Supplemental Material

Evaluation of a Motion Platform Embedded with a Dual Belt Treadmill Instrumented with Two Force Plates

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Table S1. Measure platform position across operational range-of-motion in 5cm or 5° intervals. Data is reported for one trial. The data in this table is also presented graphically in Figure 4 of the manuscript.

Input	Measured (cm)			Error (cm)			Input	Measured (deg)			Error (deg)		
(cm)	ML	AP	VT	ML	AP	VT	(deg)	Pitch	Roll	Yaw	Pitch	Roll	Yaw
-25	-24.5	-24.8	-	0.5	0.2	-	-25	-	-	-24.5			0.5
-20	-19.5	-19.9	-20.0	0.5	0.1	0.0	-20	-20.4	-20.5	-19.7	0.4	0.5	0.3
-15	-14.6	-14.9	-15.2	0.4	0.1	0.2	-15	-15.3	-15.4	-14.8	0.3	0.4	0.2
-10	-9.8	-9.9	-10.1	0.2	0.1	0.1	-10	-10.2	-10.3	-9.9	0.2	0.3	0.1
-5	-4.9	-4.9	-5.0	0.1	0.1	0.0	-5	-5.1	-5.1	-4.9	0.1	0.1	0.1
0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
5	4.9	5.0	5.2	0.1	0.0	0.2	5	5.1	5.2	4.9	0.1	0.2	0.1
10	9.8	10.0	10.4	0.2	0.0	0.4	10	10.1	10.4	9.8	0.1	0.4	0.2
15	14.7	15.0	15.7	0.3	0.0	0.7	15	15.1	15.5	14.7	0.1	0.5	0.3
20	19.6	20.0	20.9	0.4	0.0	0.9	20	19.8	20.6	19.6	0.2	0.6	0.4
25	24.5	25.0	26.1	0.5	0.0	1.1	25	-	-	24.4	-	-	0.6
30	-	-	31.3	-	-	1.3							
32	-	-	33.3	-	-	1.3							
Average				*0.3*	*0.1*	*0.5*					*0.2*	*0.3*	*0.2*

Table S2. Dynamic performance characteristic for platform translation including platform velocity, acceleration, deceleration, peak transition time, total transition time, and overshoot. This data is presented graphically in Figure 5 of the manuscript.

	Peak Velocity (m/s)			Peak Acceleration (m/s^2)			Peak Deceleration (m/s^2)			Peak Transition Time (s)			Total Transition Time (s)			Overshoot (m)		
	ML	AP	VT	ML	AP	VT	ML	AP	VT	ML	AP	VT	ML	AP	VT	ML	AP	VT
D-Flow safety filter = 1																		
0-5 cm	0.11	0.11	0.12	0.52	0.63	0.66	0.32	0.38	0.44	1.2	1.1	1.1	1.2	1.1	1.1	0.000	0.000	0.000
0-10 cm	0.24	0.25	0.25	1.23	1.24	1.30	0.76	0.78	0.86	1.1	1.0	1.0	1.4	1.2	1.5	0.000	0.000	0.001
0-15 cm	0.37	0.38	0.37	1.96	1.91	1.64	1.20	1.39	1.01	1.1	1.0	1.0	1.5	1.3	1.6	0.001	0.001	0.001
0-20 cm	0.50	0.52	0.49	2.79	2.68	2.29	1.90	1.86	1.43	1.0	1.0	1.0	1.5	1.6	1.6	0.002	0.002	0.002
0-25 cm	0.64	0.65	0.59	3.32	3.17	2.44	2.50	2.48	2.41	0.9	0.9	1.0	1.5	1.5	1.6	0.003	0.003	0.004
D-Flow safety filter = 2.5																		
0-5 cm	0.05	0.05	0.06	0.17	0.23	0.38	0.10	0.20	0.38	2.1	2.1	2.1	3.5	3.1	3.1	0.001	0.001	0.002
0-10 cm	0.11	0.11	0.11	0.30	0.43	0.42	0.14	0.22	0.39	2.1	2.0	2.0	3.4	3.3	3.5	0.003	0.003	0.003
0-15 cm	0.16	0.17	0.17	0.45	0.56	0.62	0.21	0.29	0.36	2.0	2.0	2.0	3.5	3.3	3.5	0.005	0.004	0.005
0-20 cm	0.22	0.23	0.23	0.62	0.80	0.75	0.30	0.33	0.43	2.1	2.0	2.0	3.5	3.4	3.3	0.007	0.006	0.007
0-25 cm	0.28	0.29	0.29	0.82	0.96	0.95	0.35	0.41	0.41	2.0	2.0	2.0	3.6	3.5	3.3	0.009	0.009	0.009
D-Flow safety filter = 5																		
0-5 cm	0.03	0.03	0.03	0.10	0.18	0.34	0.09	0.16	0.25	3.9	3.7	3.5	6.0	5.9	5.8	0.002	0.002	0.002
0-10 cm	0.05	0.06	0.06	0.13	0.18	0.33	0.09	0.13	0.25	3.7	3.7	3.5	6.2	6.4	6.0	0.004	0.004	0.004
0-15 cm	0.08	0.09	0.09	0.18	0.24	0.40	0.10	0.11	0.16	3.8	3.7	3.8	6.1	6.1	6.2	0.005	0.005	0.006
0-20 cm	0.11	0.11	0.12	0.20	0.29	0.38	0.09	0.14	0.13	3.7	3.7	3.6	6.4	6.3	6.0	0.008	0.008	0.008
0-25 cm	0.14	0.14	0.15	0.28	0.42	0.37	0.12	0.15	0.15	3.7	3.7	3.6	6.9	6.2	6.2	0.010	0.010	0.010

