

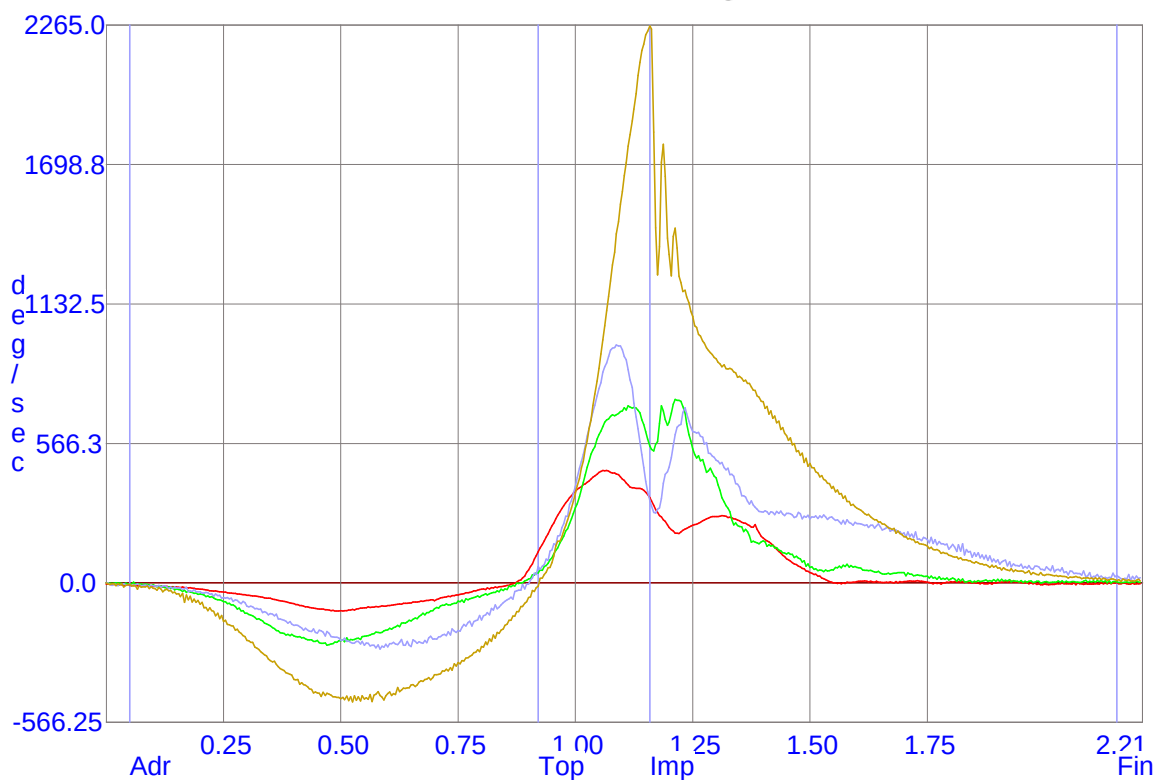
TPI 3D

■ **BIOMECHANICAL SPORTS ANALYSIS**

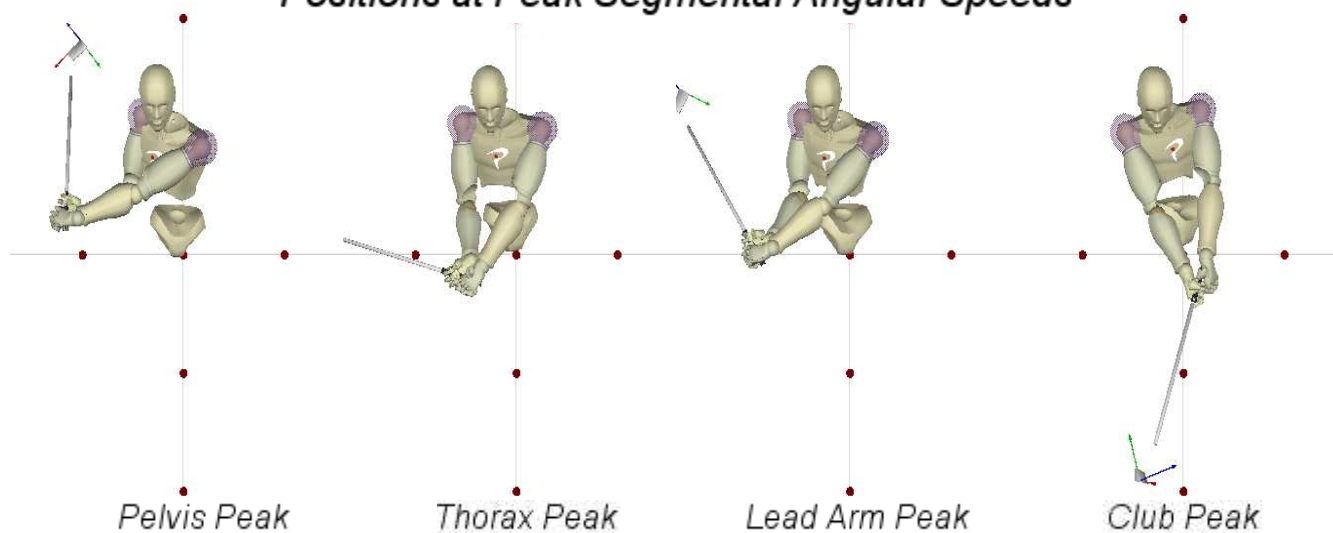


MYTPI.COM

Kinematic Sequence



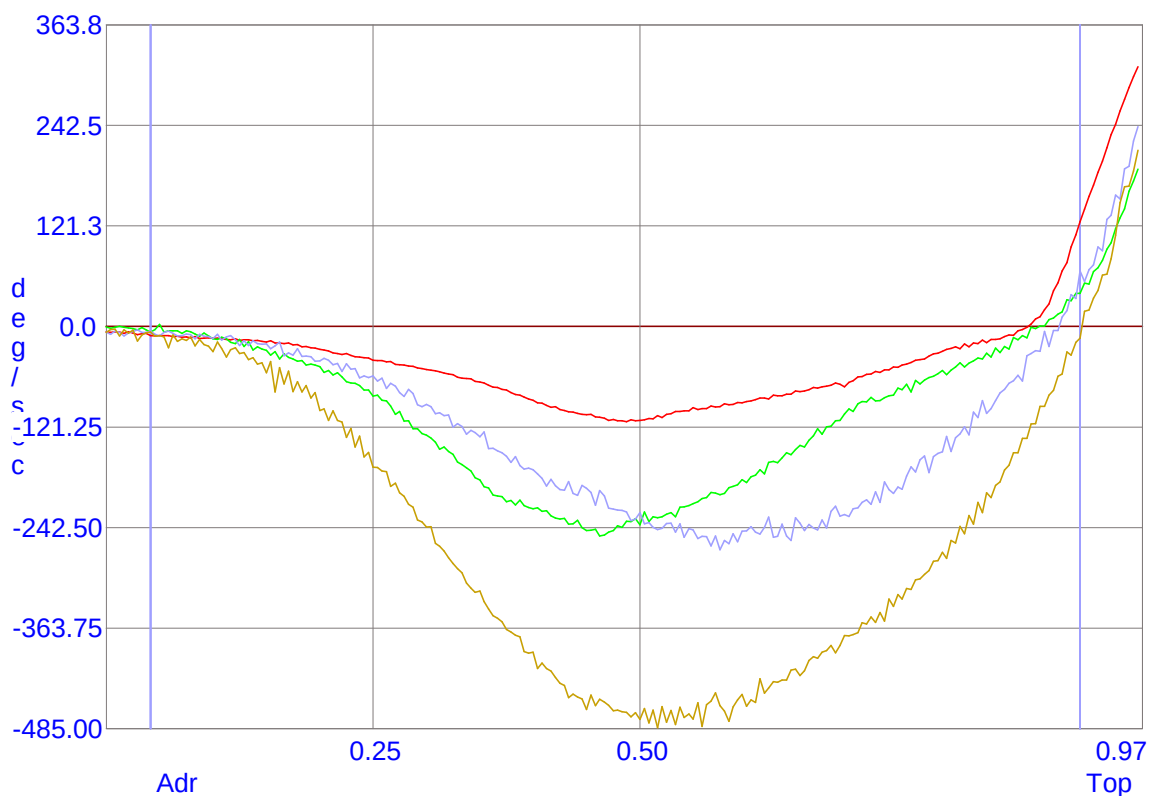
Positions at Peak Segmental Angular Speeds



		Backswing	Downswing	Follow Through
Tempo	ms	871	238	996

Backswing Sequence

