Heterogeneity, Longitudinal Decline, and Metabolic Risk in MRI-Based Quantification of 20 Individual Hip and Thigh Muscles

Brandon Whitcher[1,†], Hamzah Raza[2,†], Nicolas Basty[1], Marjola Thanaj[1], Camilo Bell-Bradford[1], Marili Niglas[1], Jimmy D. Bell[1], E. Louise Thomas[1,*,‡], and Dimitri Amiras[2,‡]

[1]Research Centre for Optimal Health, School of Life Sciences, University of Westminster, London, United Kingdom
[2]Imaging Department, Imperial College Healthcare NHS Trust, London, United Kingdom
[*]l.thomas3@westminster.ac.uk
[†]these authors contributed equally to this work
[‡]these authors contributed equally to this work

ABSTRACT

Supplementary Information

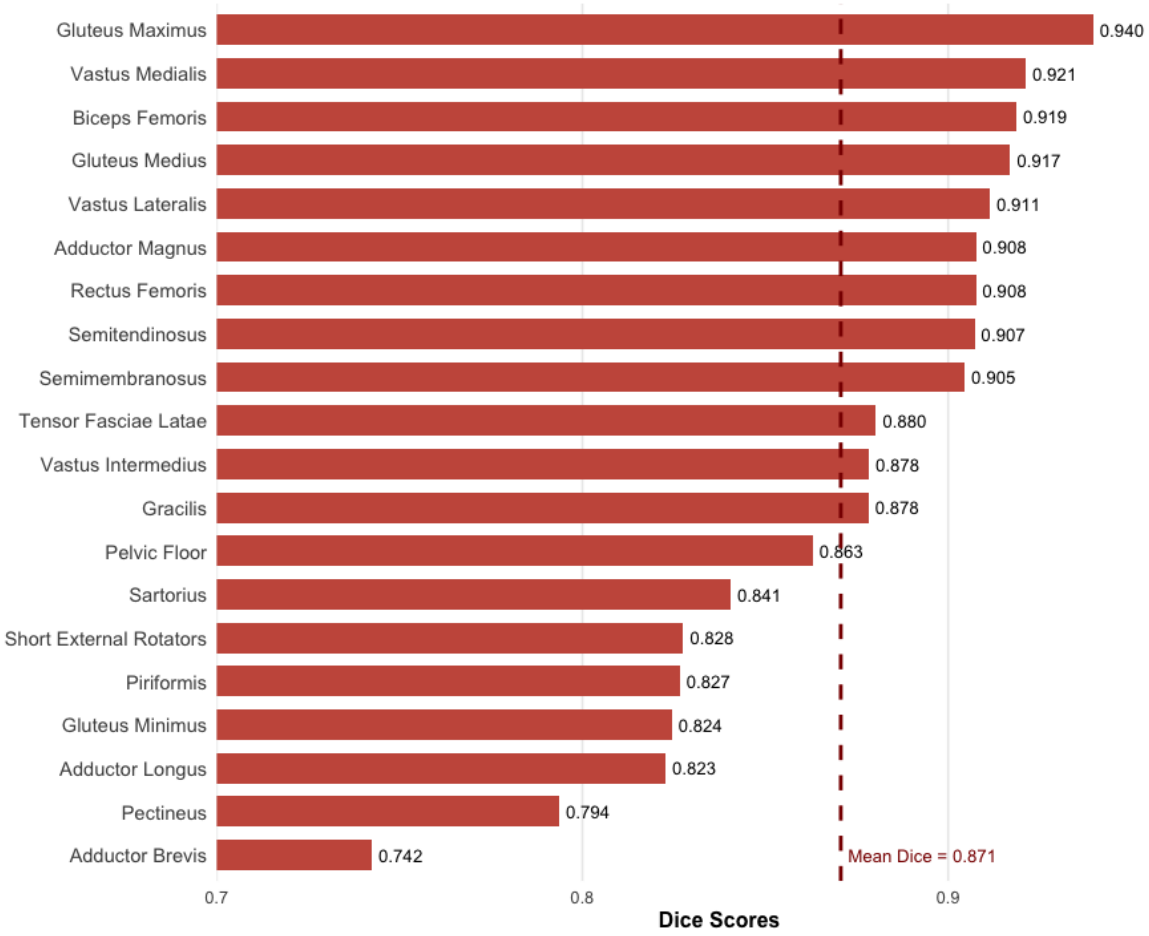


Figure S1. Average Dice scores for the segmentation model on 20 bilateral muscle groups in the hips and thighs.

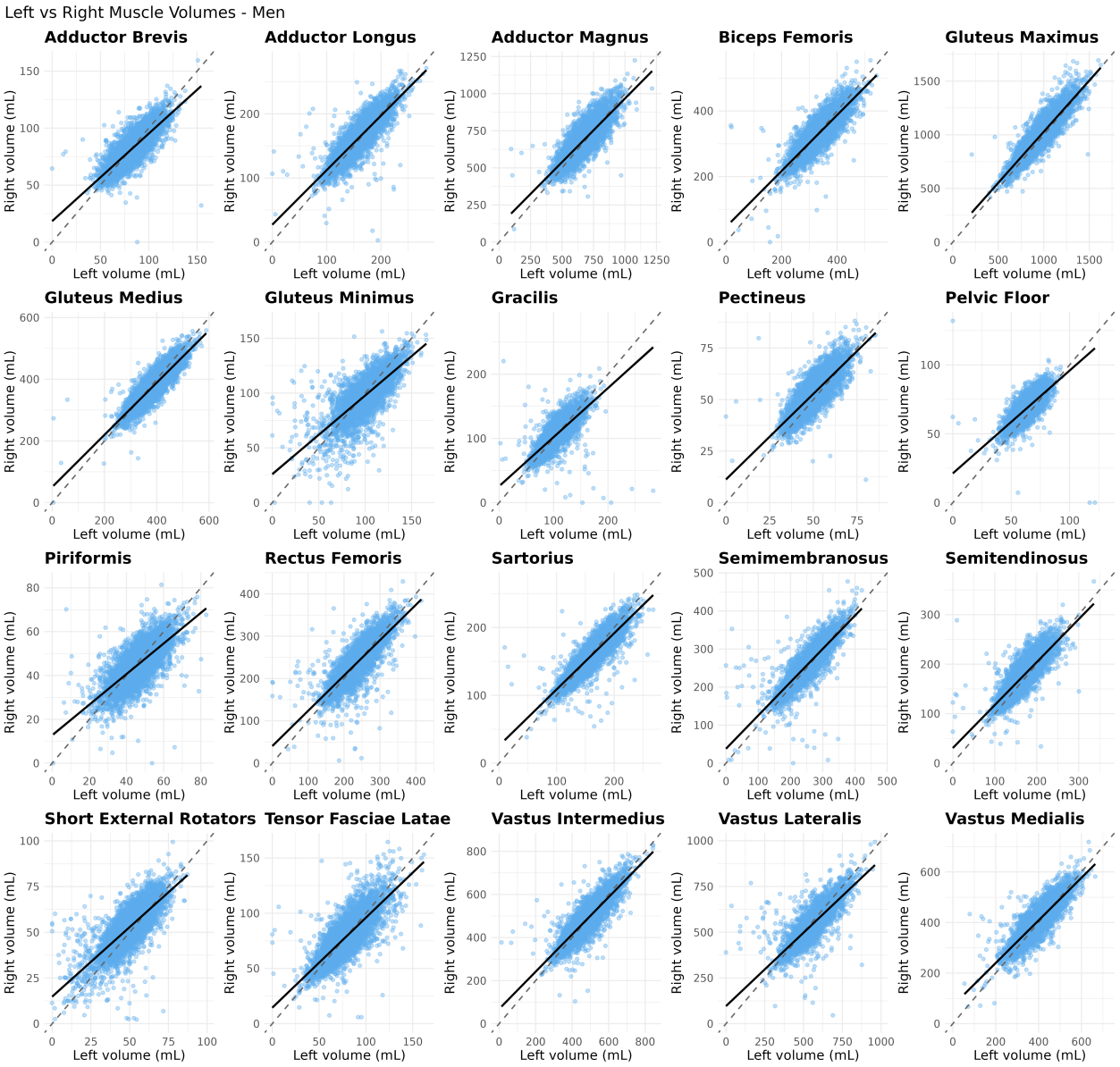


Figure S2. Comparison of left and right leg muscle volumes in male participants. Muscle volume in the left leg is plotted on the x-axis and the right leg on the y-axis. The dotted line is the 45° line, denoting equality between the measurements, and the solid line is the linear regression between the measurements.

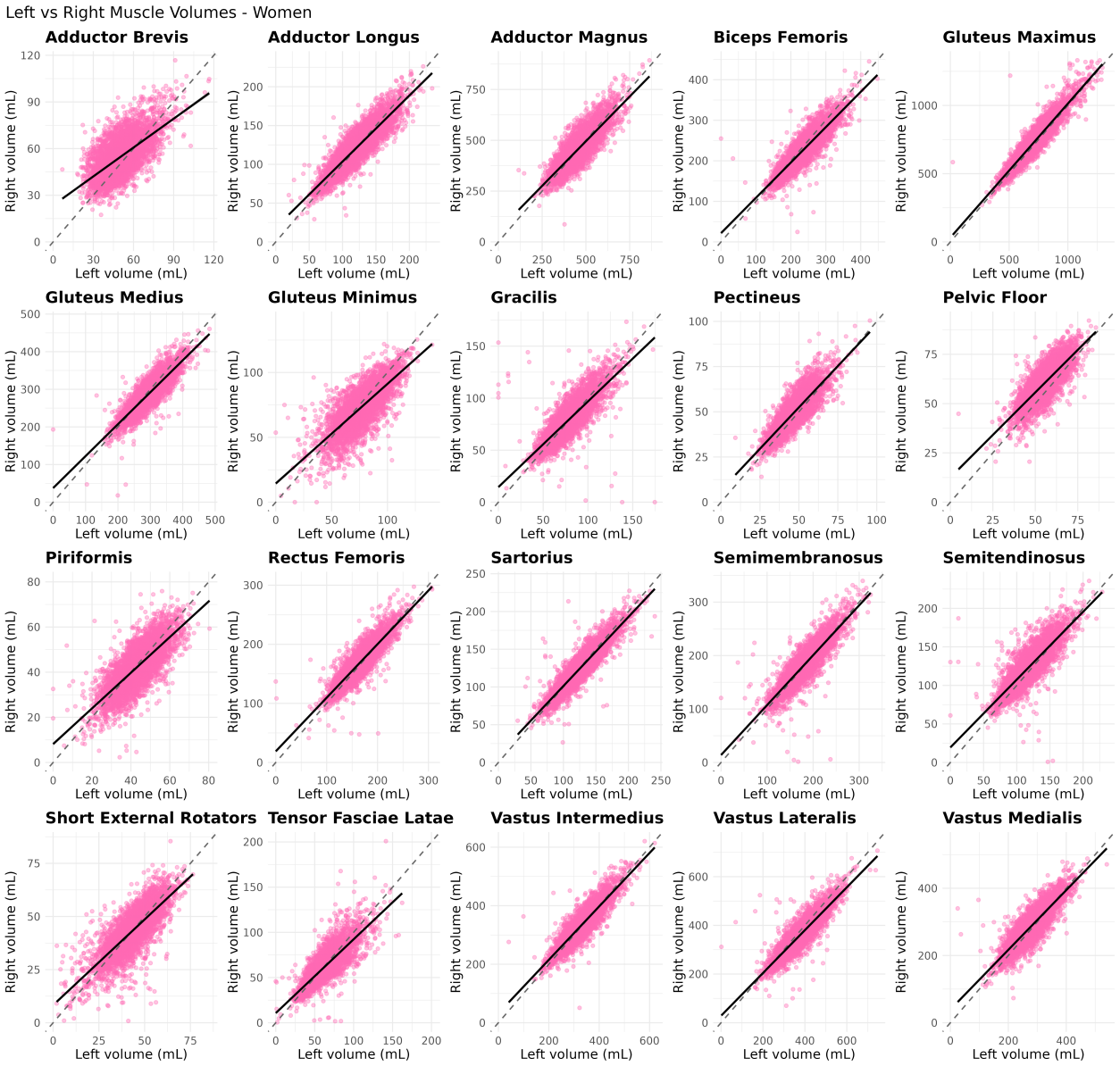


Figure S3. Comparison of left and right leg muscle volumes in female participants. Muscle volume in the left leg is plotted on the x-axis and the right leg on the y-axis. The dotted line is the 45° line, denoting equality between the measurements, and the solid line is the linear regression between the measurements.

