

TABLE E-1 Results of Two-Way Analysis of Variance of Moment Arms of the Deltoid, Pectoralis Major, and Subscapularis Subregions During Coronal-Plane Abduction and Flexion in the Anatomical Shoulders and Those with the Reverse Total Shoulder Prosthesis*

Muscle Subregion			Moment Arm in Abduction (<i>mm</i>)												Moment Arm in Flexion (<i>mm</i>)									
			Anatomical Shoulder					Reconstructed Shoulder							Anatomical Shoulder					Reconstructed Shoulder				
			2.5°	30°	60°	90°	120°	2.5°	30°	60°	90°	120°			2.5°	30°	60°	90°	120°	2.5°	30°	60°	90°	120°
Anterior deltoid	$\phi\psi$	Mean	2.0	10.9	19.9	27.1	30.3	15.6	25.2	32.5	35.8	33.3	$\psi\chi$	Mean	11.6	27.4	35.6	39.1	40.0	25.9	34.2	35.8	35.7	32.7
		Stand. dev.	1.3	3.6	4.9	5.9	5.9	2.3	2.5	1.8	3.4	2.7		Stand. dev.	5.4	5.9	7.5	6.8	6.0	5.1	2.9	4.4	5.3	5.6
Middle deltoid	$\phi\psi$	Mean	8.3	21.5	27.6	29.1	28.4	30.2	33.9	42.2	46.2	39.8	$\phi\psi$	Mean	0.0	2.8	7.2	10.8	12.2	14.2	18.6	20.1	22.8	27.0
		Stand. dev.	3.5	8.3	6.4	5.9	3.8	6.6	5.5	5.5	4.2	5.8		Stand. dev.	4.1	5.6	6.8	6.7	3.2	6.4	7.1	4.9	6.6	6.1
Posterior deltoid	$\phi\psi$	Mean	– 17.0	–6.4	–1.7	1.0	2.0	1.3	3.5	7.3	11.4	14.1	$\phi\psi\chi$	Mean	– 30.8	– 33.0	– 30.0	– 22.5	– 16.3	– 14.6	– 17.6	– 16.3	– 13.8	– 13.1
		Stand. dev.	7.4	6.0	7.4	5.8	7.5	1.4	1.0	1.4	2.5	3.6		Stand. dev.	6.0	7.8	6.8	6.3	7.9	5.5	7.0	5.1	2.8	2.4
Superior pectoralis major	$\phi\psi$	Mean	–3.0	–0.6	2.9	7.9	11.2	2.6	7.6	12.4	15.8	18.4	$\psi\chi$	Mean	9.6	35.8	52.5	50.9	44.9	39.9	44.9	43.9	41.7	42.4
		Stand. dev.	2.6	3.2	6.1	6.2	6.5	2.2	3.4	3.8	2.7	4.7		Stand. dev.	7.3	5.1	8.0	3.8	6.2	4.4	2.8	5.5	7.7	10.2
Middle pectoralis major	$\phi\psi\chi$	Mean	– 20.2	– 32.0	–31.2	– 24.5	– 17.7	– 36.5	– 36.4	– 32.7	– 25.8	– 20.9	$\phi\chi$	Mean	4.4	15.3	14.8	8.9	5.9	–9.8	–8.0	–8.1	–6.1	–0.7
		Stand. dev.	5.3	3.8	4.2	2.5	2.0	4.5	4.2	4.1	7.4	6.1		Stand. dev.	5.0	3.5	5.4	4.9	4.3	6.1	6.7	6.7	6.8	4.2
Inferior pectoralis major	$\phi\psi\chi$	Mean	– 19.6	– 29.9	–33.6	– 29.1	– 16.2	– 44.7	– 45.7	– 44.6	– 35.7	– 25.6	$\phi\psi\chi$	Mean	1.9	–0.3	–5.7	–9.2	–7.2	– 20.7	– 23.9	– 23.0	– 22.2	– 19.6
		Stand. dev.	4.7	7.8	7.3	7.1	7.0	7.0	6.9	6.1	4.7	5.5		Stand. dev.	5.6	4.2	4.0	2.4	2.1	5.6	7.4	4.9	4.8	7.0
Superior subscapularis	$\phi\chi$	Mean	7.2	0.9	–5.0	–9.3	–6.2	–2.3	2.4	3.5	4.5	1.3	$\phi\psi\chi$	Mean	35.3	19.2	9.1	0.2	–5.4	–1.1	–0.9	–1.1	–1.3	–1.3
		Stand. dev.	5.0	5.2	7.4	5.6	3.6	1.9	3.3	4.1	4.7	2.7		Stand. dev.	2.9	6.7	4.8	3.1	3.0	2.6	2.3	1.8	1.6	1.5