Angular Velocity: **Pelvis** **Thorax** **Arm** **Club**



Backswing Parameters

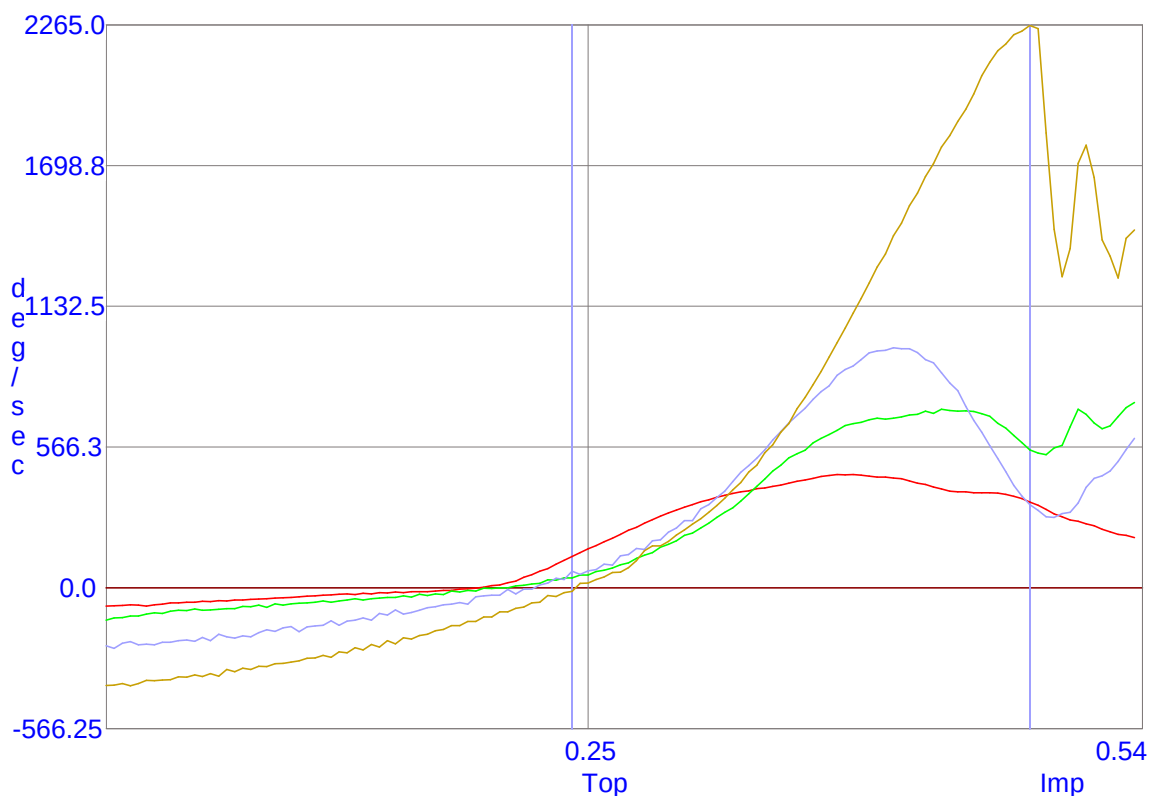
		Pelvis	Thorax	Arm	Club
Peak Order	order	2	1	4	3
Peak to Top	ms	425	450	338	396
Peak to Impact	ms	663	688	575	633
Peak Speed	d/s	115	253	269	484
Acceleration	d/s/s	233	584	494	1004
Deceleration	d/s/s	541	696	630	989

