

Additional material for paper “MRI-based anatomical characterisation of lower-limb muscles in older women”

Erica Montefiori, Barbara M. Kalkman, William H. Henson, Margaret A. Paggiosi, Eugene V. McCloskey, Claudia Mazzà

	Subject code	Height [cm]	Weight [kg]	BMI	Age [year]
Subject 1	MC17	164.0	61.4	22.8	70.5
Subject 2	MC18	156.0	75.8	31.1	64.1
Subject 3	MC19	160.5	78.6	30.5	73.0
Subject 4	MC20	158.5	69.4	27.6	67.4
Subject 5	MC22	160.0	66.3	25.9	72.2
Subject 6	MC24	160.5	58.8	22.8	65.3
Subject 7	MC25	163.5	56.8	21.2	74.6
Subject 8	MC26	158.5	64.2	25.6	68.5
Subject 9	MC27	155.0	67.0	27.9	61.8
Subject 10	MC28	154.0	60.0	25.3	83.0
Subject 11	MC29	160.4	78.0	30.3	59.1
Mean		159.2	66.9	26.5	69.0
SD		3.2	7.7	3.4	6.7

Table 1 – Anthropometric data

Inter-operator repeatability of muscle volumes [cm³]

Muscles	Subject 1			Subject 2			Subject 3			Max CoV [%]
	OP1	OP2	OP3	OP1	OP2	OP3	OP1	OP2	OP3	
Adductor brevis	65.5	48.3	55.4	48.2	59.6	56	61.4	79.1	50.3	22.8
Adductor longus	75.9	95.6	108.7	66.8	78.7	71.7	81.1	91.6	77.6	17.7
Adductor magnus	291.2	316.1	294.7	313.3	329.4	352.3	322.2	352.2	346.8	5.9
Biceps femoris short head	51.5	42.2	46.9	87.2	82.7	84.9	61.9	60.5	61.2	9.9
Biceps femoris long head	131.7	143.7	143.2	119.6	135	124.8	110.7	120.8	104	7.6
Gastrocnemius lateralis	96.5	99.5	95.8	59.9	60.3	65	97.8	102.8	99.4	4.6
Gastrocnemius medialis	179	187.7	184.5	139.2	146.5	149.2	147.5	158	160.6	4.5
Gluteus maximus	561.4	617.1	592.2	409.1	447.4	469.9	574.1	559.7	577.3	7
Gluteus medius	236.8	257.8	271.7	208.7	220.1	255.1	256.7	293.9	262.7	10.6
Gluteus minimus	62.1	75.3	67.1	56.9	64.5	75.9	33.6	42.9	37.3	14.5
Gracilis	48.1	52.7	57.3	40.6	40.4	39.3	43.3	52.5	38.2	16.2
Iliacus	109	119.5	123.7	123.4	119.2	138.4	117.1	112.1	125.6	7.9
Peroneus brevis	18.6	20.8	43.3	32.7	29.9	31.8	33.6	42.8	55.4	49.6
Peroneus longus	37.6	42.9	14.3	25.4	24	21.5	39.4	36.4	23.2	48.1
Psoas	97.1	108.6	99.4	70.1	78.7	76.1	51.6	57.6	49.7	7.8
Rectus femoris	103.7	101.1	110.1	123.6	135.7	138.8	132.3	152.2	144.4	7
Sartorius	77.7	90.2	95.1	69	77.2	71.7	96.9	98.5	88.9	10.2
Semimembranosus	165.2	163.8	167	157	167.4	163.1	88.2	108.5	94.5	10.7
Semitendinosus	81.8	92.5	87.9	118.5	130.6	120	109.4	119.5	104.5	6.9
Soleus	346.3	373	369	297.3	345.1	347.9	338.1	341	347.1	8.6
Tensor fasciae latae	33.9	43.2	41.4	28.9	32.5	33.3	41.3	48.5	45.1	12.5
Tibialis anterior	110.6	100.6	116.6	82.2	120.9	138.5	83.1	119.1	88.6	25.3
Tibialis posterior	76.2	70.9	81.4	60.9	72.4	77.4	65.8	81.1	68.4	12
Vastus intermedius	251.6	266.3	272.4	233.9	250.2	233.9	199.6	223.5	225.1	6.6
Vastus lateralis	321.1	326	326.4	286.4	348.2	328.3	303	335.4	339.2	9.8
Vastus medialis	182	195.9	196.2	208.1	206.8	206.5	205.6	207	201.2	4.2

Table 2 – Right-limb muscle volumes segmented by three operators for three randomly selected subjects. Maximum coefficient of variation (CoV) across the three datasets is reported.