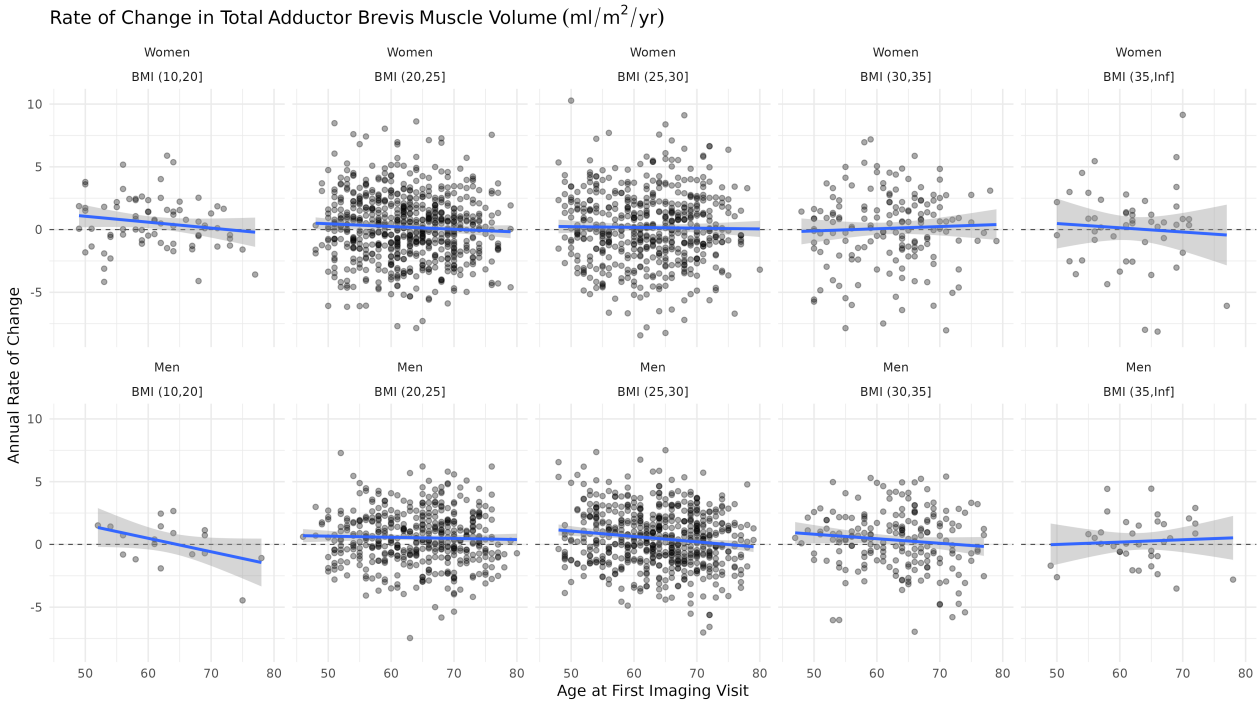


Figure S4. Annual rate of change in the adductor brevis muscle from the longitudinal cohort, separated by sex and BMI groups.

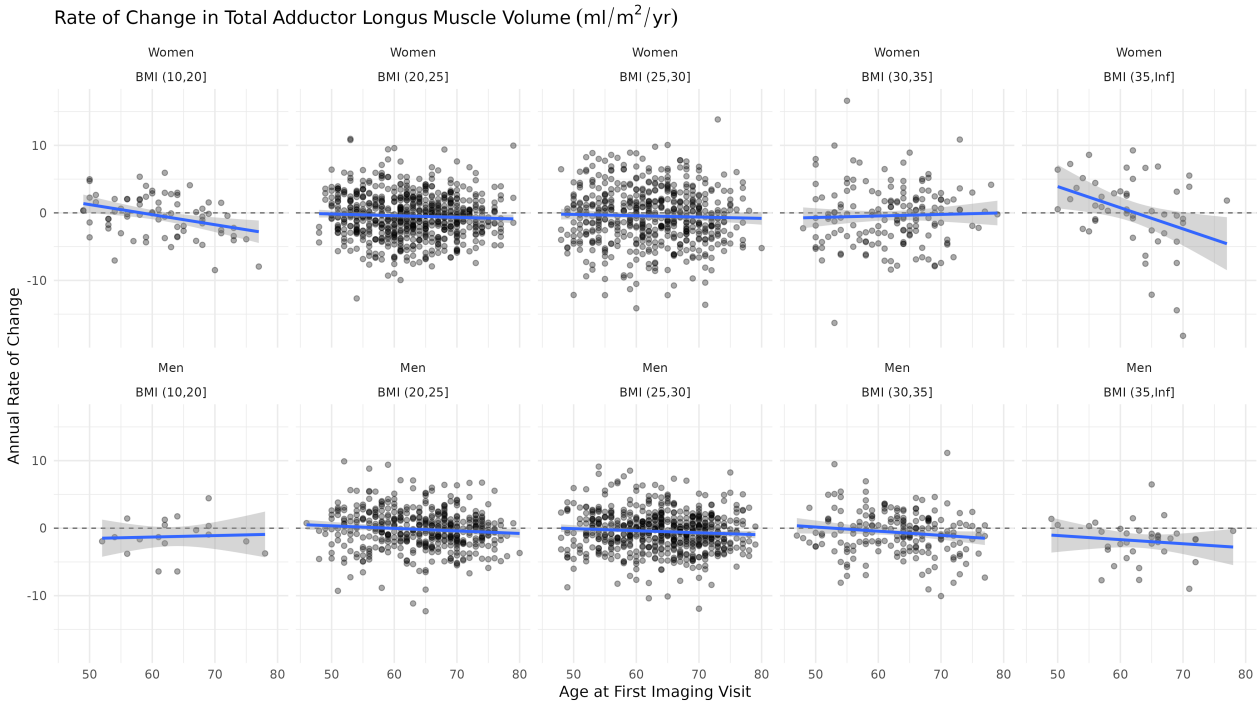


Figure S5. Annual rate of change in the adductor longus muscle from the longitudinal cohort, separated by sex and BMI groups.

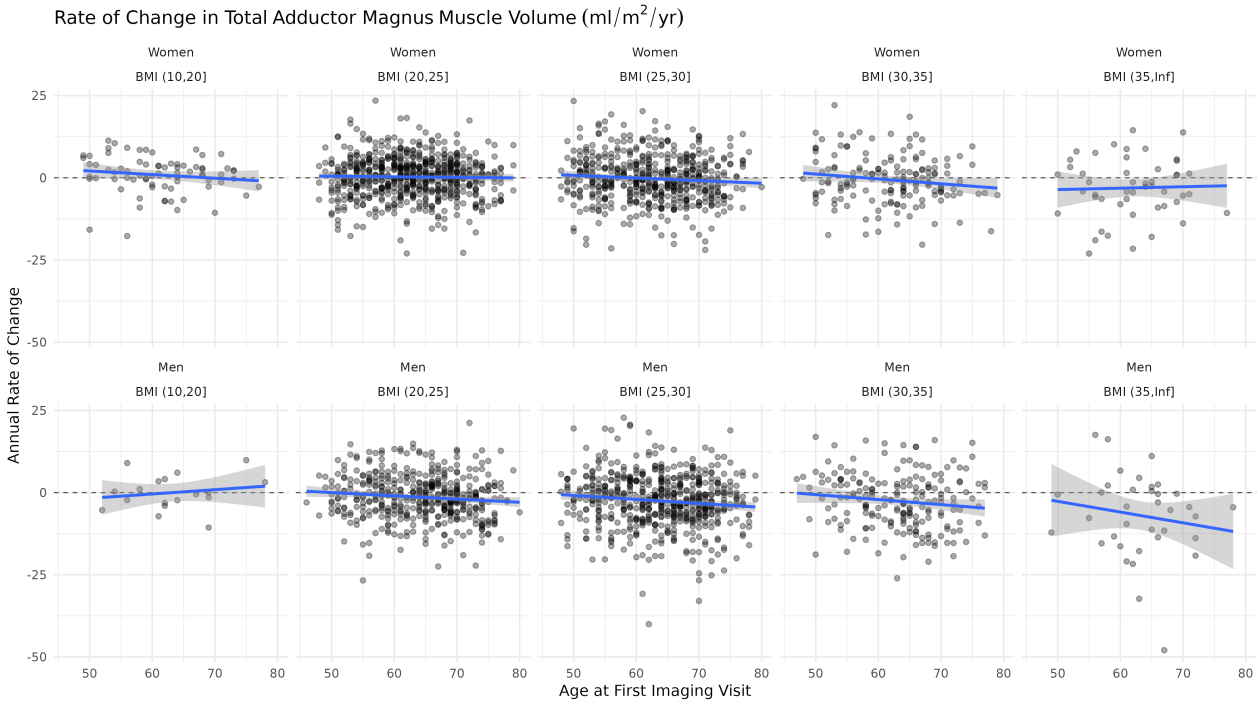


Figure S6. Annual rate of change in the adductor magnus muscle from the longitudinal cohort, separated by sex and BMI groups.

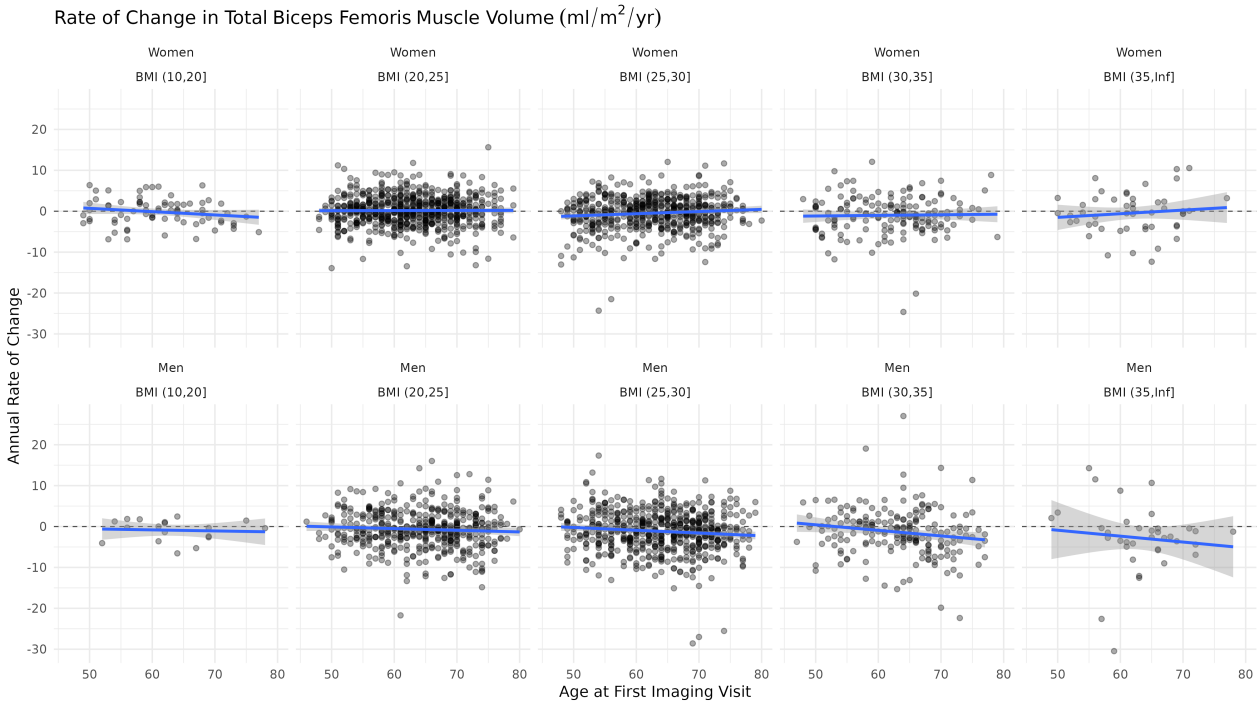


Figure S7. Annual rate of change in the biceps femoris muscle from the longitudinal cohort, separated by sex and BMI groups.