Segmental Interactions

		Pelvis-Thorax	Thorax-Arm	Arm-Club
Time Between Peaks	ms	-25	113	-58

Transition Sequence

Angular Velocity: **Pelvis** **Thorax** **Arm** **Club**



Transition Parameters

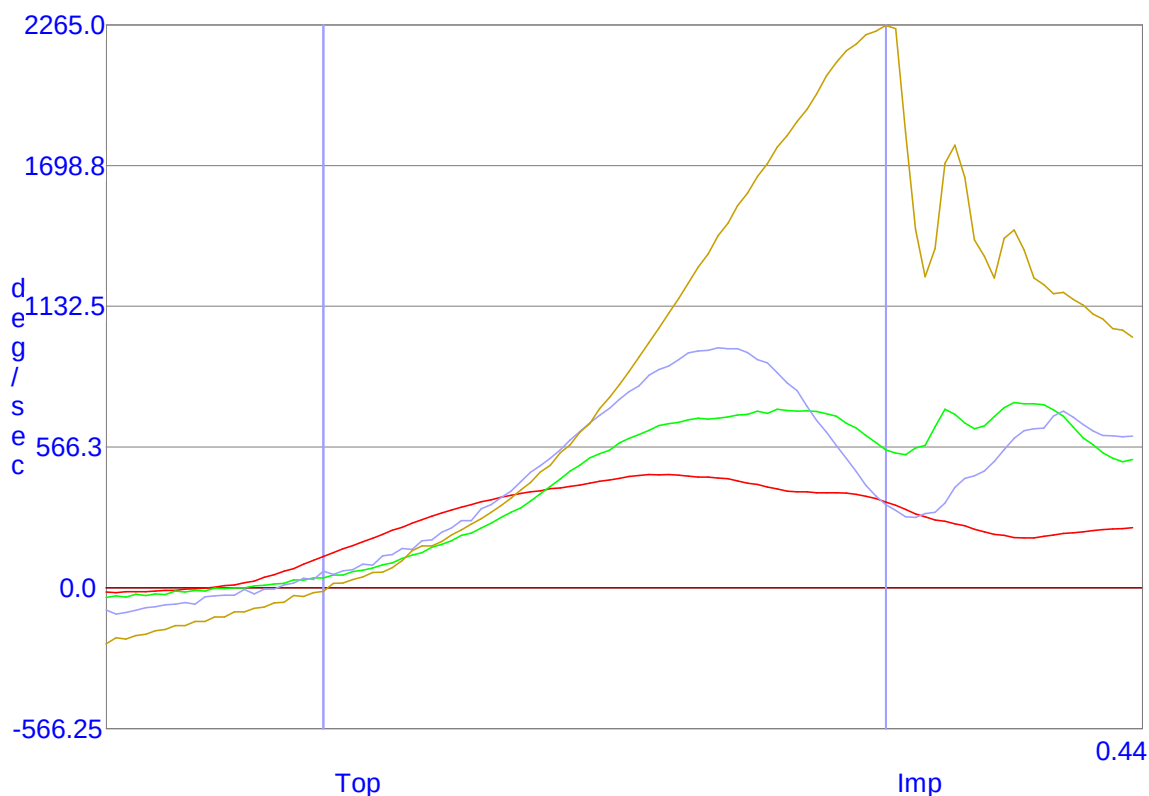
		Pelvis	Thorax	Arm	Club
Transition Order	order	1	2	3	4
Transition to Top	ms	50	42	21	0
Transition to Peak	ms	196	233	188	238
Transition to Impact	ms	288	279	258	238
Transition Acceleration	d/s/s	1176	835	1784	2918

Segmental Interactions

		Pelvis-Thorax	Thorax-Arm	Arm-Club
Time Between Transitions	ms	8	21	21

Downswing Sequence

Angular Velocity: **Pelvis** **Thorax** **Arm** **Club**



Sequence Parameters

		Pelvis	Thorax	Arm	Club
Peak Order	order	1	3	2	4
Peak Time Pre-Impact	ms	92	46	71	0
Peak Speed	d/s	456	719	966	2262
% of Max	%	20	32	43	100
Acceleration	d/s/s	2334	3091	5177	9581
Deceleration	d/s/s	1204	3579	8917	9151

Segmental Interactions

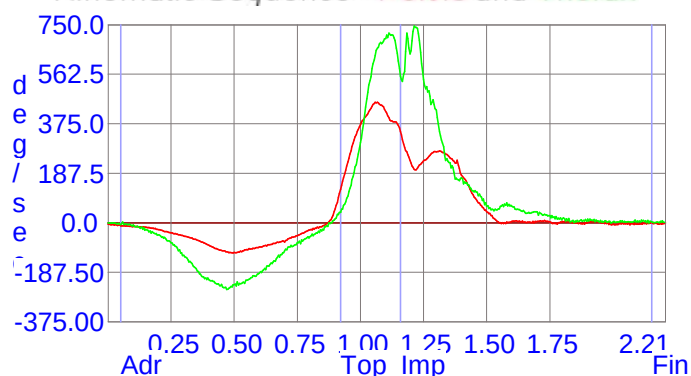
		Plv-Thx	Thx-Arm	Arm-Clb
Time Between Peaks	ms	46	-25	71
Angular Speed Gain	d/s	263	247	1296
Gain Factor	ratio	1.6	1.3	2.3

Contribution by Joint

		Legs	Core	Shldr	Wrist
% Contribution	%	20	12	11	57

Spine Link Interactions

Kinematic Sequence - Pelvis and Thorax



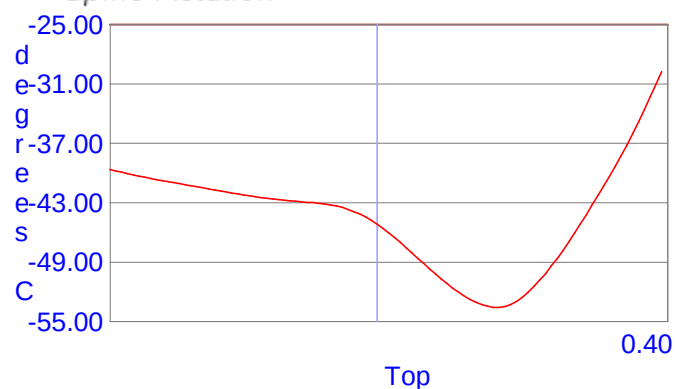
Transition Phase - Pelvis and Thorax



Total Spine Rotation (deg)