Intra-operator repeatability of muscle volumes [cm³]

Muscles	Subject 1			CoV
	REP1	REP2	REP3	
Adductor brevis	54.7	47.7	54.2	7.5
Adductor longus	73.1	81.7	74.6	6.0
Adductor magnus	362.3	342.0	339.8	3.6
Biceps femoris caput breve	54.8	57.4	60.2	4.7
Gastrocnemius lateralis	71.4	79.8	80.0	6.4
Gastrocnemius medialis	114.1	126.1	129.6	6.6
Gluteus maximus	626.2	616.8	641.9	2.0
Gluteus medius	238.5	260.5	262.9	5.3
Gluteus minimus	37.7	58.6	52.0	21.6
Gracilis	45.0	45.6	43.3	2.7
Iliacus	103.5	109.0	105.8	2.6
Peroneus brevis	28.8	33.3	32.4	7.6
Peroneus longus	34.7	32.5	40.1	10.9
Rectus femoris	106.4	114.8	118.9	5.6
Sartorius	91.8	89.1	92.5	2.0
Semimembranosus	80.9	92.3	90.2	6.9
Semitendinosus	115.8	108.1	104.6	5.2
Soleus	279.0	277.4	250.6	5.9
Tensor fasciae latae	49.4	49.9	50.5	1.1
Tibialis anterior	78.7	77.7	84.0	4.2
Tibialis posterior	66.8	72.9	79.8	8.9
Vastus intermedius	165.9	162.4	163.3	1.1
Vastus lateralis	312.2	310.3	317.8	1.2

Table 3 - Right-limb muscle volumes segmented three times by one operator. Coefficient of variation (CoV) across the three repetitions is reported.

Muscle volumes [cm³]

Muscle	Subject 1		Subject 2		Subject 3		Subject 4		Subject 5		Subject 6		Subject 7		Subject 8		Subject 9		Subject 10		Subject 11		Mean	SD	CoV [%]
	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left			
Adductor brevis	61	59	62	50	78	75	47	48	59	53	69	72	58	48	39	42	57	66	54	61	71	67	58.9	10.6	18.1
Adductor longus	70	62	83	84	60	80	72	70	69	76	117	101	66	67	70	73	79	76	92	81	90	88	78.5	13.4	17.1
Adductor magnus	448	449	396	336	379	349	317	318	324	321	370	297	324	313	294	229	336	291	282	322	498	402	345.2	62.7	18.2
Biceps femoris caput breve	52	43	41	37	73	70	31	40	51	68	60	52	81	87	35	40	57	52	69	62	77	58	56.1	15.9	28.3
Biceps femoris caput longum	128	116	123	133	122	134	93	85	78	55	96	104	119	120	90	86	135	132	95	111	140	136	110.5	22.9	20.7
Gastrocnemius lateralis	87	81	85	66	80	56	67	62	48	61	64	68	64	60	86	83	69	96	81	98	97	100	75.4	15.2	20.1
Gastrocnemius medialis	141	146	185	178	176	189	132	160	131	146	134	144	157	139	143	140	188	179	123	148	226	228	160.6	29.3	18.3
Gluteus maximus	606	583	786	736	654	607	474	434	646	587	469	454	406	409	515	441	618	561	593	574	777	750	576.4	117.8	20.4
Gluteus medius	251	198	257	257	284	297	196	201	237	188	233	268	197	209	183	166	251	237	285	257	419	346	246.2	58.2	23.6
Gracilis	36	37	76	58	43	55	17	32	45	28	54	53	48	41	34	27	48	48	38	43	68	68	45.2	14.4	31.8
Iliacus	82	95	127	130	107	109	101	106	110	105	111	102	127	123	105	95	118	109	124	117	165	136	113.8	17.3	15.2
Peroneus brevis	40	30	41	36	42	36	34	57	29	28	33	42	39	33	34	24	25	19	41	34	39	34	34.8	8.0	22.8
Rectus femoris	115	116	69	128	112	115	94	103	113	101	151	158	127	124	141	118	113	104	125	132	157	131	120.3	20.8	17.3
Sartorius	60	52	93	76	105	72	64	54	85	79	91	82	63	69	51	51	86	78	102	97	166	152	83.0	29.6	35.7
Semimembranosus	122	124	151	149	126	149	104	116	98	86	108	115	154	157	107	104	154	165	99	88	125	123	123.9	24.0	19.4
Semitendinosus	72	87	142	155	93	82	95	103	102	84	140	126	101	118	63	57	89	82	89	109	137	129	102.5	26.7	26.0
Soleus	306	286	401	369	406	376	323	368	258	277	286	291	305	297	267	264	360	346	328	338	503	516	339.6	70.2	20.7
Tensor fasciae latae	46	34	53	52	50	52	17	22	34	32	33	32	36	29	58	69	36	34	58	41	46	52	41.6	12.8	30.7
Tibialis anterior	83	100	104	96	94	102	79	88	89	85	78	76	74	82	111	100	110	111	89	83	136	114	94.7	15.3	16.1
Tibialis posterior	66	72	87	81	91	84	89	84	58	57	73	76	56	61	87	78	68	76	73	66	109	111	77.4	14.9	19.2
Vastus intermedius	222	237	353	342	295	305	256	258	258	264	283	243	277	234	256	251	272	252	230	200	329	255	266.9	38.5	14.4
Vastus lateralis	304	294	393	365	352	309	293	286	245	257	307	296	327	286	260	228	350	321	328	303	499	394	317.9	59.2	18.6
Vastus medialis	167	172	208	183	268	243	224	260	203	232	241	223	226	208	220	187	209	182	178	206	267	198	213.8	29.7	13.9