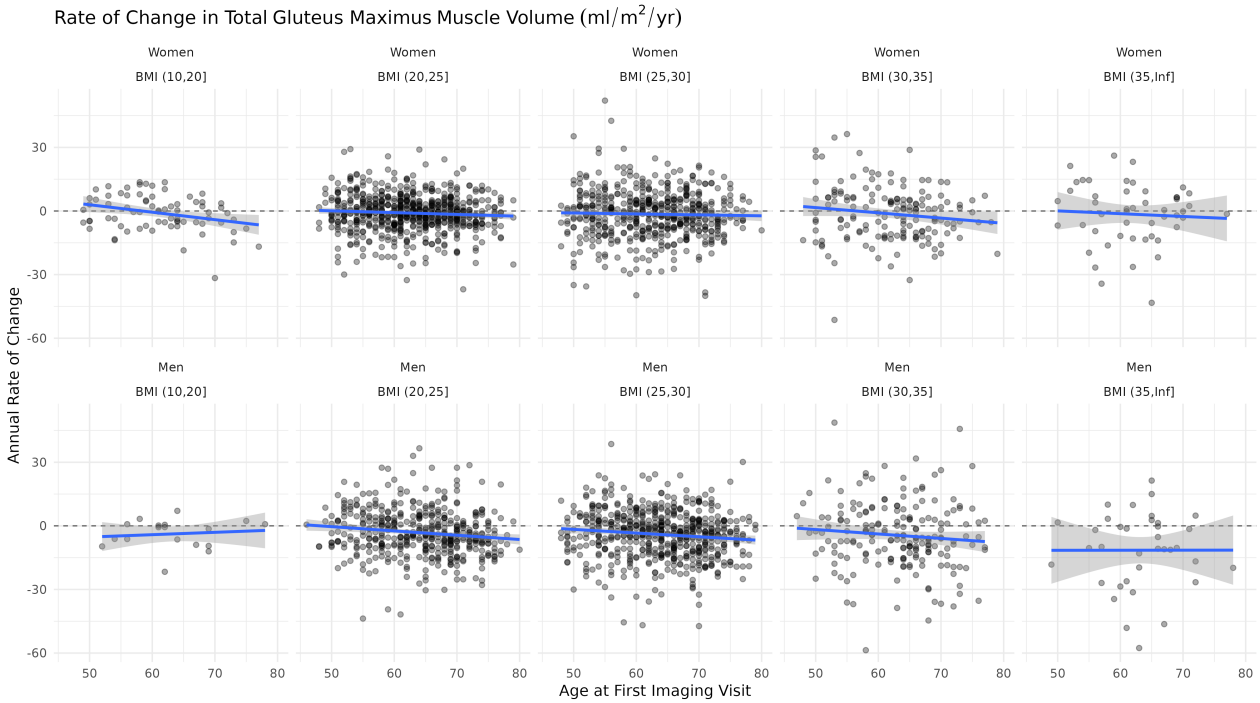


Figure S8. Annual rate of change in the gluteus maximus muscle from the longitudinal cohort, separated by sex and BMI groups.

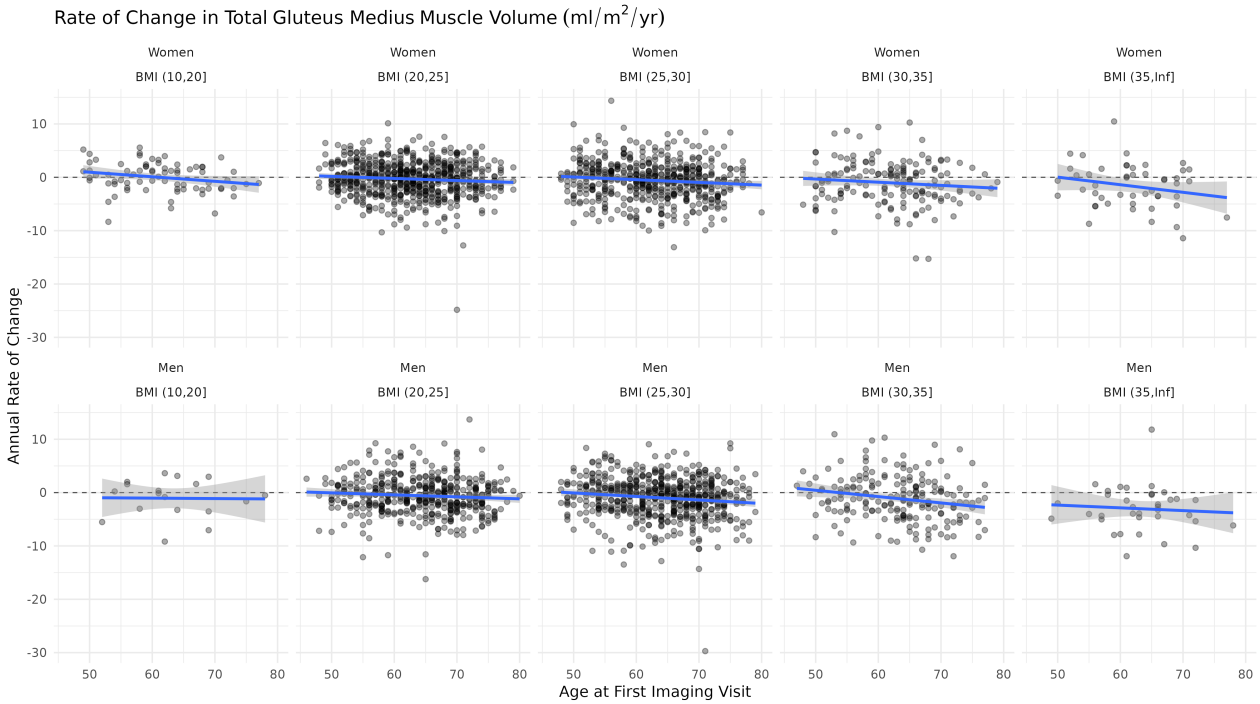


Figure S9. Annual rate of change in the gluteus medius muscle from the longitudinal cohort, separated by sex and BMI groups.

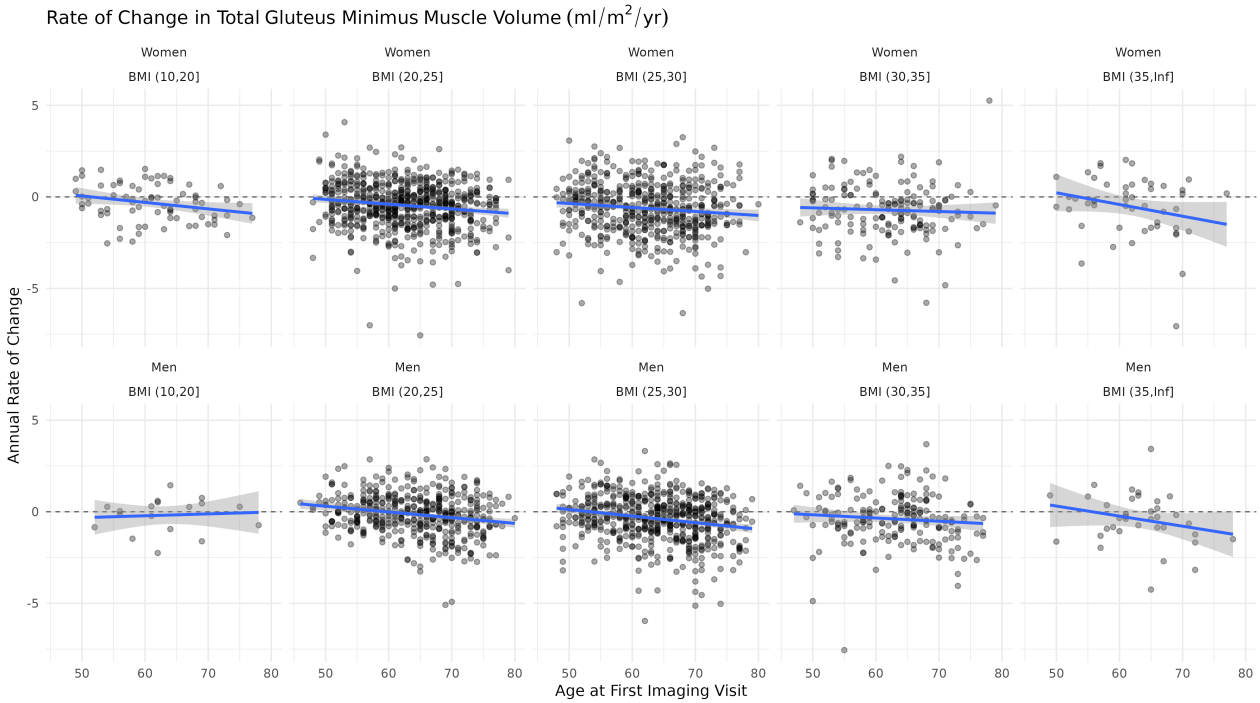


Figure S10. Annual rate of change in the gluteus minimus muscle from the longitudinal cohort, separated by sex and BMI groups.

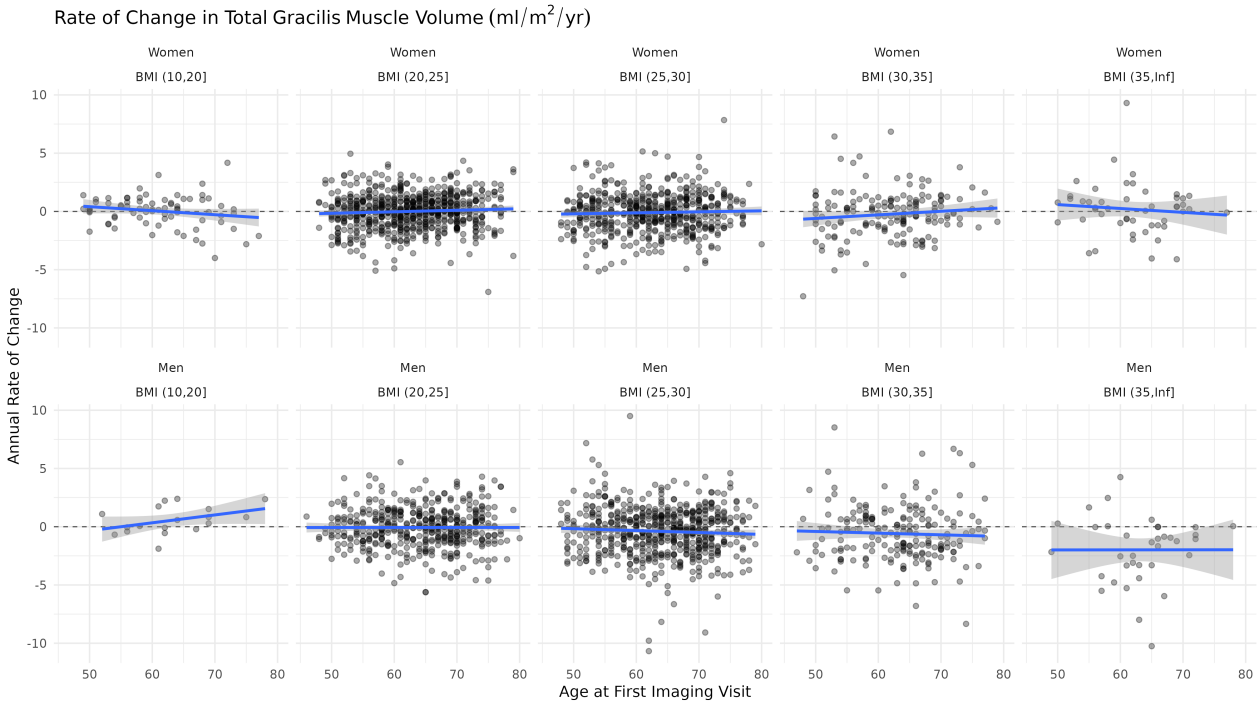


Figure S11. Annual rate of change in the gracilis muscle from the longitudinal cohort, separated by sex and BMI groups.



Figure S12. Annual rate of change in the pectineus muscle from the longitudinal cohort, separated by sex and BMI groups.