	Angle
At Pelvis Transition	43
At Thorax Transition	43
At Maximum	53

Spine Rotation



Transitional Spine Rotation (Stretch)

	Angle (deg)	Time (ms)	Rate (d/s)
Contra-Directional	0	8	11
Ipsi-Directional	10	133	78
Total Stretch	11	142	74

Transitional Timings (ms)

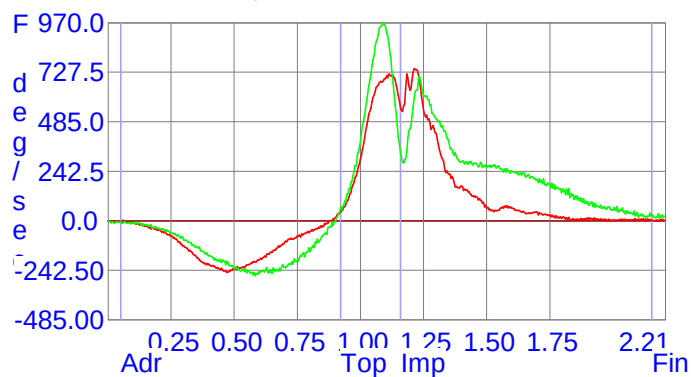
	Pelvis	Thorax
To Club Transition	50	42
To Impact	288	279

Transitional Accelerations (d/s/s)

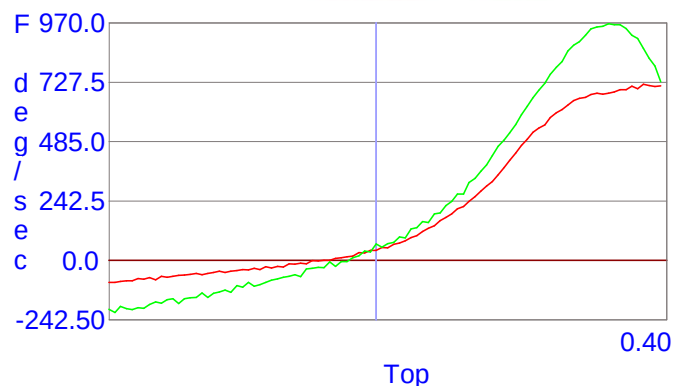
	Pelvis	Thorax
Acceleration	1176	835

Shoulder Link Interactions

Kinematic Sequence - Thorax and Arm



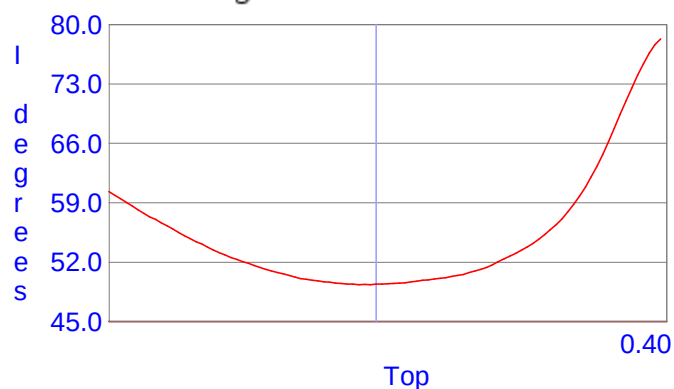
Transition Phase - Thorax and Arm



Total Shoulder Angle (deg)

	Angle
At Thorax Transition	50
At Arm Transition	49
At Min Angle	49

Shoulder Angle



Transitional Shoulder Stretch

	Angle (deg)	Time (ms)	Rate (d/s)
Contra-Directional	0	21	17
Ipsi-Directional	0	17	5
Total Stretch	0	38	12

Transitional Timings (ms)

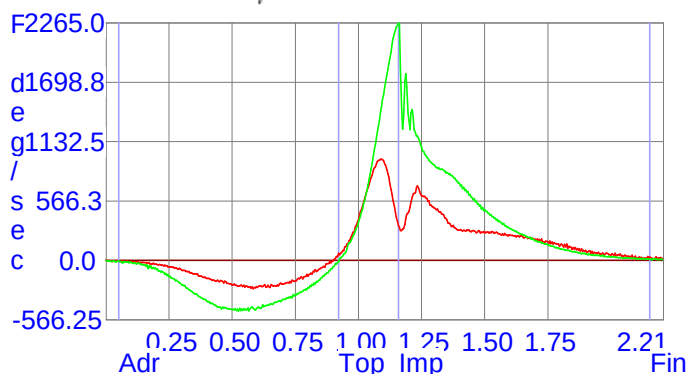
	Thorax	Lead Arm
To Club Transition	42	21
To Impact	279	258

Transitional Accelerations (d/s/s)

	Thorax	Lead Arm
Acceleration	835	1784

Wrist Link Interactions

Kinematic Sequence - Arm and Club



Wrist Set Angles (deg)

	Angle
At Arm Transition	88
At Club Transition	87
At Max Set	79
At Arm 30deg Pre-Impact	97

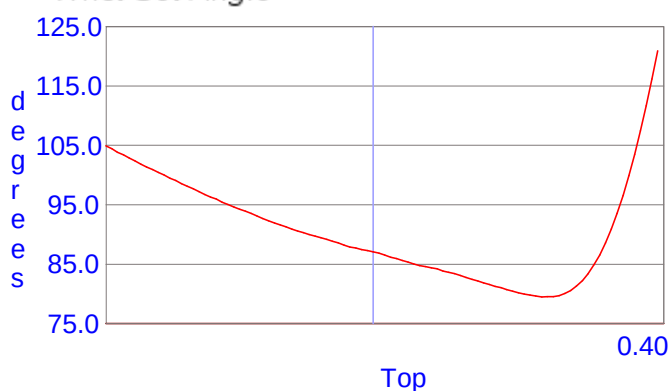
Shaft Lean (deg)