Table 4 – Right and left volume of the muscles segmented in the lower limbs of the eleven subjects enrolled in the study Mean, standard deviation (SD) and coefficient of variation (CoV) are reported .

Muscle length [mm]

Muscle	Subject 1		Subject 2		Subject 3		Subject 4		Subject 5		Subject 6		Subject 7		Subject 8		Subject 9		Subject 10		Subject 11		Mean	SD	CoV [%]
	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left			
Adductor brevis	202	218	183	171	228	177	235	245	182	183	196	203	200	204	215	226	192	178	220	258	221	243	208.2	24.6	11.8
Adductor longus	234	237	246	234	263	267	295	291	272	297	280	266	237	260	283	268	236	212	286	263	232	269	260.2	23.7	9.1
Adductor magnus	363	356	372	377	373	390	365	374	342	357	361	313	364	359	322	307	297	279	304	296	389	396	347.9	34.7	10.0
Biceps femoris caput breve	208	202	227	224	253	258	240	258	230	242	281	281	242	254	207	217	227	223	234	221	210	220	234.4	22.4	9.5
Biceps femoris caput longum	291	298	280	275	302	324	257	261	250	254	273	259	293	283	282	261	292	283	227	262	298	296	277.4	21.9	7.9
Gastrocnemius lateralis	255	259	206	211	286	247	202	202	191	211	214	208	194	185	239	266	253	266	225	261	265	263	232.2	30.6	13.2
Gastrocnemius medialis	279	273	268	266	321	325	255	262	263	280	264	265	269	256	289	269	307	292	250	298	330	327	282.2	25.3	9.0
Gluteus maximus	373	345	364	354	342	343	309	282	328	346	354	331	303	315	356	334	363	354	345	339	353	349	340.1	21.7	6.4
Gluteus medius	280	255	278	267	271	275	281	264	278	254	279	275	286	283	280	256	285	274	294	269	290	272	274.8	10.8	3.9
Gracilis	341	343	340	356	360	358	388	399	365	372	379	380	343	312	377	370	332	337	322	357	342	333	354.9	22.3	6.3
Iliacus	324	313	333	336	336	349	329	345	365	346	325	316	348	340	320	309	320	318	344	338	342	341	333.5	14.2	4.3
Peroneus brevis	230	242	231	228	246	256	296	346	260	236	294	300	275	258	253	233	226	221	264	225	223	238	253.8	31.7	12.5
Rectus femoris	351	323	314	318	319	304	335	340	354	331	318	318	320	326	349	331	308	307	314	306	325	318	324.1	14.4	4.4
Sartorius	595	586	576	581	591	592	617	626	609	595	590	593	610	593	562	566	589	594	585	590	572	585	590.7	15.2	2.6
Semimembranosus	302	317	269	273	318	309	287	278	217	232	328	323	297	285	251	283	294	301	257	276	282	289	285.0	28.2	9.9
Semitendinosus	321	330	305	332	322	330	342	322	310	325	367	371	362	351	342	365	292	285	292	289	316	283	325.1	27.4	8.4
Soleus	374	373	395	374	392	389	353	368	316	318	382	380	375	354	362	336	366	357	352	379	365	349	364.0	21.2	5.8
Tensor fasciae latae	183	170	182	196	217	217	173	166	203	202	206	183	163	170	208	212	177	183	182	194	197	188	189.6	16.5	8.7
Tibialis anterior	311	320	338	273	298	317	322	330	374	350	330	318	301	299	341	352	364	327	284	286	314	351	322.8	26.4	8.2
Tibialis posterior	296	326	328	327	348	322	321	335	328	302	326	331	309	277	315	269	276	285	288	308	314	282	309.7	22.2	7.2
Vastus intermedius	409	380	400	373	445	368	348	390	418	424	422	409	413	419	399	392	397	379	402	394	359	364	395.8	24.1	6.1
Vastus lateralis	425	387	417	406	368	343	437	356	462	374	414	368	392	389	417	368	393	376	426	402	432	391	397.5	29.4	7.4
Vastus medialis	336	367	316	312	377	349	374	384	319	374	389	389	403	389	381	372	388	344	335	376	362	334	362.2	27.1	7.5