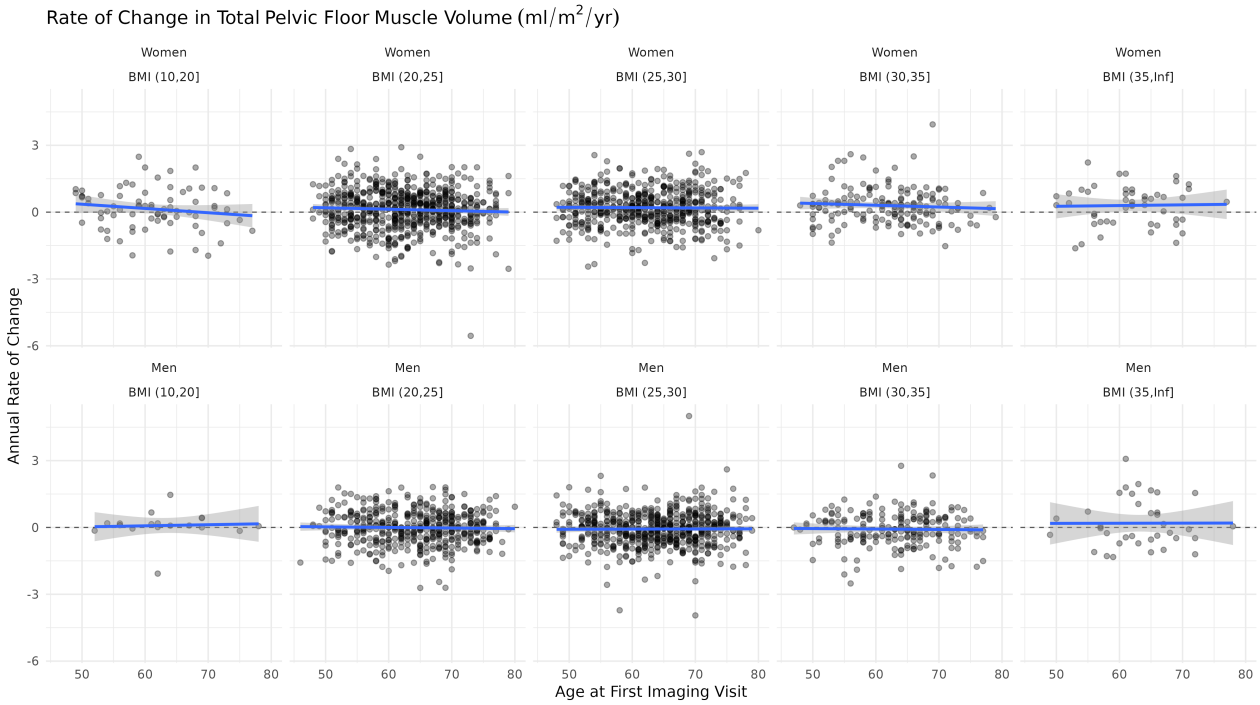


Figure S13. Annual rate of change in the pelvic floor muscle from the longitudinal cohort, separated by sex and BMI groups.

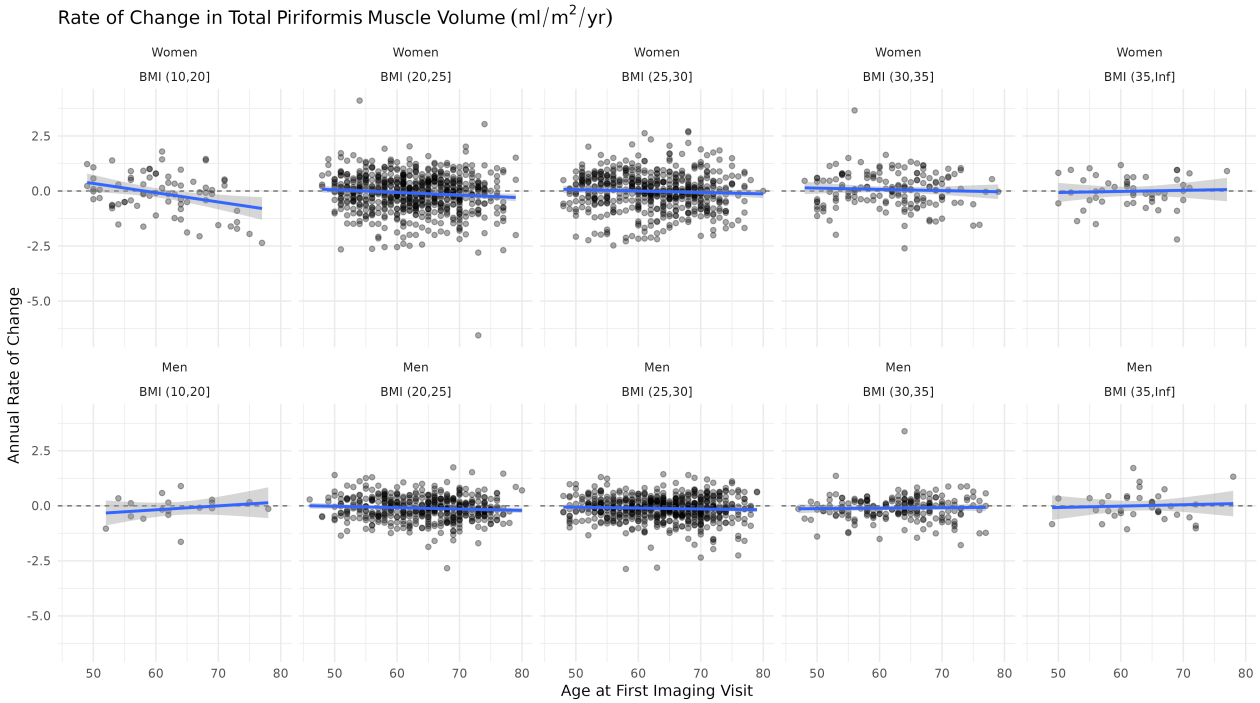


Figure S14. Annual rate of change in the piriformis muscle from the longitudinal cohort, separated by sex and BMI groups.

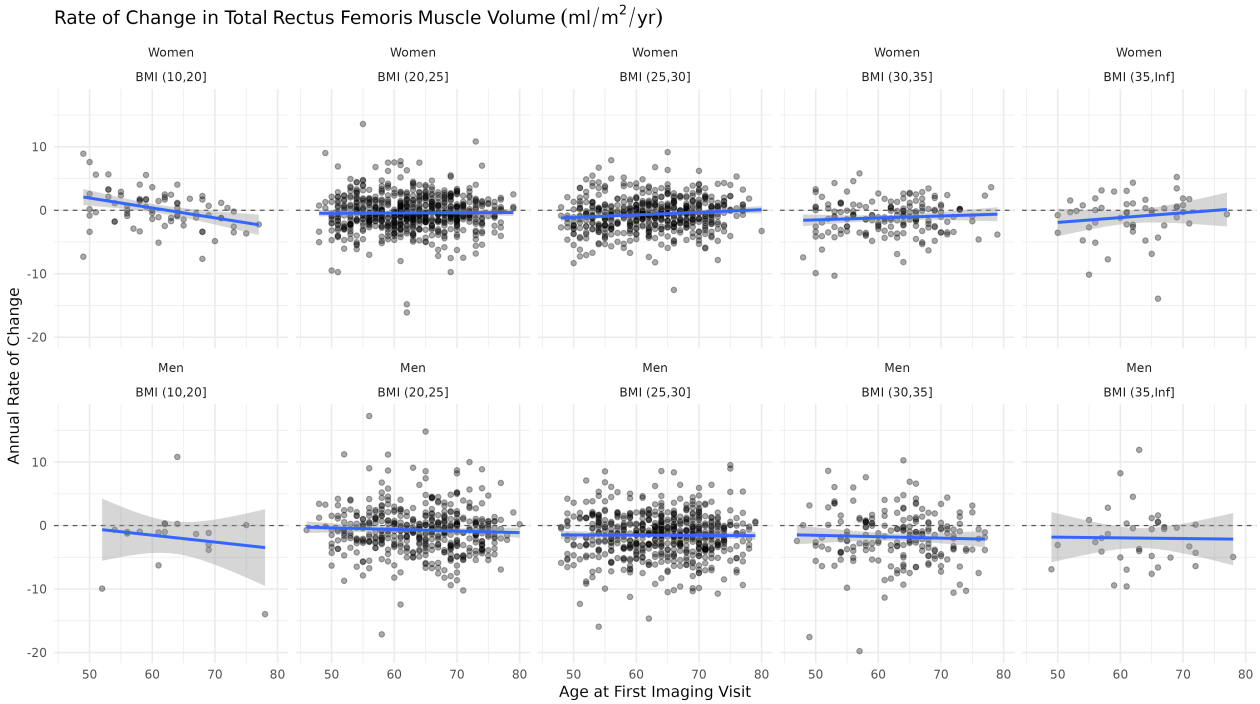


Figure S15. Annual rate of change in the rectur femoris muscle from the longitudinal cohort, separated by sex and BMI groups.

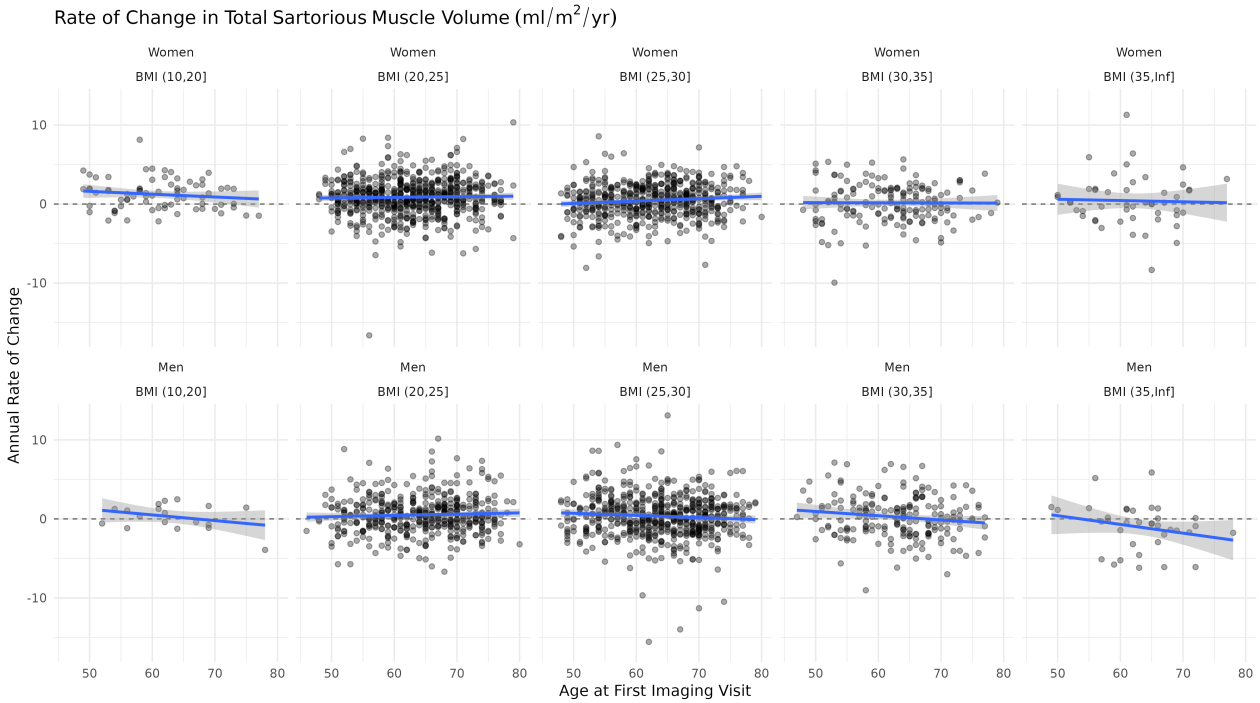


Figure S16. Annual rate of change in the sartorius muscle from the longitudinal cohort, separated by sex and BMI groups.