	Angle
At Impact	18 F

Transition Phase - Arm and Club



Wrist Set Angle



Transitional Wrist Set Stretch

	Angle (deg)	Time (ms)	Rate (d/s)
Contra-Directional	1	21	56
Ipsi-Directional	8	121	63
Total Stretch	9	142	62

Transitional Timings (ms)

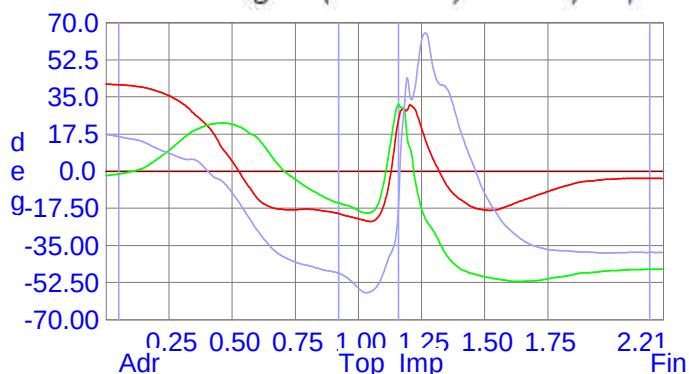
	Lead Arm	Club
To Club Transition	21	0
To Impact	258	238

Transitional Accelerations (d/s/s)

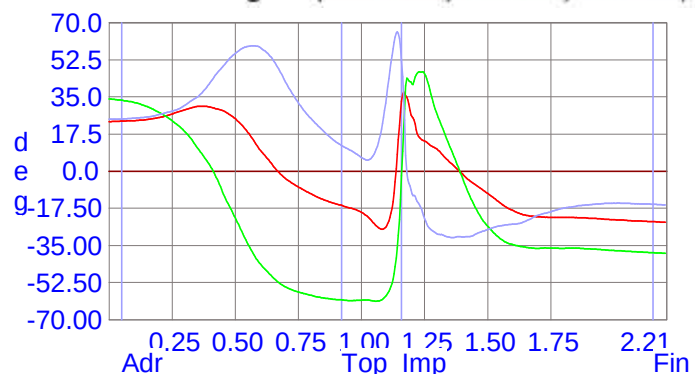
	Lead Arm	Club
Acceleration	1784	2918

Wrist Link Interactions

Lead Wrist Angles (Uln-Rad, Flx-Ext, Sup-Pro)



Trail Wrist Angles (Uln-Rad, Flx-Ext, Pro-Sup)



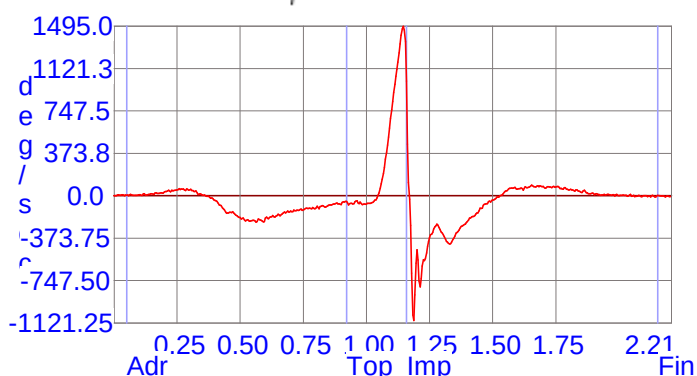
Lead Wrist Angles (Degrees)

	Adr	Top	Imp	Fin
Deviation	41 U	20 R	24 U	3 R
Flexion Extension	1 E	15 E	32 F	46 E
Forearm Sup-Pro	16 S	48 P	17 P	38 P

Trail Wrist Angles (Degrees)

	Adr	Top	Imp	Fin
Deviation	24 U	16 R	33 U	24 R
Flexion Extension	33 F	61 E	2 E	38 E
Forearm Pro-Sup	25 P	12 P	52 P	16 S

Wrist Release Speed



Angular Velocities (Deg/Sec)

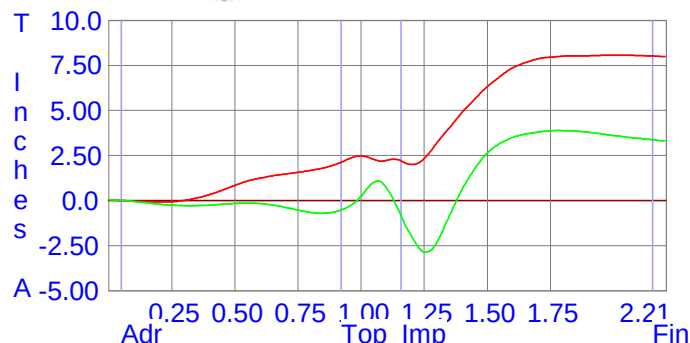
	Imp
Lead Wrist Sup-Pro Vel	1717 S
Lead Wrist Ext-Flex Vel	264 E
Trail Elbow Extn Vel	660 E
Club Handle Axial Vel	1743 C