Table 5 – Right and left length of the muscles segmented in the lower limbs of the eleven subjects enrolled in the study Mean, standard deviation (SD) and coefficient of variation (CoV) are reported .

Muscle PCSA [cm²]

	This study																						Charles et al			Ward et al	Handsfield et al	
	Sbj1		Sbj2		Sbj3		Sbj4		Sbj5		Sbj6		Sbj7		Sbj8		Sbj9		Sbj10		Sbj11		Smp 1	Smp 2	Smp 3	Mean	Mean	SD
	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L						
Adductor brevis	4.5	3.9	5.0	4.3	5.0	6.2	2.9	2.9	4.7	4.2	5.2	5.2	4.3	3.5	2.6	2.7	4.4	5.4	3.6	3.5	4.7	4.0	5.1	3.4	4.9	5.0	9.7	1.9
Adductor longus	5.9	5.3	6.8	7.2	4.5	6.0	4.9	4.8	5.1	5.1	8.4	7.6	5.6	5.1	4.9	5.4	6.7	7.2	6.4	6.2	7.7	6.6	6.7	6.2	6.5	6.6	15.4	3.6
Adductor magnus	31.6	32.4	27.3	22.9	26.1	22.9	22.3	21.8	24.3	23.0	26.3	24.3	22.8	22.4	23.4	19.1	29.0	26.8	23.8	27.9	32.9	26.1	26.8	50.1	31.0	21.3	45.5	8.5
Biceps femoris long head	15.7	13.9	15.7	17.3	14.4	14.8	12.9	11.6	11.2	11.6	12.6	14.3	14.5	15.1	11.4	11.8	16.6	16.6	15.0	15.1	16.8	16.4	13.1	12.3	16.3	11.5	25.9	4.9
Biceps femoris short head	5.1	4.3	3.7	3.4	5.9	5.5	2.7	3.1	4.5	5.8	4.4	3.8	6.8	7.0	3.4	3.7	5.1	4.7	6.0	5.7	7.5	5.4	4.1	10.7	11.1	5.2	7.8	1.8
Gastrocnemius lateralis	12.6	11.5	15.3	11.6	10.4	8.4	12.4	11.3	9.3	10.7	11.0	12.0	12.1	12.0	13.4	11.6	10.1	13.5	13.4	13.9	13.5	14.1	13.1	11.8	12.0	9.9	23.0	6.0
Gastrocnemius medialis	26.6	28.3	36.3	35.2	28.8	30.6	27.2	32.0	26.3	27.3	26.8	28.6	30.7	28.6	26.1	27.3	32.3	32.2	25.8	26.1	35.9	36.6	-	-	-	21.4	50.1	10.0
Gluteus maximus	26.2	27.3	34.8	33.6	30.8	28.5	24.7	24.8	31.8	27.3	21.4	22.1	21.6	20.9	23.3	21.3	27.4	25.6	27.8	27.3	35.5	34.7	-	-	-	36.0	46.8	8.7
Gluteus medius	24.2	21.0	25.0	26.0	28.4	29.2	18.8	20.5	23.1	20.0	22.6	26.3	18.6	19.9	17.7	17.5	23.8	23.3	26.2	25.8	39.1	34.4	17.8	17.9	20.3	36.1	45.6	10.2
Gracilis	1.3	1.4	2.8	2.1	1.5	1.9	0.6	1.0	1.5	1.0	1.8	1.8	1.8	1.6	1.1	0.9	1.8	1.8	1.5	1.5	2.5	2.6	5.3	5.8	3.6	2.2	4.7	1.0
Iliacus	4.5	5.4	6.8	6.9	5.7	5.6	5.5	5.5	5.4	5.4	6.1	5.8	6.5	6.5	5.8	5.5	6.6	6.1	6.4	6.2	8.6	7.1	-	-	-	10.2	12.4	2.5