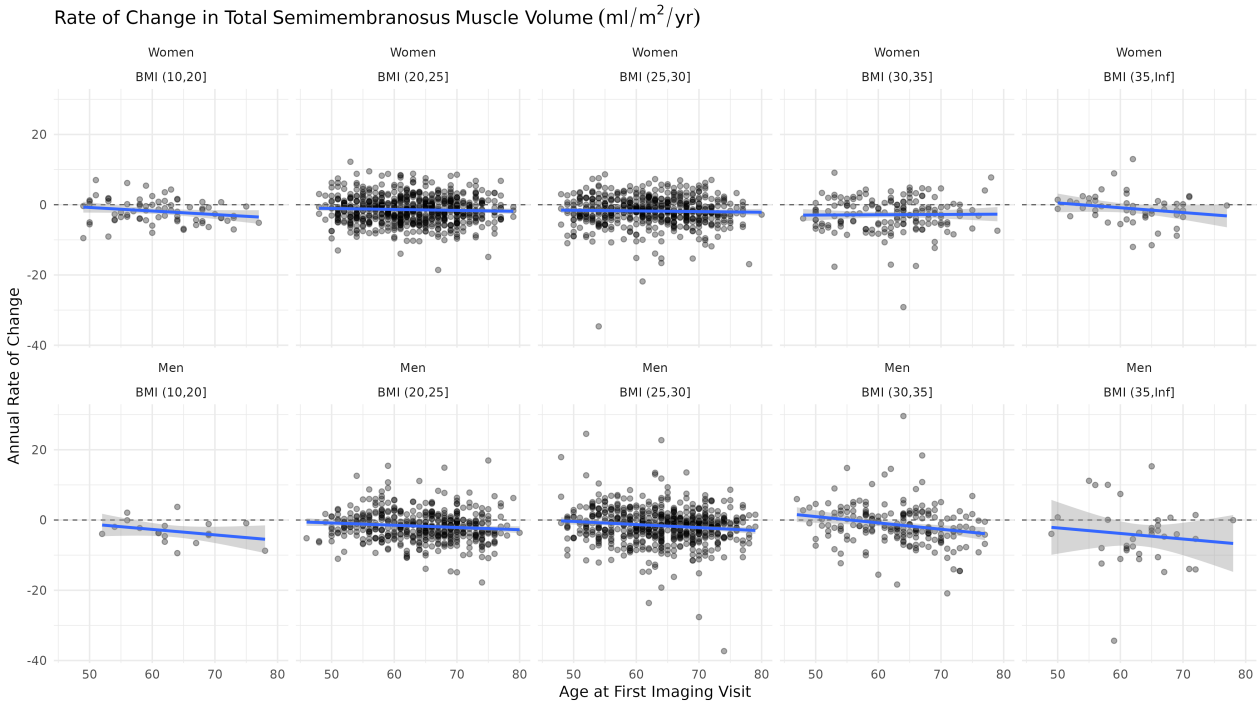


Figure S17. Annual rate of change in the semimembranosus muscle from the longitudinal cohort, separated by sex and BMI groups.

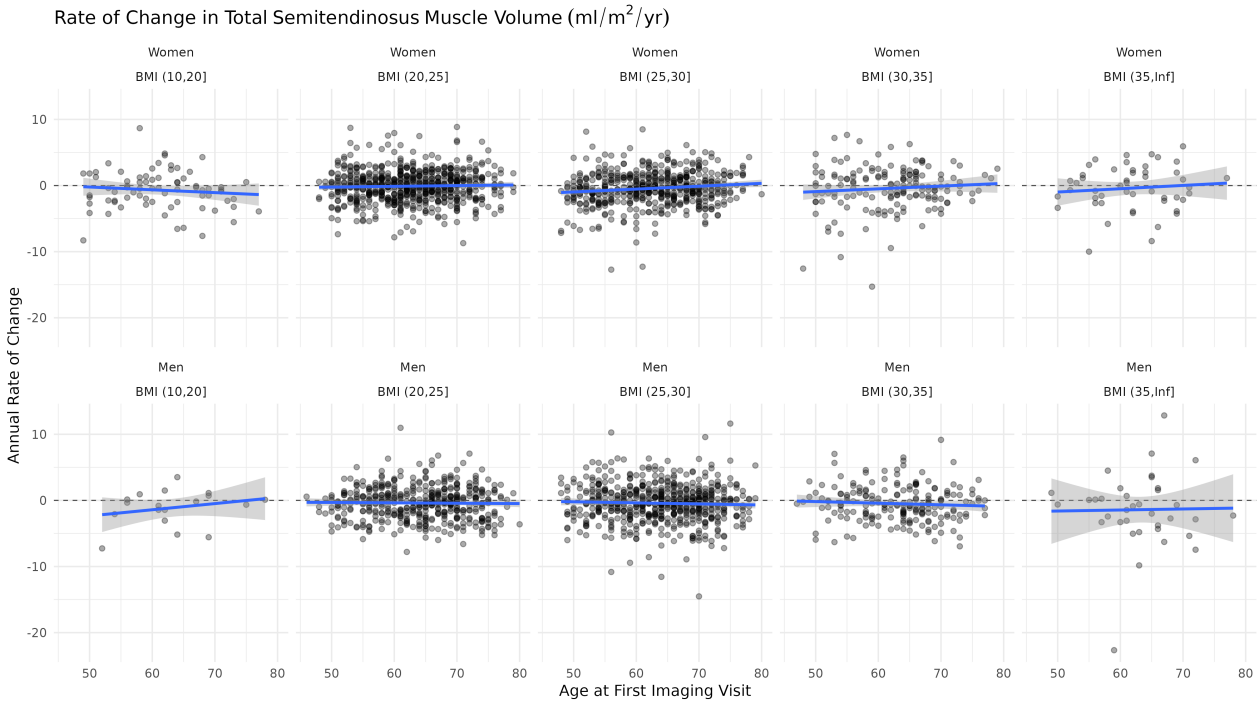


Figure S18. Annual rate of change in the semitendinosus muscle from the longitudinal cohort, separated by sex and BMI groups.

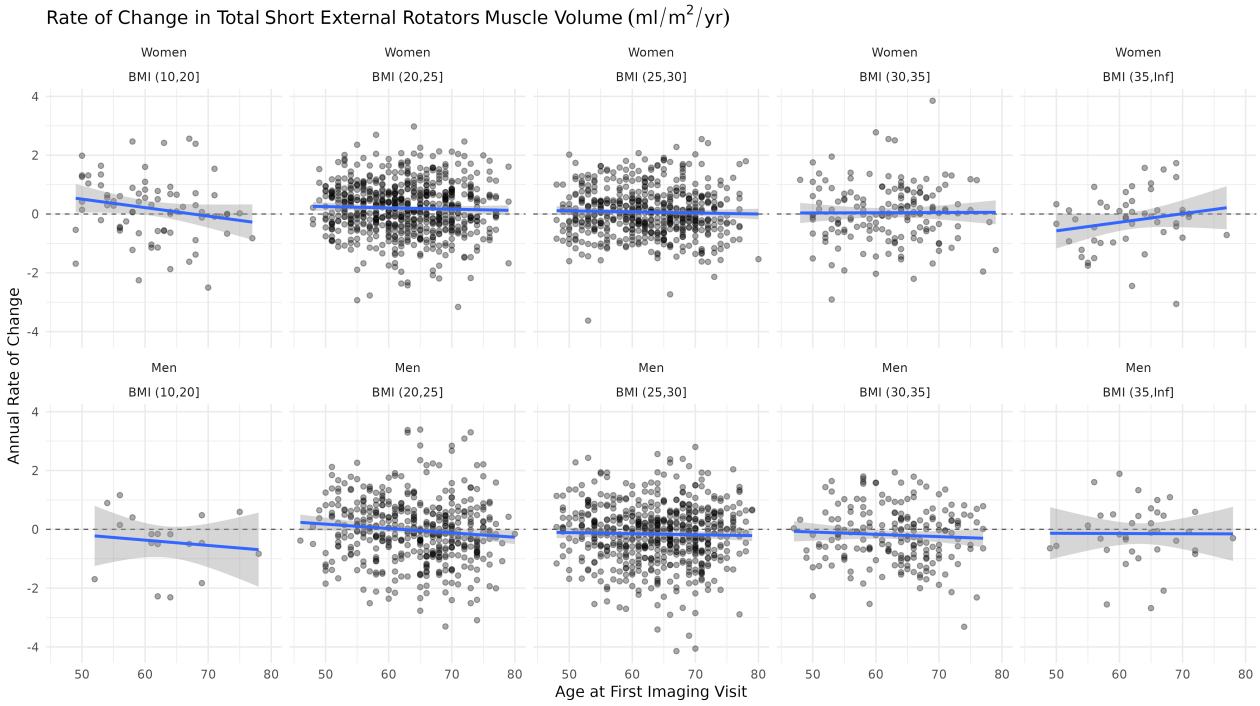


Figure S19. Annual rate of change in the short external rotator muscle from the longitudinal cohort, separated by sex and BMI groups.

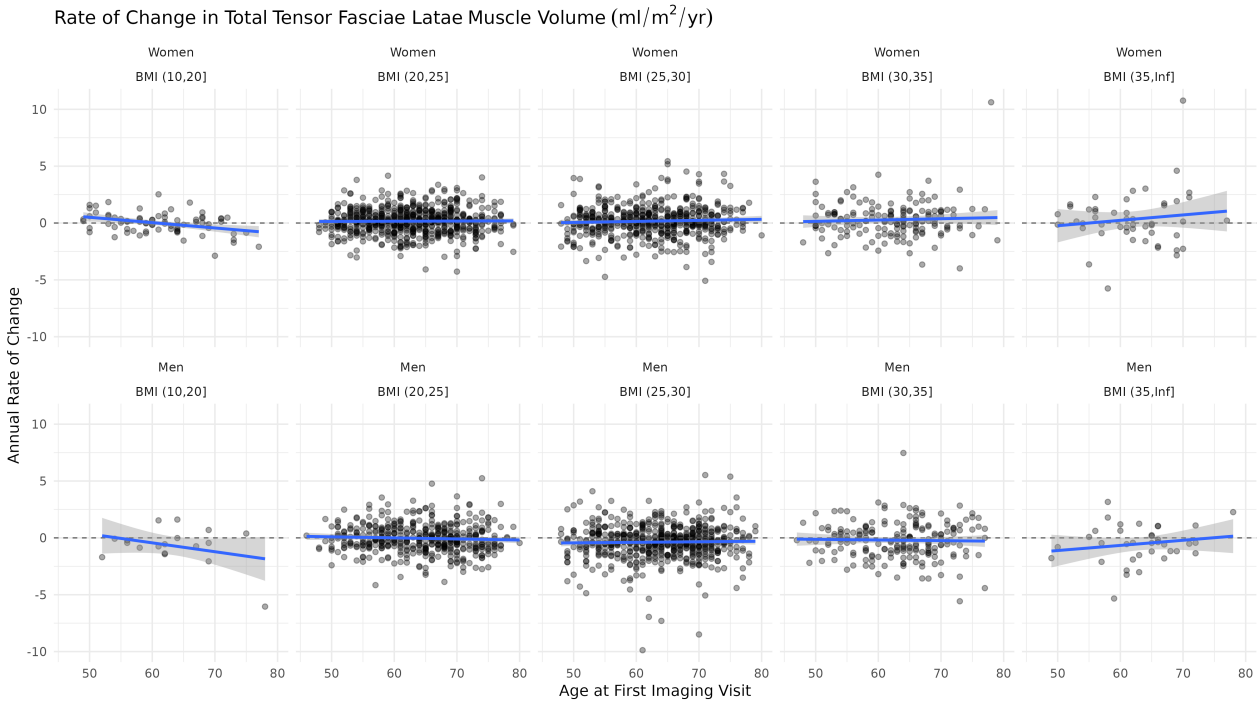


Figure S20. Annual rate of change in the tensor fasciae latae muscle from the longitudinal cohort, separated by sex and BMI groups.