Max Release Speed deg/sec 1492

Projected Impact Speed mph 98

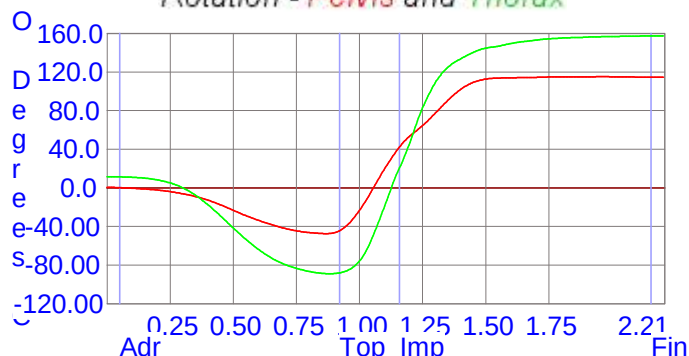
Trunk Dynamic Stability

Sway - Pelvis and Thorax



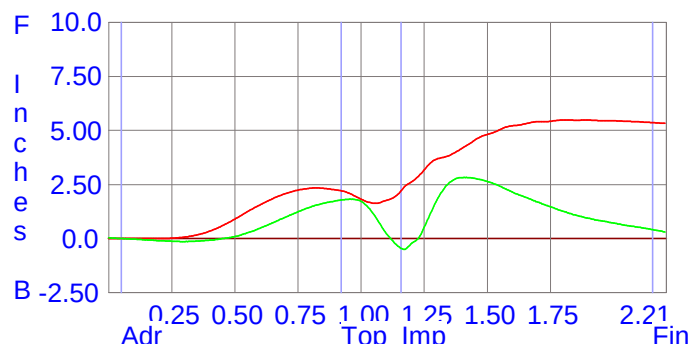
(Inches)	Adr	Top	Imp	Fin
Pelvis	0.0 T	2.1 T	2.2 T	8.0 T
Thorax	0.0 T	0.5 A	0.8 A	3.4 T

Rotation - Pelvis and Thorax



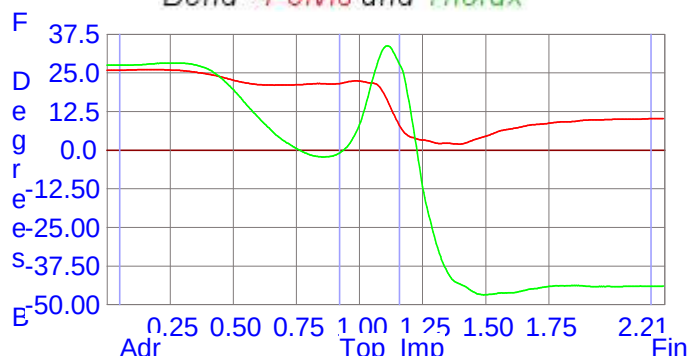
(Degrees)	Adr	Top	Imp	Fin
Pelvis	0 C	45 C	42 O	8 O
Thorax	11 O	88 C	21 O	157 O

Thrust - Pelvis and Thorax



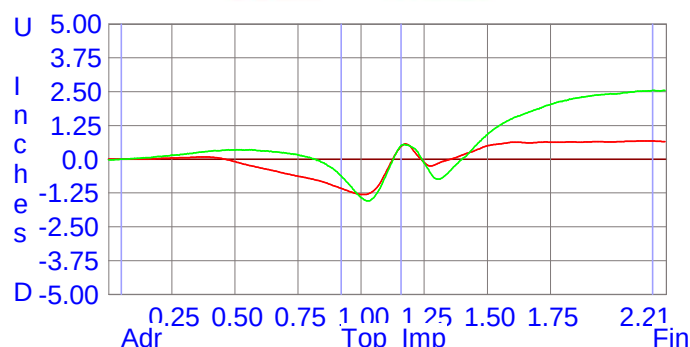
(Inches)	Adr	Top	Imp	Fin
Pelvis	-0.0 B	2.2 F	2.2 F	5.4 F
Thorax	0.0 F	1.8 F	0.5 B	0.4 F

Bend - Pelvis and Thorax



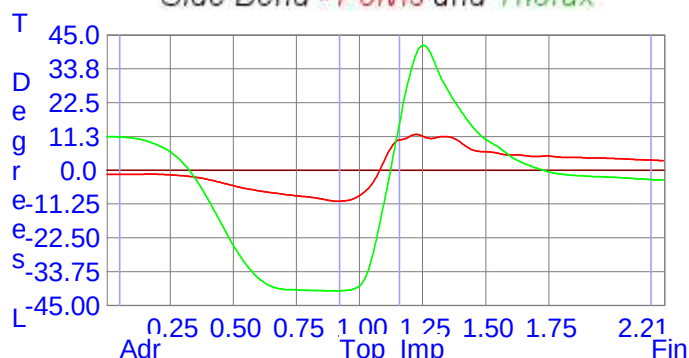
(Degrees)	Adr	Top	Imp	Fin
Pelvis	26 F	22 F	8 F	10 F
Thorax	28 F	1 B	28 F	44 B

Lift - Pelvis and Thorax



(Inches)	Adr	Top	Imp	Fin
Pelvis	-0.0 D	1.1 D	0.5 U	0.7 U
Thorax	0.0 D	0.6 D	0.5 U	2.5 U

Side Bend - Pelvis and Thorax



(Degrees)	Adr	Top	Imp	Fin
Pelvis	1 L	10 L	10 T	3 T
Thorax	11 T	40 L	16 T	3 L

Dynamic Range of Motion

Head Angles (deg)

Rotation	11 C	91 O	102
Bend	51 F	9 B	61
Side Bend	10 L	33 T	42

Neck Angles (deg)

Rotation	58 C	78 O	136
Flexion-Extension	13 E	54 E	41
Side Bend	34 L	21 T	55

Thorax Angles (deg)

Rotation	89 C	158 O	246
Bend	34 F	47 B	81
Side Bend	40 L	42 T	82

Lead Shoulder Angles (deg)

Elevation	7 B	158 B	151
Horizontal Adduction	49 I	191 I	142

Pelvis Angles (deg)

Rotation	47 C	115 O	163
Bend	26 F	2 F	24
Side Bend	10 L	12 T	22

Spine Angles (deg)

Rotation	54 C	30 O	83
Flexion-Extension	20 F	54 E	74
Side Bend	32 L	30 T	62
Forward Tilt	33 F	18 F	15
Side Tilt	2 L	16 T	18

Trail Elbow Angles (deg)

Flexion-Extension	170 F	90 F	80
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Lead Elbow Angles (deg)

Flexion-Extension	174 F	64 F	109
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Trail Wrist Angles (deg)