Peroneus brevis	9.2	6.5	9.4	8.2	8.9	7.5	6.0	8.7	5.9	6.1	5.9	7.3	7.4	6.7	7.0	5.4	5.7	4.4	8.1	7.8	9.1	7.6	-	-	-	5.0	-	-
Rectus femoris	15.6	17.1	10.4	19.2	16.7	18.1	13.3	14.4	15.3	14.6	22.6	23.6	19.0	18.0	19.3	16.9	17.5	16.1	19.0	20.6	23.0	19.6	22.7	22.0	26.1	13.9	34.8	7.4
Sartorius	1.1	1.0	1.8	1.5	2.0	1.4	1.2	1.0	1.5	1.5	1.7	1.5	1.1	1.3	1.0	1.0	1.6	1.5	1.9	1.8	3.2	2.9	3.2	3.0	3.2	1.9	3.4	0.8
Semimembranosus	16.8	16.4	23.4	22.7	16.6	20.1	15.0	17.4	18.8	15.5	13.7	14.9	21.6	23.0	17.8	15.3	21.9	22.9	16.0	13.3	18.5	17.7	8.5	28.6	21.2	19.1	37.8	9.1
Semitendinosus	3.4	4.1	7.2	7.2	4.4	3.8	4.3	4.9	5.1	4.0	5.9	5.2	4.3	5.2	2.8	2.4	4.7	4.4	4.7	5.8	6.7	7.0	12.8	15.7	15.4	4.9	9.3	2.3
Soleus	74.4	69.7	92.3	89.6	94.1	88.0	83.2	90.8	74.1	79.2	68.0	69.6	73.9	76.3	67.0	71.5	89.4	88.3	84.7	81.2	125.1	134.5	80.3	45.8	85.2	58.8	124.1	24.9
Tensor fasciae latae	2.5	2.0	2.9	2.7	2.3	2.4	1.0	1.3	1.7	1.6	1.6	1.8	2.2	1.7	2.8	3.2	2.0	1.9	3.2	2.1	2.3	2.8	-	-	-	2.5	4.0	1.3
Tibialis anterior	9.9	11.5	11.3	13.1	11.7	11.9	9.1	9.9	8.8	9.0	8.8	8.8	9.2	10.2	12.0	10.5	11.2	12.5	11.6	10.8	16.0	12.0	19.8	11.3	17.0	11.1	15.8	2.9
Tibialis posterior	18.5	18.5	22.2	20.6	21.7	21.8	23.1	20.9	14.7	15.8	18.7	19.1	15.2	18.3	22.9	24.1	20.7	22.3	21.0	17.8	29.0	32.9	-	-	-	14.8	28.4	4.7
Vastus intermedius	22.6	26.0	36.7	38.2	27.6	34.6	30.7	27.6	25.7	25.9	28.0	24.8	27.9	23.2	26.7	26.7	28.6	27.7	23.8	21.1	38.2	29.2	14.2	31.7	38.8	16.8	39.0	8.0
Vastus lateralis	18.8	20.0	24.8	23.7	25.1	23.7	17.6	21.2	14.0	18.1	19.5	21.1	21.9	19.4	16.4	16.3	23.4	22.5	20.3	19.8	30.4	26.5	18.6	28.2	61.9	37.0	59.3	12.1
Vastus medialis	22.6	21.3	29.9	26.7	32.3	31.6	27.2	30.7	28.9	28.3	28.2	26.0	25.5	24.3	26.2	22.9	24.5	24.1	24.2	24.9	33.5	27.0	23.6	35.0	25.9	23.7	59.1	11.4

Table 6 –Physiological cross-sectional areas (PCSAs) measured for the eleven subjects enrolled in our study (for right and left muscles) and three cadavers included in Charles et al., 2019. Mean and mean and SD PCSA are reported for Ward et al. 2009 and Handsfield et al. 2014, respectively.

References

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