Table S3. Dynamic performance characteristic for platform rotation including platform velocity, acceleration, deceleration, peak transition time, total transition time, and overshoot. This data is presented graphically in Figure 5 of the manuscript. For the yaw condition, 0-20 deg test was not performed.

	Peak Velocity (deg/s)			Peak Acceleration (deg/s^2)			Peak Deceleration (deg/s^2)			Peak Transition Time (s)			Total Transition Time (s)			Overshoot (deg)		
	Pitch	Roll	Yaw	Pitch	Roll	Yaw	Pitch	Roll	Yaw	Pitch	Roll	Yaw	Pitch	Roll	Yaw	Pitch	Roll	Yaw
D-Flow safety filter = 1																		
0-5 deg	12.0	12.1	11.3	57.8	66.8	55.7	41.9	40.9	31.5	1.1	1.1	1.1	1.1	1.3	1.1	0.0	0.0	0.0
0-10 deg	25.4	26.0	24.4	124.4	139.9	126.7	87.4	103.3	80.1	1.0	1.0	1.1	1.6	1.0	1.6	0.1	0.0	0.1
0-15 deg	38.6	39.3	36.5	194.3	210.4	193.3	135.5	154.4	125.7	1.0	1.0	1.0	1.6	1.5	1.6	0.2	0.1	0.2
0-20 deg	50.9	52.2	na	236.6	259.3	na	194.9	207.4	na	1.0	1.0	na	1.5	1.6	na	0.2	0.3	na
D-Flow safety filter = 2.5																		
0-5 deg	5.5	5.5	5.2	25.5	40.2	16.2	16.4	27.8	12.9	2.0	2.1	2.1	3.4	3.4	3.3	0.1	0.2	0.2
0-10 deg	11.2	11.6	10.8	32.6	37.3	36.3	19.6	18.9	15.7	2.1	2.0	2.1	3.4	3.4	3.3	0.3	0.3	0.3
0-15 deg	17.3	17.6	16.6	51.9	50.3	54.5	25.5	24.8	19.3	2.0	1.9	2.1	3.6	3.5	3.3	0.5	0.5	0.5
0-20 deg	23.0	23.4	na	66.6	79.5	na	33.7	45.9	na	2.0	1.9	na	3.5	3.3	na	0.7	0.6	na
D-Flow safety filter = 5																		
0-5 deg	3.0	3.1	2.8	15.0	19.1	11.0	9.1	21.7	6.0	3.7	3.4	3.6	6.2	5.6	6.3	0.2	0.2	0.2
0-10 deg	5.8	6.0	5.6	20.5	35.0	13.8	17.1	27.7	9.6	3.8	3.6	3.8	6.3	5.7	6.2	0.4	0.4	0.4
0-15 deg	8.8	9.0	8.4	23.4	33.1	19.5	16.9	32.4	11.6	3.8	3.7	3.8	6.2	5.7	6.1	0.6	0.5	0.6
0-20 deg	11.7	12.0	na	31.5	32.4	na	16.1	31.3	na	3.8	3.6	na	6.1	6.2	na	0.8	0.7	na

Table S4. Mean and two standard deviation of force measurements due to platform acceleration for progressively larger platform movement. This data is presented graphically in Figure 6 of the manuscript.

