



Supplementary Material

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Table i. Capsular ligaments considered in analysis (✓). Excluding values: where the ligament was not functioning in tension (1); the ligament contribution was not statistically significant (2); or where ligaments only contributed a small amount to rotational restraint (< 20% of net restraint) (3).

Joint position			Capsular ligament			
Position	ADD/ABD	Rotation	Lateral ILF	Medial ILF	PFL	ISFL
EXT	ADD	ER	✓	✓	2	1
EXT	0°	ER	✓	✓	2	1
EXT	ABD	ER	3	2	✓	1
EXT	ADD	IR	1	✓	2	✓
EXT	0°	IR	1	✓	2	✓
EXT	ABD	IR	1	2	✓	✓
0°	ADD	ER	✓	✓	2	1
0°	0°	ER	✓	✓	2	1
0°	ABD	ER	3	2	✓	1
0°	ADD	IR	1	✓	2	✓
0°	0°	IR	1	✓	2	✓
0°	ABD	IR	1	2	✓	✓
30°	ADD	ER	✓	2	2	1
30°	0°	ER	✓	3	2	1
30°	ABD	ER	✓	2	2	1

30°	ADD	IR	1	3	2	✓
30°	0°	IR	1	2	2	✓
30°	ABD	IR	1	2	3	✓
60°	ADD	ER	✓	2	2	1
60°	0°	ER	✓	2	2	1
60°	ABD	ER	✓	2	2	1
60°	ADD	IR	1	2	2	✓
60°	0°	IR	1	2	2	✓
60°	ABD	IR	1	2	3	3
90°	ADD	ER	✓	2	2	1
90°	0°	ER	✓	2	2	1
90°	ABD	ER	✓	2	2	1
90°	ADD	IR	1	2	2	✓
90°	0°	IR	1	2	2	✓
90°	ABD	IR	1	2	3	2
FLX	ADD	ER	✓	2	2	1
FLX	0°	ER	✓	2	2	1
FLX	ABD	ER	✓	2	2	1
FLX	ADD	IR	1	2	2	✓
FLX	0°	IR	1	2	2	✓
FLX	ABD	IR	1	2	3	2

ABD, abduction; ADD, adduction; ER, external rotation; EXT, extension; FLX, flexion; ILF, iliofemoral;

IR, internal rotation; ISFL, ischiofemoral; PFL, pubofemoral.

Table ii. Capsular ligament effective moment arms and net reaction force vectors generated at 5 Nm rotational restraint throughout range of motion for a right hip expressed in the International Society of Biomechanics pelvic coordinate system. The effective moment arm considers the relative angle between ligament line of action and axis of rotation, called the ‘twist angle’. Thus, the effective moment arm is calculated in 3D as the perpendicular distance (in mm) between the ligament line of action and axis of rotation multiplied by the sine of the twist angle.

Joint angles, °			Mean ligament moment arms in active positions (to nearest mm)				Mean force magnitude (to nearest 10 N)			
Flexion	(+) ADD/(-) ABD	Rotation	Lateral ILF	Medial ILF	PFL	ISFL	Fx (Pos to Ant)	Fy (Inf to Sup)	Fz (Med to Lat)	Resultant Force
-13	3.1	-11.1	6	12			20	370	-240	440
-13	0	-13.6	6	11			20	300	-220	370
-13	-22.1	-22.5			10		50	60	-140	160
-13	3.1	28.7		13		14	-80	180	-80	210
-13	0	30.2		12		14	-100	170	-130	230
-13	-22.1	20.5			14	15	-90	-40	-230	250
0	9.9	-13.5	13	18			0	280	-150	320
0	0	-23.8	14	17			20	180	-130	230
0	-27.7	-32.2			8		40	60	-150	160
0	9.9	30.5		20		17	-60	90	-50	120
0	0	31.9		16		16	-90	60	-120	170

0	-27.7	19.7			14	19	-50	-40	-190	200
30	24.8	-15.0	26				-20	130	-60	140
30	0	-35.0	27				30	100	-80	130
30	-38	-46.8	32				60	40	-60	90
30	24.8	30.1				22	-90	10	-90	130
30	0	35.0				23	-80	-10	-130	150
30	-38	18.9				24	-20	-40	-50	70
60	28.2	-22.0	35				-40	90	-50	100
60	0	-37.4	33				10	70	-60	90
60	-42.5	-37.1	33				70	50	-70	110
60	28.2	22.7				23	-90	0	-130	160
60	0	30.9				20	-40	-60	-120	140
60	-42.5	17.8					-	-	-	-
90	23.5	-35.5	37				-30	60	-50	80
90	0	-41.2	32				0	70	-70	100
90	-46.9	-24.8	29				90	70	-90	140
90	23.5	10.0				14	-100	-40	-210	230
90	0	20.8				10	-50	-80	-150	180
90	-46.9	13.9					-	-	-	-

115	9.5	-44.9	33				-30	80	-70	110
115	0	-46.5	30				-10	90	-80	120
115	-40.5	-23.3	26				110	120	-140	210
115	9.5	0.7				11	-90	-50	-200	230
115	0	8.1				9	-60	-70	-170	190
115	-40.5	14.5					-	-	-	-

ABD, abduction; ADD, adduction; Ant, anterior; Fx, force in x-direction; Fy, force in y-direction; Fz, force in z-direction; ILF, iliofemoral; Inf, inferior; ISFL, ischiofemoral; Lat, lateral; Med, medial; PFL, pubofemoral; Pos, posterior; Sup, superior.