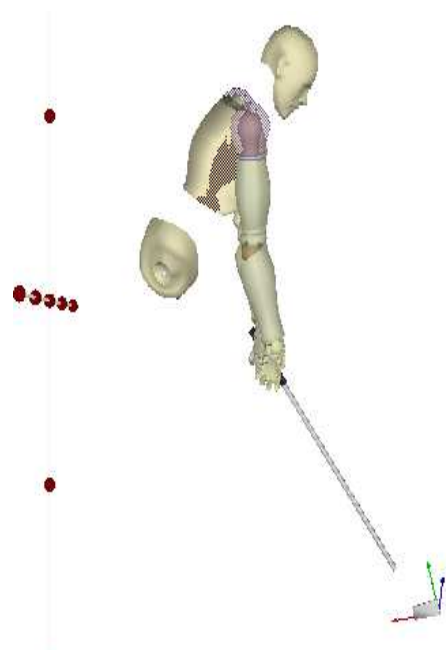
Rotation	66 S	31 P	97
Flexion-Extension	47 E	61 F	108
Deviation	37 U	27 R	65

Lead Wrist Angles (deg)

Rotation	65 S	57 P	122
Flexion-Extension	32 F	52 E	84
Deviation	41 U	24 R	65

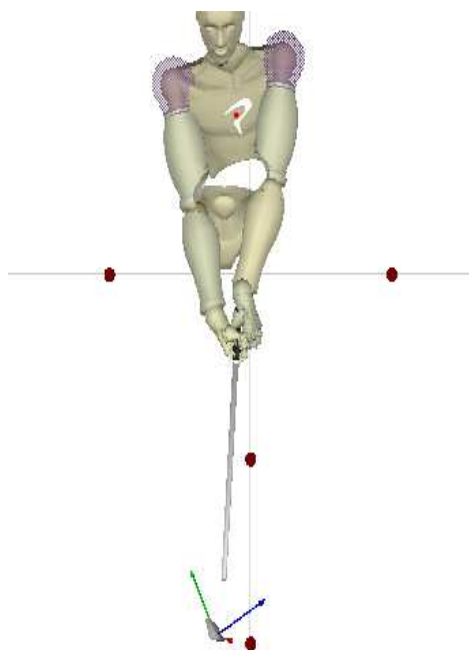
Columns are max range to each side and total range traveled

Position At Address



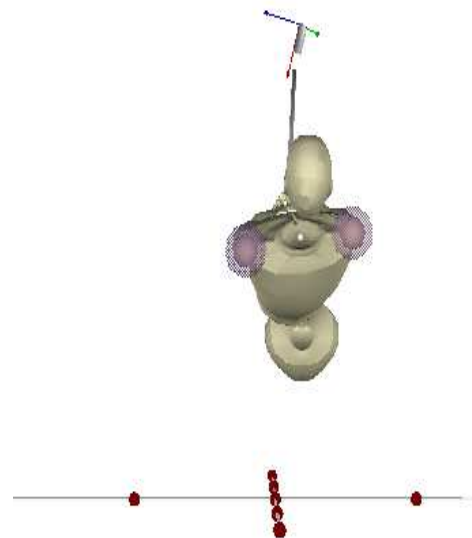
Angles (deg)

	Pelvis	Thorax
Rotation	0 C	11 O
Bend	26 F	28 F
Side Bend	1 L	11 T

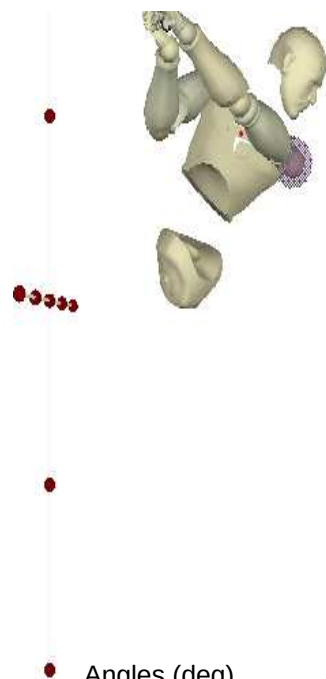


Angles (deg)

	Spine
Rotation	11 O
Flexion-Extension	2 F
Side Bend	12 T

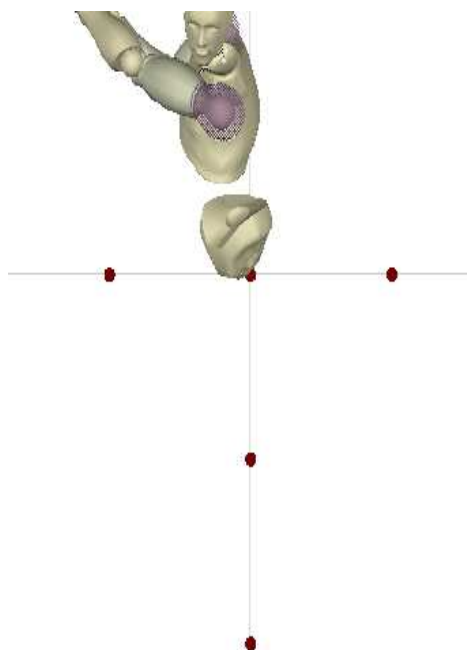


Position At Top



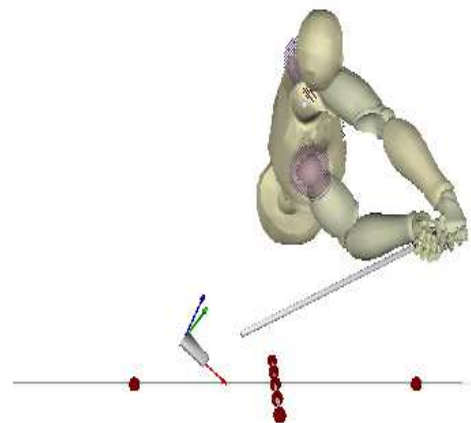
Angles (deg)

	Pelvis	Thorax
Rotation	45 C	88 C
Bend	22 F	1 B
Side Bend	10 L	40 L



Angles (deg)