Platform Translation	Medial-lateral			Anterior-posterior			Vertical		
D-Flow safety filter = 1	ML (N)	AP (N)	VT (N)	ML (N)	AP (N)	VT (N)	ML (N)	AP (N)	VT (N)
0-5 cm	28 ± 39	2 ± 18	2 ± 33	1 ± 15	28 ± 46	1 ± 30	0 ± 15	2 ± 15	30 ± 52
0-10 cm	63 ± 89	1 ± 17	4 ± 34	1 ± 20	67 ± 86	1 ± 48	1 ± 14	3 ± 26	59 ± 110
0-15 cm	90 ± 160	4 ± 26	6 ± 48	2 ± 15	94 ± 149	3 ± 41	3 ± 14	3 ± 22	76 ± 177
0-20 cm	115 ± 226	6 ± 36	9 ± 63	3 ± 18	117 ± 229	4 ± 47	3 ± 17	1 ± 21	76 ± 211
0-25 cm	131 ± 278	9 ± 45	9 ± 66	3 ± 19	129 ± 267	6 ± 47	2 ± 21	1 ± 27	66 ± 201
D-Flow safety filter = 2.5									
0-5 cm	2 ± 13	0 ± 9	0 ± 10	0 ± 6	2 ± 13	0 ± 11	0 ± 10	1 ± 11	3 ± 24
0-10 cm	5 ± 20	1 ± 12	0 ± 20	0 ± 13	6 ± 30	0 ± 23	0 ± 15	1 ± 17	5 ± 32
0-15 cm	8 ± 24	1 ± 23	1 ± 22	0 ± 13	10 ± 38	0 ± 31	0 ± 15	1 ± 19	6 ± 46
0-20 cm	10 ± 36	1 ± 18	1 ± 23	0 ± 14	12 ± 47	0 ± 29	0 ± 16	0 ± 20	9 ± 57
0-25 cm	17 ± 39	2 ± 25	1 ± 34	0 ± 16	14 ± 55	0 ± 27	0 ± 14	0 ± 24	10 ± 71
D-Flow safety filter = 5									
0-5 cm	0 ± 8	0 ± 8	0 ± 5	0 ± 4	0 ± 9	0 ± 7	0 ± 9	0 ± 11	0 ± 14
0-10 cm	1 ± 6	0 ± 6	0 ± 5	0 ± 6	1 ± 13	0 ± 10	0 ± 8	0 ± 9	0 ± 16
0-15 cm	1 ± 10	0 ± 11	0 ± 10	0 ± 8	1 ± 22	0 ± 14	0 ± 12	0 ± 15	1 ± 20
0-20 cm	1 ± 12	0 ± 12	0 ± 14	0 ± 9	1 ± 20	0 ± 15	0 ± 14	0 ± 14	1 ± 25
0-25 cm	2 ± 14	0 ± 17	0 ± 17	0 ± 11	2 ± 18	0 ± 18	0 ± 14	0 ± 15	1 ± 24

Platform Rotation	Pitch			Roll			Yaw		
D-Flow safety filter = 1	ML (N)	AP (N)	VT (N)	ML (N)	AP (N)	VT (N)	ML (N)	AP (N)	VT (N)
0-5 cm	0 ± 14	27 ± 62	2 ± 26	35 ± 36	2 ± 16	26 ± 41	1 ± 26	19 ± 32	1 ± 27
0-10 cm	1 ± 23	62 ± 105	3 ± 42	58 ± 111	1 ± 20	42 ± 81	0 ± 31	34 ± 66	2 ± 36
0-15 cm	2 ± 27	91 ± 151	3 ± 69	84 ± 179	3 ± 28	58 ± 131	1 ± 30	50 ± 93	3 ± 31
0-20 cm	1 ± 29	93 ± 176	3 ± 82	91 ± 200	8 ± 48	60 ± 156	na	na	na
D-Flow safety filter = 2.5									
0-5 cm	0 ± 9	4 ± 23	0 ± 24	2 ± 14	0 ± 15	2 ± 19	0 ± 17	2 ± 16	0 ± 19
0-10 cm	0 ± 11	6 ± 35	0 ± 29	6 ± 20	0 ± 17	4 ± 25	0 ± 23	3 ± 24	0 ± 25
0-15 cm	0 ± 13	10 ± 44	1 ± 33	9 ± 30	0 ± 23	6 ± 34	1 ± 25	4 ± 25	0 ± 24
0-20 cm	0 ± 14	14 ± 49	1 ± 35	11 ± 37	0 ± 19	5 ± 39	na	na	na
D-Flow safety filter = 5									
0-5 cm	0 ± 6	0 ± 8	0 ± 8	0 ± 8	0 ± 11	0 ± 6	0 ± 9	0 ± 11	0 ± 9
0-10 cm	0 ± 7	1 ± 14	0 ± 16	1 ± 10	0 ± 11	1 ± 10	0 ± 11	0 ± 11	0 ± 10
0-15 cm	0 ± 10	1 ± 19	0 ± 15	1 ± 13	0 ± 15	1 ± 16	0 ± 16	1 ± 14	0 ± 16
0-20 cm	0 ± 8	2 ± 19	0 ± 17	1 ± 15	0 ± 14	1 ± 15	na	na	na