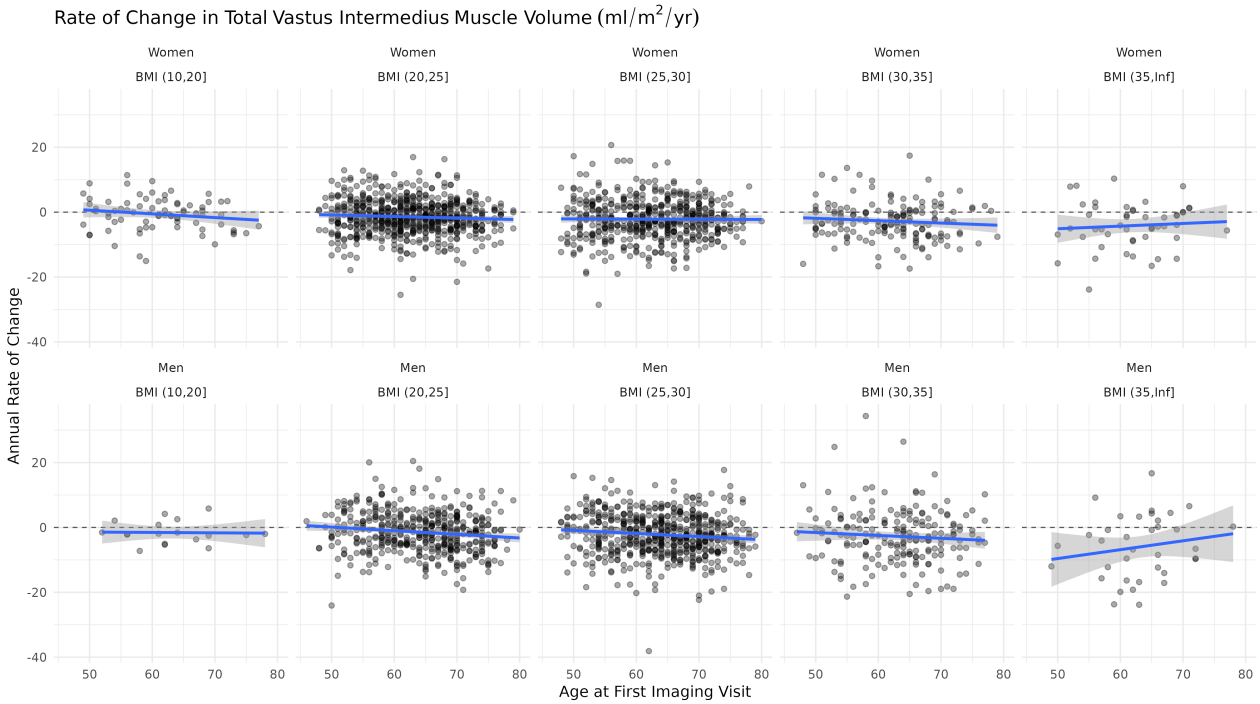


Figure S21. Annual rate of change in the vastus intermedius muscle from the longitudinal cohort, separated by sex and BMI groups.

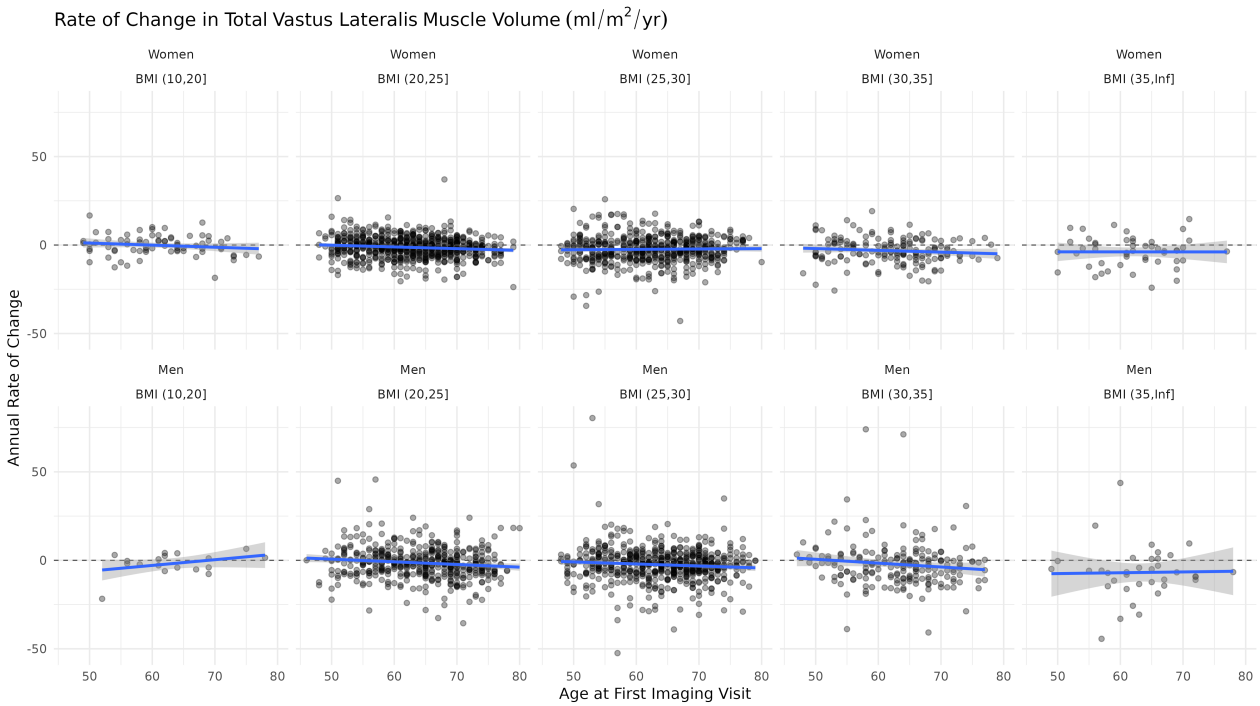


Figure S22. Annual rate of change in the vastus lateralis muscle from the longitudinal cohort, separated by sex and BMI groups.

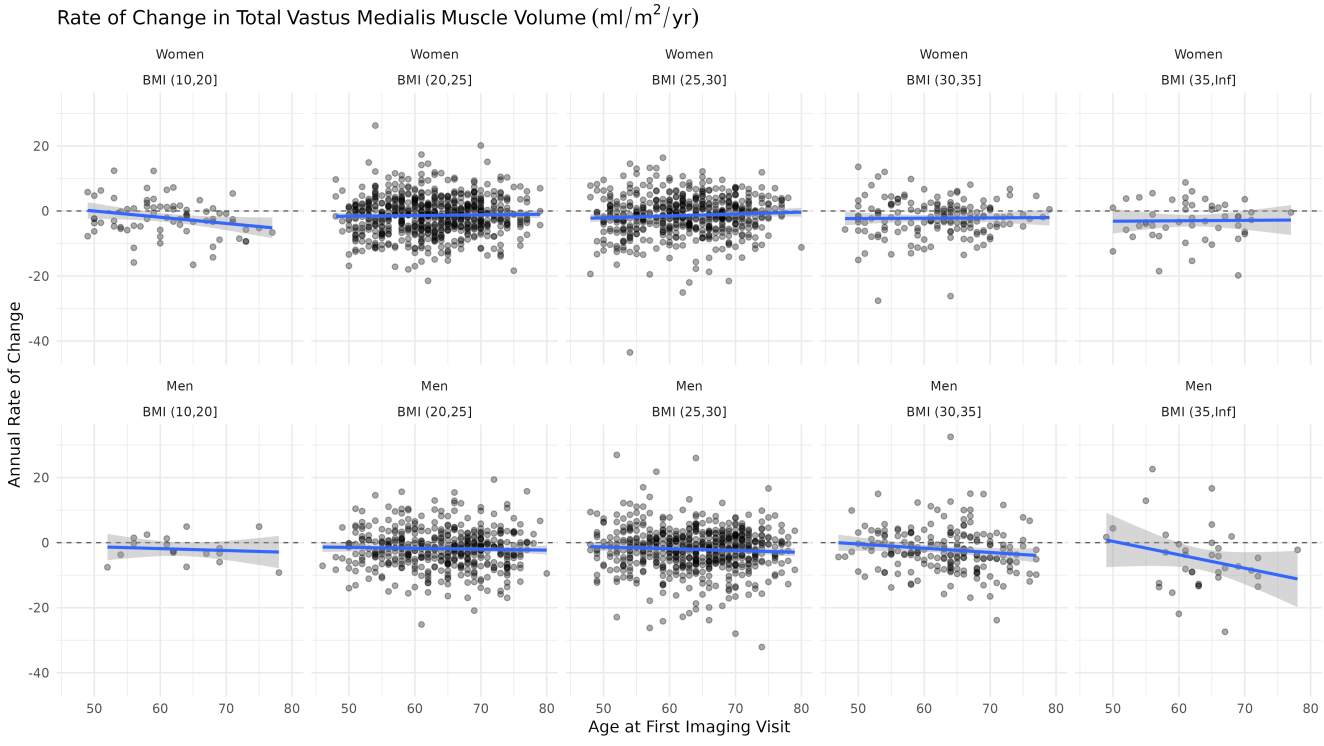


Figure S23. Annual rate of change in the vastus medialis muscle from the longitudinal cohort, separated by sex and BMI groups.

Image-Derived Phenotype	Women $n = 5,199$[1]	Men $n = 5,641$[1]	Overall $n = 10,840$[1]
Adductor Brevis Index (ml/m^2)	40 (8)	54 (9)	47 (11)
Adductor Longus Index (ml/m^2)	92 (19)	105 (17)	99 (19)
Adductor Magnus Index (ml/m^2)	341 (57)	440 (63)	392 (78)
Biceps Femoris Index (ml/m^2)	175 (29)	214 (31)	195 (36)
Gluteus Maximus Index (ml/m^2)	540 (98)	625 (101)	584 (108)
Gluteus Medius Index (ml/m^2)	217 (29)	245 (30)	232 (33)
Gluteus Minimus Index (ml/m^2)	57 (10)	65 (10)	61 (11)
Gracilis Index (ml/m^2)	59 (13)	68 (13)	64 (14)
Pectineus Index (ml/m^2)	36.6 (6.6)	33.9 (5.0)	35.2 (6.0)
Pelvic Floor Index (ml/m^2)	44.1 (5.0)	42.8 (4.6)	43.4 (4.8)
Piriformis Index (ml/m^2)	32.4 (6.3)	29.7 (5.0)	31.0 (5.8)
Rectus Femoris Index (ml/m^2)	125 (19)	153 (25)	140 (26)
Sartorius Index (ml/m^2)	94 (19)	104 (16)	99 (18)
Semimembranosus Index (ml/m^2)	136 (25)	164 (28)	151 (30)
Semitendinosus Index (ml/m^2)	90 (17)	110 (19)	101 (21)
Short External Rotators Index (ml/m^2)	33 (7)	34 (6)	33 (6)
Tensor Fasciae Latae Index (ml/m^2)	47 (13)	51 (11)	49 (13)
Vastus Intermedius Index (ml/m^2)	247 (38)	315 (47)	282 (55)
Vastus Lateralis Index (ml/m^2)	281 (46)	358 (53)	321 (62)
Vastus Medialis Index (ml/m^2)	214 (32)	260 (37)	238 (42)

[1] Mean (SD)

Table S1. Average total volume divided by height squared of the twenty bilateral muscle groups in the hips and thighs, separated by sex. Values are reported as mean and standard deviation.

Characteristic	Women		Men	
	baseline $N = 1,452^1$	**re-imaging** $N = 1,452^1$	**baseline** $N = 1,314^1$	**re-imaging** $N = 1,314^1$
Age (years)	62 (7)	65 (7)	64 (7)	66 (7)
White Ethnicity	1,269 (87%)	1,269 (87%)	1,171 (89%)	1,171 (89%)
Weight (kg)	68 (12)	68 (12)	82 (13)	82 (13)
Height (m)	1.63 (0.06)	1.63 (0.06)	1.75 (0.06)	1.75 (0.06)
BMI (kg/m^2)	25.7 (4.3)	25.8 (4.4)	26.7 (3.8)	26.7 (3.8)
Waist Circumference (cm)	83 (11)	83 (11)	93 (11)	94 (11)
Hip Circumference (cm)	101 (9)	100 (9)	100 (7)	99 (7)
Waist-to-Hip Ratio	0.82 (0.07)	0.83 (0.07)	0.93 (0.06)	0.94 (0.07)
Dominant Hand Grip Strength (kg)	24 (6)	22 (6)	39 (8)	36 (9)
Systolic Blood Pressure (mmHg)	135 (18)	139 (19)	142 (16)	144 (17)
Diastolic Blood Pressure (mmHg)	76 (10)	78 (10)	81 (10)	81 (10)
Total MET (hours/week)	49 (40)	50 (41)	52 (44)	51 (43)
Sedentary Time (hours)	4.89 (2.02)	5.03 (2.09)	5.47 (2.19)	5.63 (2.21)
T2D	48 (3.3%)	20 (1.4%)	84 (6.4%)	30 (2.3%)
ASAT Volume (l)	9.9 (4.1)	9.9 (4.2)	7.0 (3.3)	7.0 (3.3)
VAT Volume (l)	2.87 (1.53)	2.94 (1.56)	5.21 (2.33)	5.27 (2.36)

[1]Mean (SD); n (%)

Table S2. Demographics for participants in the longitudinal cohort, separated by sex. Values for continuous variables are reported as mean and standard deviation, values for discrete variables are reported as percentages. ASAT: abdominal subcutaneous adipose tissue; BMI: body mass index; MET: metabolic equivalent of task; T2D: type-2 diabetes; VAT: visceral adipose tissue.