Middle subscapularis	$\phi\chi$	Mean	1.3	-1.7	-7.1	-12.6	-7.6	-13.7	-11.1	-10.4	-8.1	-10.3	$\phi\psi\chi$	Mean	24.2	17.4	11.2	3.5	-0.6	-11.7	-13.1	-10.9	-8.8	-7.1
		Stand. dev.	2.7	3.4	5.8	6.7	4.6	7.9	4.6	5.3	5.7	6.1		Stand. dev.	3.1	6.9	6.0	3.0	2.9	8.0	4.6	3.6	3.7	4.0
Inferior subscapularis	ϕ	Mean	-3.0	-4.4	-11.2	-16.6	-10.2	-9.5	-15.2	-16.7	-14.6	-9.2	$\phi\chi$	Mean	10.4	8.4	4.7	-1.2	-3.0	-28.5	-23.3	-19.2	-15.3	-12.1
		Stand. dev.	4.8	7.5	5.4	6.9	4.2	9.6	7.9	9.4	9.2	10.8		Stand. dev.	4.5	7.0	6.0	3.7	4.1	5.4	4.9	4.6	3.2	3.5

*The mean moment arm and standard deviation are shown for abduction and flexion angles of 2.5°, 30°, 60°, 90°, and 120°. ϕ denotes a significant difference in the mean muscle moment arm over the joint range of motion due to reverse total shoulder arthroplasty (reconstructed shoulder), ψ denotes a significant difference in the mean muscle moment arm due to joint angle effects, and χ denotes a significant interaction between joint angle effects and shoulder anatomy.

TABLE E-2 Results of Two-Way Analysis of Variance of Moment Arms of the Latissimus Dorsi Subregions and the Teres Major During Coronal-Plane Abduction and Flexion in the Anatomical Shoulders and Those with the Reverse Total Shoulder Prosthesis*

Muscle/Muscle Subregion			Moment Arm in Abduction (<i>mm</i>)												Moment Arm in Flexion (<i>mm</i>)									
			Anatomical Shoulder					Reconstructed Shoulder							Anatomical Shoulder					Reconstructed Shoulder				
			10°	30°	60°	90°	120°	10°	30°	60°	90°	120°			10°	30°	60°	90°	120°	10°	30°	60°	90°	120°
Superior latissimus dorsi	$\phi\psi\chi$	Mean	−4.4	−	−	−	−	−	−	−	−	−	$\phi\psi\chi$	Mean	−	−	−	−8.7	−0.1	−	−	−	−	−4.3
			17.5	28.2	26.9	15.2	36.5	45.9	48.7	37.4	16.6			12.7	20.3	19.3			30.7	39.7	28.3	13.8		
		Stand. dev.	5.0	6.7	5.9	4.9	3.8	6.0	5.9	6.5	7.3	9.5		Stand. dev.	4.3	4.9	3.8	3.5	1.0	4.8	5.2	6.8	3.5	4.4
Middle latissimus dorsi	$\phi\psi$	Mean	−	−	−	−	−	−	−	−	−	−	$\phi\psi\chi$	Mean	−4.3	−7.8	−4.7	−0.9	−1.5	−	−	−	−6.9	−8.1
			16.9	26.3	38.3	31.9	19.4	20.3	46.4	49.2	38.0	24.3			25.0	27.1	15.5							
		Stand. dev.	7.3	8.2	7.1	3.8	3.4	8.6	6.0	7.5	7.0	8.7		Stand. dev.	7.4	5.2	2.2	1.1	2.5	8.9	8.2	6.5	4.8	5.1
Inferior latissimus dorsi	$\phi\psi$	Mean	−3.3	−	−	−	−	−	−	−	−	−	$\phi\psi\chi$	Mean	−3.2	−8.6	−	−6.0	−2.9	−	−	−	−	−
			21.0	36.3	35.7	19.6	16.6	36.5	46.8	39.5	22.3			10.5	22.9	28.8	22.5	13.6	11.9					
		Stand. dev.	7.3	5.5	4.0	5.2	6.3	4.5	6.8	7.6	5.8	6.4		Stand. dev.	2.3	6.1	3.2	1.8	2.3	5.2	5.6	5.1	4.7	5.8
Teres major	$\phi\psi$	Mean	−	−	−	−	−	−	−	−	−	−	$\phi\psi\chi$	Mean	−	−	−	−	−	−	−	−	−	−
			13.9	26.1	40.4	45.8	27.6	38.0	47.9	57.1	58.6	46.9			32.5	50.2	54.4	44.5	19.7	55.9	67.3	58.4	47.2	41.5
		Stand. dev.	7.4	8.2	9.6	8.5	9.3	5.1	6.1	5.7	6.1	8.4		Stand. dev.	4.0	8.5	7.8	9.2	9.0	7.0	9.1	7.3	6.0	6.2

*The mean moment arm and standard deviation are shown for abduction and flexion angles of 10°, 30°, 60°, 90°, and 120°. ϕ denotes a significant difference in the mean muscle moment arm over the joint range of motion due to reverse total shoulder arthroplasty (reconstructed shoulder), ψ denotes a significant difference in the mean muscle moment arm due to joint angle effects, and χ denotes a significant interaction between joint angle effects and shoulder anatomy.

