9.74	13.38	17.15	21.02	25.02	29.13					46.92	7 / 1			
	reaction time	0.182	interval	3.50	3.64	3.77	3.87	4.00	4.11			4.65	WB PB		10.91	11.98	
	velocity	8.01	10.00	9.62	9.28	9.04	8.75	8.52				8.60	8.88		9.62	8.76	
	H1 lead leg	L	strides	20	13	13	13	13	13	13		16.5	114.5				

2019 Weltklasse (Zürich, SUI) (TV Analysis)

Men's 400m Hurdles		Date 2019.08.29										FINAL					
		H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	400m	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time	5.66	9.16	12.76	16.40	20.22	24.18	28.32	32.56	37.08	41.62		46.92	7 / 1			
	reaction time	0.140	interval	3.50	3.60	3.64	3.82	3.96	4.14	4.24	4.52	4.54	5.30	AR PB	10.74	11.92	13.30
	velocity	7.95	10.00	9.72	9.62	9.16	8.84	8.45	8.25	7.74	7.71	7.55	8.53		9.78	8.81	7.89
	H1 lead leg	L	strides	20	13	13	13	13	13	15	15	18.2	159.2				

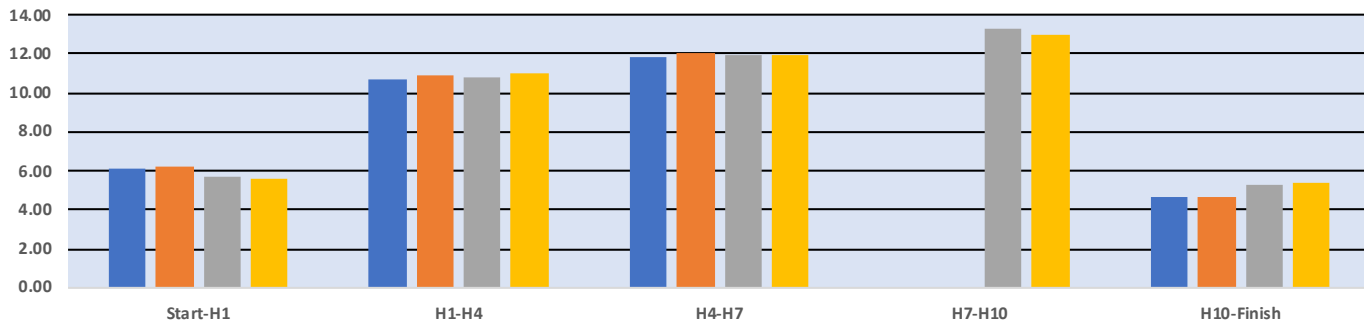
2020 Bauhaus Galan (Stockholm, SWE) (TV Analysis)

Men's 400m Hurdles		Date 2020.08.23										FINAL					
		H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	Run-In	400m	Lane / Place	H1-H4	H4-H7	H7-H10
Warholm, Karsten (NOR) (1996)	time	5.58	9.14	12.80	16.60	20.44	24.42	28.48	32.64	36.94	41.48		46.87	8 / 1			
	reaction time	0.161	interval	3.56	3.66	3.80	3.84	3.98	4.06	4.16	4.30	4.54	5.39	AR PB	11.02	11.88	13.00
	velocity	8.06	9.83	9.56	9.21	9.11	8.79	8.62	8.41	8.14	7.71	7.42	8.53		9.53	8.84	8.08
	H1 lead leg	L	strides	20	13	13	13	13	13	13	15	18	157				



Time Intervals (s)

Hurdle Phases



2021 Bislett Night of Highlights (Oslo, NOR)

Evaluated with: ObjectusVideo
 Quality & Frame Rate: 1280 x 720 @ 25fps
 Timing From: First Movement
 Source: <https://www.youtube.com/watch?v=NivYikNOI0&t=2s>

2020 Impossible Games (Oslo, NOR)

Evaluated with: ObjectusVideo
 Quality & Frame Rate: 1920 x 1080 @ 30fps
 Timing From: First Movement
 Source: <https://www.youtube.com/watch?v=aYUG74Uzr5M>

2019 Weltklasse (Zürich, SUI)

Evaluated with: ObjectusVideo
 Quality & Frame Rate: 1920 x 1080 @ 50fps
 Timing From: First Movement
 Source: <https://www.youtube.com/watch?v=JdYoau0-HEc>

2020 Bauhaus Galan (Stockholm, SWE)

Evaluated with: ObjectusVideo
 Quality & Frame Rate: 1920 x 1080 @ 30fps
 Timing From: First Movement
 Source: https://www.youtube.com/watch?v=NNmygWfl_xg