IDP	Women		Men							
	baseline $N = 1,452^1$	**re-imaging** $N = 1,452^1$	**baseline** $N = 1,314^1$	**re-imaging** $N = 1,314^1$	Δ (Women)	Δ (Men)	%Δ (Women)	%Δ (Men)	p (Women)^2	p (Men)^2
Adductor Brevis (ml)	105 (20)	106 (20)	163 (27)	166 (27)	0.7 (16.4)	2.9 (15.0)	2.1 (16.4)	2.3 (9.8)	0.0575	< 0.0001
Adductor Longus (ml)	243 (52)	239 (52)	325 (57)	321 (58)	−3.6 (22.7)	−3.7 (20.4)	−1.2 (9.4)	−1.0 (6.4)	< 0.0001	< 0.0001
Adductor Magnus (ml)	886 (150)	883 (149)	1,338 (210)	1,319 (209)	−3.6 (40.2)	−18.4 (55.4)	−0.3 (4.8)	−1.3 (4.1)	0.0007	< 0.0001
Biceps Femoris (ml)	457 (79)	454 (78)	651 (105)	643 (104)	−3.0 (23.4)	−7.8 (49.9)	−0.5 (5.2)	−0.3 (23.4)	< 0.0001	< 0.0001
Gluteus Maximus (ml)	1,406 (243)	1,393 (244)	1,909 (317)	1,876 (315)	−12.8 (59.6)	−33.5 (83.0)	−0.9 (4.1)	−1.7 (4.2)	< 0.0001	< 0.0001
Gluteus Medius (ml)	572 (81)	566 (81)	749 (99)	741 (99)	−5.3 (19.3)	−8.0 (24.5)	−0.9 (3.4)	−1.0 (3.3)	< 0.0001	< 0.0001
Gluteus Minimus (ml)	155 (28)	151 (30)	199 (32)	196 (33)	−3.8 (7.7)	−2.5 (8.1)	−2.6 (5.5)	−1.3 (4.6)	< 0.0001	< 0.0001
Gracilis (ml)	152 (33)	151 (33)	208 (40)	206 (40)	−0.9 (9.7)	−2.6 (15.7)	−0.4 (6.7)	−1.0 (8.4)	0.0004	< 0.0001
Pectineus (ml)	95 (17)	96 (17)	102 (15)	101 (15)	0.9 (9.4)	−0.8 (7.8)	1.4 (9.6)	−0.5 (7.8)	< 0.0001	< 0.0001
Pelvic Floor (ml)	117 (15)	118 (16)	131 (15)	130 (15)	0.6 (4.8)	−0.7 (5.2)	0.5 (4.3)	−0.4 (4.0)	< 0.0001	< 0.0001
Piriformis (ml)	87 (17)	86 (18)	92 (16)	91 (16)	−0.6 (5.0)	−1.0 (3.6)	−0.6 (7.3)	−1.1 (4.0)	0.0005	< 0.0001
Rectus Femoris (ml)	336 (57)	331 (56)	482 (84)	472 (83)	−4.5 (15.7)	−9.8 (26.1)	−1.2 (4.8)	−1.9 (5.6)	< 0.0001	< 0.0001
Sartorius (ml)	238 (45)	241 (45)	312 (51)	313 (52)	3.0 (13.5)	1.9 (20.3)	1.5 (6.3)	0.8 (7.3)	< 0.0001	0.0005
Semimembranosus (ml)	362 (65)	350 (65)	503 (90)	491 (90)	−11.7 (24.5)	−11.9 (48.6)	−3.1 (6.8)	1.8 (95.6)	< 0.0001	< 0.0001
Semitendinosus (ml)	237 (44)	235 (45)	340 (63)	336 (63)	−2.6 (15.4)	−3.7 (22.1)	−1.0 (6.7)	−1.0 (7.2)	< 0.0001	< 0.0001
Short External Rotators (ml)	88 (18)	88 (18)	102 (20)	101 (20)	0.4 (5.1)	−1.2 (6.9)	0.6 (6.5)	−0.8 (7.3)	0.0049	< 0.0001
Tensor Fasciae (ml)	119 (32)	120 (34)	155 (35)	153 (36)	0.6 (7.6)	−2.1 (9.9)	0.3 (6.2)	−1.3 (6.9)	0.0039	< 0.0001
Vastus Intermedius (ml)	654 (109)	640 (108)	975 (157)	959 (158)	−13.5 (34.1)	−16.2 (52.8)	−2.0 (5.4)	−1.5 (6.0)	< 0.0001	< 0.0001
Vastus Lateralis (ml)	750 (129)	736 (128)	1,100 (179)	1,084 (182)	−14.2 (41.1)	−16.5 (74.3)	−1.8 (5.7)	−1.3 (7.4)	< 0.0001	< 0.0001
Vastus Medialis (ml)	570 (95)	559 (96)	804 (129)	790 (130)	−11.4 (35.2)	−14.5 (64.8)	−1.9 (6.5)	−1.0 (22.5)	< 0.0001	< 0.0001

[1]Mean (SD)
[2]Wilcoxon signed-rank test

Table S3. Summary of total leg-muscle volume IDPs at the baseline and re-imaging visits for the longitudinal cohort, separated by sex. Values are reported as mean and standard deviation. Differences are provided in both raw units (Δ = re-imaging − baseline [in ml]) and as percentages (%Δ = [re-imaging − baseline]/baseline × 100). The Bonferroni corrected p-value threshold for statistical significance is 0.00010417.

IDP	Women		Men							
	baseline $N = 1,452$[1]	re-imaging $N = 1,452$[1]	baseline $N = 1,314$[1]	re-imaging $N = 1,314$[1]	Δ (Women)	Δ (Men)	%Δ (Women)	%Δ (Men)	p (Women)[2]	p (Men)[2]
Adductor Brevis (%)	7.88 (3.04)	8.03 (3.22)	4.95 (1.29)	5.04 (1.47)	0.2 (1.7)	0.1 (0.6)	3.3 (19.7)	1.6 (11.0)	0.0004	< 0.0001
Adductor Longus (%)	5.66 (1.90)	5.85 (2.08)	5.46 (2.15)	5.64 (2.42)	0.2 (0.7)	0.2 (0.7)	3.3 (11.8)	2.8 (12.2)	< 0.0001	< 0.0001
Adductor Magnus (%)	6.01 (2.38)	6.23 (2.52)	5.19 (1.82)	5.30 (2.04)	0.2 (0.9)	0.1 (0.6)	3.5 (13.0)	1.7 (10.6)	< 0.0001	< 0.0001
Biceps Femoris (%)	9.3 (4.2)	9.9 (4.5)	7.5 (3.4)	8.0 (3.7)	0.6 (1.4)	0.4 (1.1)	8.0 (15.4)	6.2 (13.3)	< 0.0001	< 0.0001
Gluteus Maximus (%)	18 (8)	19 (9)	14 (7)	15 (8)	0.8 (1.8)	0.7 (1.7)	4.9 (10.8)	4.7 (11.5)	< 0.0001	< 0.0001
Gluteus Medius (%)	8.7 (3.8)	9.2 (4.1)	7.9 (3.2)	8.1 (3.5)	0.4 (1.1)	0.2 (1.0)	4.9 (12.1)	2.7 (10.5)	< 0.0001	< 0.0001
Gluteus Minimus (%)	13 (7)	14 (8)	8.3 (4.0)	8.6 (4.4)	1.0 (1.7)	0.4 (1.2)	8.3 (13.2)	4.2 (12.2)	< 0.0001	< 0.0001
Gracilis (%)	18 (7)	19 (7)	8.2 (3.4)	8.6 (3.7)	0.4 (2.6)	0.3 (1.3)	3.2 (14.9)	4.7 (14.6)	< 0.0001	< 0.0001
Pectineus (%)	9.20 (2.93)	9.51 (3.10)	5.84 (1.45)	5.98 (1.66)	0.3 (1.1)	0.1 (0.7)	3.8 (11.6)	2.5 (11.4)	< 0.0001	< 0.0001
Pelvic Floor (%)	16 (6)	17 (6)	9.1 (3.5)	9.5 (3.8)	0.9 (2.1)	0.4 (1.4)	6.9 (14.3)	5.2 (14.5)	< 0.0001	< 0.0001
Piriformis (%)	17.4 (5.7)	18.2 (5.8)	11.2 (3.9)	11.7 (4.2)	0.8 (1.9)	0.5 (1.4)	5.1 (11.6)	4.4 (11.5)	< 0.0001	< 0.0001
Rectus Femoris (%)	6.95 (2.72)	7.17 (2.91)	5.14 (1.25)	5.21 (1.44)	0.2 (0.9)	0.1 (0.5)	3.2 (11.7)	1.1 (8.8)	< 0.0001	0.0258
Sartorius (%)	19 (7)	20 (7)	9.9 (4.5)	10.5 (4.9)	1.1 (2.3)	0.6 (1.4)	7.1 (13.8)	7.1 (14.4)	< 0.0001	< 0.0001
Semimembranosus (%)	11.6 (6.0)	12.5 (6.5)	9.9 (5.2)	10.6 (5.7)	0.9 (1.7)	0.7 (1.6)	8.8 (15.1)	7.1 (14.1)	< 0.0001	< 0.0001
Semitendinosus (%)	9.3 (4.0)	9.7 (4.2)	7.13 (2.94)	7.38 (3.21)	0.4 (1.3)	0.3 (1.0)	4.3 (13.3)	3.4 (11.7)	< 0.0001	< 0.0001
Short External Rotators (%)	13 (6)	14 (7)	7.1 (3.3)	7.3 (3.7)	0.5 (1.8)	0.2 (1.1)	3.8 (13.1)	2.4 (12.5)	< 0.0001	< 0.0001
Tensor Fasciae (%)	23 (10)	23 (10)	14 (7)	14 (8)	0.8 (2.4)	0.7 (2.0)	4.1 (11.9)	5.0 (13.5)	< 0.0001	< 0.0001
Vastus Intermedius (%)	4.62 (1.91)	4.71 (2.10)	4.31 (1.35)	4.32 (1.52)	0.1 (0.7)	0.0 (0.5)	1.3 (13.4)	−0.3 (10.0)	0.0399	0.0004
Vastus Lateralis (%)	5.35 (2.43)	5.61 (2.70)	4.54 (1.41)	4.63 (1.59)	0.3 (0.8)	0.1 (0.6)	4.6 (15.1)	1.8 (12.1)	< 0.0001	0.0005
Vastus Medialis (%)	5.04 (2.26)	5.29 (2.53)	4.16 (1.45)	4.25 (1.68)	0.2 (0.8)	0.1 (0.5)	4.4 (14.4)	1.3 (11.3)	< 0.0001	0.0178

[1]Mean (SD)
[2]Wilcoxon signed-rank test

Table S4. Summary of relative fat fraction IDPs at the baseline and re-imaging visits for the longitudinal cohort, separated by sex. Values are reported as mean and standard deviation. Differences are provided in both raw units (Δ = re-imaging − baseline [in ml]) and as percentages (%Δ = [re-imaging − baseline]/baseline × 100). The Bonferroni corrected p-value threshold for statistical significance is 0.00010417.