TABLE E-3 Maximum and Minimum Muscle Moment Arms and the Joint Angles at Which They Occurred in the Anatomical Shoulders and Those with the Reverse Total Shoulder Arthroplasty (Reconstructed Shoulder)*

Muscle/Muscle Subregion		Scapular-Plane Abduction				Coronal-Plane Abduction				Flexion			
		Max. Moment Arm (mm)	Joint Angle (deg)	Min. Moment Arm (mm)	Joint Angle (deg)	Max. Moment Arm (mm)	Joint Angle (deg)	Min. Moment Arm (mm)	Joint Angle (deg)	Max. Moment Arm (mm)	Joint Angle (deg)	Min. Moment Arm (mm)	Joint Angle (deg)
Anterior deltoid	Anatomical	39.3	120	2.1	2.5	30.2	120	2.0	2.5	40.0	120	11.6	2.5
	Reconstructed shoulder	38.6	97.5	7.4	2.5	35.8	90	15.6	2.5	36.0	75	25.9	2.5
Middle deltoid	Anatomical	33.1	120	6.7	2.5	29.1	86.3	8.3	2.5	12.2	120	0	2.5
	Reconstructed shoulder	42.9	82.5	22.5	2.5	46.3	86.3	30.2	2.5	27.0	120	14.2	2.5
Posterior deltoid	Anatomical	−14.9	34	3.0	120	−15.9	5	2.0	120	−33.0	30	−16.3	120
	Reconstructed shoulder	−12.4	2.5	5.2	120	14.1	120	1.3	2.5	−17.6	27.5	−13.1	108.8
Superior pectoralis major	Anatomical	30.2	120	3.1	2.5	11.2	120	−3.0	2.5	53.7	71	9.6	2.5
	Reconstructed shoulder	30.2	90	9.4	2.5	18.4	120	2.6	2.5	45.0	37.5	39.9	2.5
Middle pectoralis major	Anatomical	−12.7	38	−2.9	120	−32.9	41.3	−17.7	120	15.9	45	4.4	2.5
	Reconstructed shoulder	−21.5	22.5	−10.9	120	−37.1	17.5	−20.9	120	−9.8	2.5	−0.7	120
Inferior pectoralis major	Anatomical	−22.2	68	−12.4	120	−33.6	63.8	−16.2	120	−9.3	98	1.9	2.5
	Reconstructed shoulder	−39.2	52.5	−21.6	120	−45.8	41.3	−25.6	120	−24.4	22.5	−19.6	120
Superior latissimus dorsi	Anatomical	−31.5	71	−7.8	10	−29.9	71.3	−4.4	10	−22.1	45	−0.1	120
	Reconstructed shoulder	−50.2	60	−18.9	120	−49.	52.5	−16.6	120	−40.0	27.5	−4.3	120
Middle latissimus dorsi	Anatomical	−21.0	10	−6.4	120	−38.6	63.8	−16.9	10	−7.8	30	−0.7	98
	Reconstructed shoulder	−31.0	25	−11.8	120	−50.0	48.8	−3.7	2.5	−28.3	22.5	−6.6	97.5
Inferior latissimus dorsi	Anatomical	−28.9	10	−9.9	120	−38.1	71.3	−3.3	10	−10.8	53	−2.9	120
	Reconstructed shoulder	−31.9	37.5	−17.2	120	−47.0	63.8	−7.1	2.5	−28.8	30	−11.8	112.5
Superior subscapularis	Anatomical	9.8	2.5	2.2	120	−9.5	93.8	7.2	2.5	35.3	2.5	−5.4	120
	Reconstructed shoulder	9.4	78.8	4.3	2.5	4.6	86.3	−2.3	2.5	−4.0	2.5	−0.9	48.8
Middle subscapularis	Anatomical	−2.4	120	1.8	30	−12.7	94	1.3	2.5	24.2	2.5	−0.6	120

	Reconstructed shoulder	−5.8	2.5	2.2	108.8	−13.7	2.5	−8.1	93.8	−13.5	22.5	−7.1	120
Inferior subscapularis	Anatomical	−9.5	94	−1.5	15	−16.6	90	−2.2	15	10.4	2.5	−3.4	109
	Reconstructed shoulder	−15.7	52.5	−6.7	2.5	−16.7	60	−9.2	120	−28.5	2.5	−12.1	120
Teres major	Anatomical	−47.3	87	−18.6	15	−46.1	82.5	−12.1	10	−54.4	56	−19.7	120
	Reconstructed shoulder	−61.7	78.8	−40.4	2.5	−33.9	2.5	−59.8	78.8	−67.4	27.5	−41.5	120

*Positive values signify either abductor or flexor muscle action; negative values signify adductor or extensor muscle action.