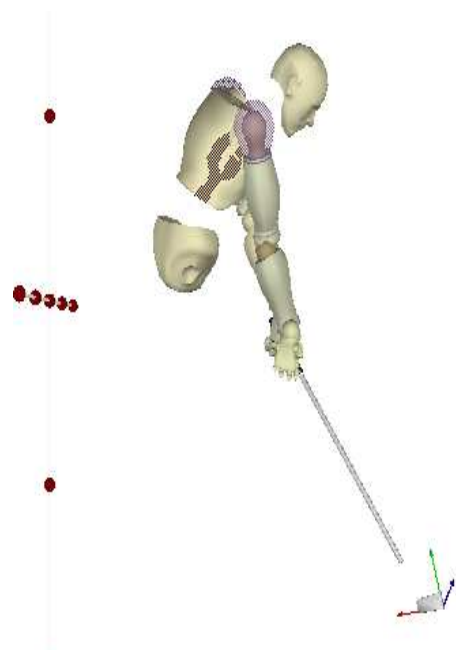
	Spine
Rotation	45 C
Flexion-Extension	22 B
Side Bend	30 L



Displacements (inches)

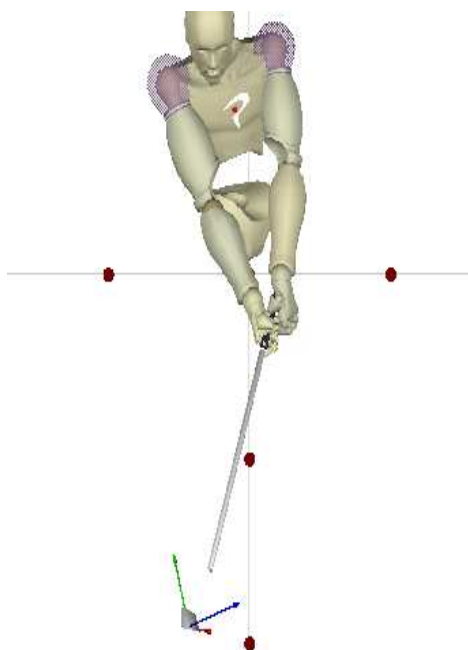
	Pelvis	Thorax
Sway	2.1 T	0.5 A
Thrust	2.2 F	1.8 F
Lift	1.1 D	0.6 D

Position At Impact



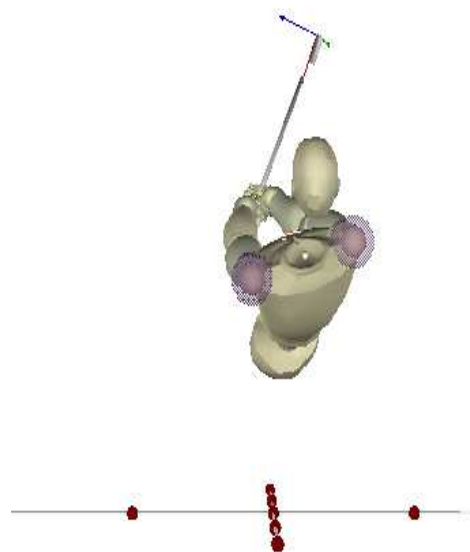
Angles (deg)

	Pelvis	Thorax
Rotation	42 O	21 O
Bend	8 F	28 F
Side Bend	10 T	16 T



Angles (deg)

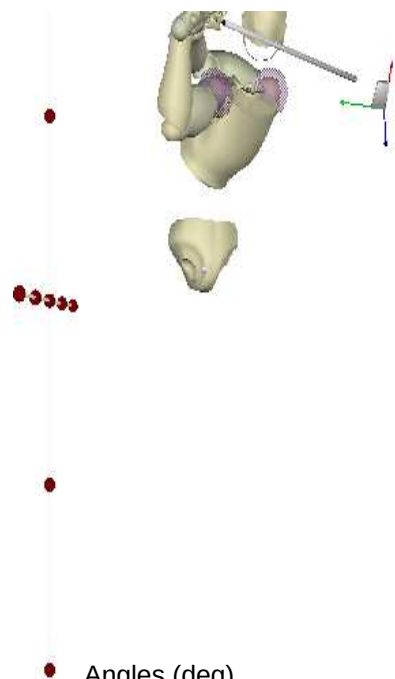
	Spine
Rotation	21 C
Flexion-Extension	20 F
Side Bend	5 T



Displacements (inches)

	Pelvis	Thorax
Sway	2.2 T	0.8 A
Thrust	2.2 F	0.5 B
Lift	0.5 U	0.5 U

Position At Finish

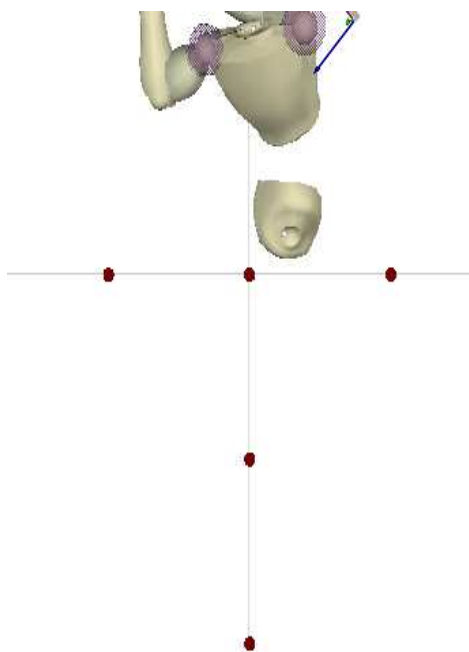


Angles (deg)

	Pelvis	Thorax
Rotation	115 O	157 O
Bend	10 F	44 B
Side Bend	3 T	3 L

Displacements (inches)

	Pelvis	Thorax
Sway	8.0 T	3.4 T
Thrust	5.4 F	0.4 F
Lift	0.7 U	2.5 U



Angles (deg)

	Spine
Rotation	29 O
Flexion-Extension	54 B
Side Bend	6 L