Characteristic	Women		Men	
	T2D n = 628[1]	**control** n = 628[1]	**T2D** n = 1,088[1]	**control** n = 1,088[1]
Age (years)	66 (7)	66 (7)	67 (7)	67 (7)
White Ethnicity	553 (88%)	582 (93%)	961 (88%)	1,012 (93%)
Weight (kg)	79 (16)	78 (16)	89 (14)	89 (14)
Height (m)	1.62 (0.06)	1.61 (0.06)	1.74 (0.06)	1.75 (0.06)
BMI (kg/m^2)	30.0 (5.6)	30.0 (5.6)	29.1 (4.3)	29.1 (4.3)
Waist Circumference (cm)	94 (13)	91 (13)	101 (11)	99 (11)
Hip Circumference (cm)	107 (12)	108 (12)	103 (8)	104 (8)
Waist-to-Hip Ratio	0.88 (0.08)	0.85 (0.07)	0.98 (0.07)	0.96 (0.06)
Dominant Hand Grip Strength (kg)	22 (6)	23 (6)	36 (9)	38 (8)
Systolic Blood Pressure (mmHg)	141 (19)	142 (19)	143 (17)	146 (18)
Diastolic Blood Pressure (mmHg)	76 (10)	79 (10)	78 (10)	82 (10)
Total MET (hours/week)	43 (42)	43 (40)	43 (44)	44 (40)
Sedentary Time (hours)	5.93 (2.33)	5.33 (2.07)	6.34 (2.44)	5.89 (2.28)
GLP-1 intake	7 (1.1%)	0 (0%)	23 (2.1%)	0 (0%)
T2D	628 (100%)	0 (0%)	1,088 (100%)	0 (0%)
ASAT Volume (l)	13.4 (5.2)	13.5 (5.3)	8.7 (3.7)	8.7 (3.9)
VAT Volume (l)	4.60 (1.83)	4.09 (1.78)	7.00 (2.53)	6.46 (2.43)

[1]Mean (SD); n (%)

Table S5. Demographics for participants in the type-2 diabetes case-cohort cohort, separated by sex. Values for continuous variables are reported as mean and standard deviation, values for discrete variables are reported as percentages. ASAT: abdominal subcutaneous adipose tissue; BMI: body mass index; MET: metabolic equivalent of task; VAT: visceral adipose tissue.

IDP	Women			Men		
	T2D $n = 628$[1]	**control** $n = 628$[1]	**p-value**[2]	**T2D** $n = 1,088$[1]	**control** $n = 1,088$[1]	**p-value**[2]
Adductor Brevis (ml)	108 (24)	105 (22)	0.0082	166 (29)	171 (28)	< 0.0001
Adductor Longus (ml)	255 (53)	264 (51)	0.0032	309 (54)	329 (55)	< 0.0001
Adductor Magnus (ml)	953 (174)	940 (173)	0.2370	1,349 (216)	1,378 (210)	0.0007
Biceps Femoris (ml)	484 (87)	480 (86)	0.3931	653 (109)	669 (104)	0.0002
Gluteus Maximus (ml)	1,539 (297)	1,518 (289)	0.1717	1,897 (356)	1,969 (337)	< 0.0001
Gluteus Medius (ml)	595 (92)	589 (88)	0.3979	749 (107)	765 (101)	0.0009
Gluteus Minimus (ml)	153 (32)	150 (31)	0.1750	197 (35)	200 (35)	0.0580
Gracilis (ml)	167 (36)	167 (38)	0.6755	205 (43)	216 (41)	< 0.0001
Pectineus (ml)	103 (19)	105 (17)	0.2645	105 (16)	106 (16)	0.2112
Pelvic Floor (ml)	117 (16)	120 (15)	0.0013	130 (16)	133 (16)	0.0001
Piriformis	87 (17)	89 (17)	0.0165	90 (17)	92 (16)	0.0004
Rectus Femoris (ml)	322 (55)	334 (56)	0.0001	442 (77)	475 (80)	< 0.0001
Sartorious	267 (51)	268 (51)	0.8227	320 (52)	331 (51)	< 0.0001
Semimembranosus (ml)	378 (78)	371 (77)	0.1147	505 (95)	514 (90)	0.0023
Semitendinosus (ml)	248 (47)	250 (48)	0.1330	331 (62)	348 (61)	< 0.0001
Short External Rotators (ml)	88 (19)	87 (18)	0.1404	102 (21)	104 (21)	0.0297
Tensor Fasciae (ml)	131 (37)	135 (38)	0.0237	152 (35)	160 (36)	< 0.0001
Vastus Intermedius (ml)	667 (122)	669 (118)	0.9011	941 (162)	980 (155)	< 0.0001
Vastus Lateralis (ml)	759 (141)	773 (137)	0.1453	1,066 (181)	1,118 (173)	< 0.0001
Vastus Medialis (ml)	571 (100)	576 (95)	0.4467	776 (131)	804 (124)	< 0.0001

[1]Mean (SD)
[2]Wilcoxon rank sum test

Table S6. Summary of total leg-muscle volume for the type-2 diabetes case-control cohort, separated by sex. Values are reported as mean and standard deviation. The Bonferroni corrected p-value threshold for statistical significance is 0.00010417.

IDP	Women			Men		
	T2D $n = 628$[1]	control $n = 628$[1]	p-value[2]	T2D $n = 1,088$[1]	control $n = 1,088$[1]	p-value[2]
Adductor Brevis (%)	10.0 (4.10)	9.8 (3.68)	0.9601	6.0 (2.00)	5.5 (1.62)	< 0.0001
Adductor Longus (%)	7.6 (3.03)	6.9 (2.45)	0.0002	7.1 (3.38)	6.4 (2.84)	< 0.0001
Adductor Magnus (%)	7.9 (4.02)	7.6 (3.49)	0.2943	6.5 (3.17)	6.1 (2.56)	0.0050
Biceps Femoris (%)	13.6 (6.79)	12.9 (6.23)	0.1524	10.2 (5.42)	9.3 (4.53)	0.0010
Gluteus Maximus (%)	26.8 (11.51)	24.1 (10.09)	< 0.0001	20.9 (10.01)	18.1 (8.84)	< 0.0001
Gluteus Medius (%)	13.3 (6.02)	12.0 (5.63)	< 0.0001	11.0 (5.56)	9.5 (4.09)	< 0.0001
Gluteus Minimus (%)	17.1 (9.11)	17.6 (9.22)	0.3264	10.6 (5.84)	9.7 (4.92)	0.0002
Gracilis (%)	20.2 (7.80)	20.5 (7.39)	0.5473	10.5 (4.79)	9.4 (4.21)	< 0.0001
Pectineus (%)	10.9 (3.93)	10.3 (3.13)	0.0824	7.0 (2.14)	6.5 (1.85)	< 0.0001
Pelvic Floor (%)	20.7 (6.95)	20.1 (6.68)	0.1325	11.7 (4.72)	10.6 (4.18)	< 0.0001
Piriformis (%)	20.9 (6.29)	20.5 (5.91)	0.3114	14.0 (5.27)	12.7 (4.43)	< 0.0001
Rectus Femoris (%)	9.7 (4.32)	9.1 (4.18)	0.0208	6.5 (2.43)	5.8 (1.86)	< 0.0001
Sartorious (%)	23.0 (8.35)	22.7 (7.53)	0.6009	13.2 (6.20)	12.1 (5.66)	< 0.0001
Semimembranosus (%)	17.8 (9.40)	16.7 (9.00)	0.0228	14.0 (7.79)	12.5 (6.57)	< 0.0001
Semitendinosus (%)	13.0 (6.16)	12.1 (5.56)	0.0411	9.3 (4.56)	8.6 (4.13)	< 0.0001
Short External Rotators (%)	16.7 (8.14)	17.0 (7.68)	0.1553	9.3 (5.01)	8.6 (4.46)	0.0003
Tensor Fasciae (%)	30.5 (11.72)	28.2 (11.06)	0.0008	19.1 (9.47)	17.4 (8.47)	< 0.0001
Vastus Intermedius (%)	6.6 (3.30)	6.2 (3.00)	0.0027	5.5 (2.70)	5.1 (2.02)	< 0.0001
Vastus Lateralis (%)	7.9 (4.23)	7.5 (3.87)	0.0593	5.9 (2.86)	5.3 (2.16)	< 0.0001
Vastus Medialis (%)	7.6 (3.96)	7.0 (3.55)	0.0020	5.5 (2.80)	4.9 (2.15)	< 0.0001

[1]Mean (SD)
[2]Wilcoxon rank sum test

Table S7. Median relative fat fraction (rFF) of the twenty bilateral muscle groups in the hips and thighs for the type-2 diabetes case-control cohort, separated by sex. Values are reported as mean and standard deviation. The Bonferroni corrected p-value threshold for statistical significance is 0.00010417.

Characteristic	Women		Men	
	control $n = 11^1$	**GLP-1RA** $n = 11^1$	**control** $n = 27^1$	**GLP-1RA** $n = 27^1$
Age (years)	69 (7)	69 (7)	69 (5)	69 (5)
White Ethnicity	9 (82%)	10 (91%)	25 (93%)	21 (78%)
Weight (kg)	84 (12)	85 (12)	94 (12)	95 (13)
Height (m)	1.61 (0.06)	1.62 (0.05)	1.74 (0.06)	1.75 (0.05)
BMI (kg/m^2)	32.4 (3.4)	32.5 (3.6)	31.1 (3.5)	31.3 (3.6)
Waist Circumference (cm)	101 (10)	103 (10)	108 (11)	107 (11)
Hip Circumference (cm)	111 (7)	112 (9)	105 (7)	104 (7)
Waist-to-Hip Ratio	0.91 (0.05)	0.92 (0.06)	1.03 (0.07)	1.03 (0.08)
Dominant Hand Grip Strength (kg)	20.5 (3.3)	18.9 (4.5)	34 (9)	35 (5)
Systolic Blood Pressure (mmHg)	149 (21)	151 (22)	147 (21)	140 (16)
Diastolic Blood Pressure (mmHg)	76 (9)	81 (9)	81 (10)	76 (6)
Townsend Deprivation Index	−1.90 (2.73)	−1.80 (2.71)	−1.91 (2.40)	−1.81 (2.30)
Total MET (hours/week)	50 (62)	93 (93)	49 (49)	39 (41)
Sedentary Time (hours)	5.59 (2.83)	5.91 (1.80)	6.15 (1.48)	6.63 (1.68)
ASAT Volume (l)	14.8 (5.3)	15.5 (3.7)	10.2 (3.1)	10.8 (3.7)
VAT Volume (l)	5.97 (2.21)	5.73 (1.28)	8.29 (2.62)	8.59 (2.27)
Duration of GLP-1RA Treatment (months)	0.00 (–)	6.27 (2.76)	0.00 (–)	6.36 (2.67)

[1]Mean (SD); n (%)

Table S8. Demographics for participants in the GLP-1RA case-control cohort, separated by sex. Values for continuous variables are reported as mean and standard deviation, values for discrete variables are reported as percentages. ASAT: abdominal subcutaneous adipose tissue; BMI: body mass index; GLP-1RA - glucagon-like peptide-1 receptor agonist; MET: metabolic equivalent of task; VAT: visceral adipose tissue.

IDP	Women			Men		
	control $n = 11$[1]	GLP-1RA $n = 11$[1]	p-value[2]	control $n = 27$[1]	GLP-1RA $n = 27$[1]	p-value[2]
Adductor Brevis (ml)	100 (12)	112 (18)	0.0652	170 (24)	159 (35)	0.2706
Adductor Longus (ml)	256 (46)	279 (53)	0.2426	321 (53)	289 (64)	0.0460
Adductor Magnus (ml)	964 (233)	992 (202)	0.6063	1,389 (230)	1,357 (233)	0.5710
Biceps Femoris (ml)	483 (83)	501 (86)	0.4779	690 (107)	643 (107)	0.0638
Gluteus Maximus (ml)	1,539 (290)	1,512 (147)	0.5619	1,996 (324)	1,912 (372)	0.4094
Gluteus Medius (ml)	551 (91)	623 (39)	0.0281	798 (103)	735 (123)	0.0372
Gluteus Minimus (ml)	141 (36)	149 (26)	0.3000	200 (40)	193 (39)	0.7058
Gracilis (ml)	183 (47)	189 (48)	0.5190	220 (45)	210 (44)	0.2706
Pectineus (ml)	109 (18)	107 (18)	0.9487	111 (15)	104 (15)	0.2464
Pelvic Floor (ml)	113 (17)	123 (12)	0.1164	133 (13)	129 (24)	0.1377
Piriformis (ml)	81 (15)	79 (21)	0.9487	92 (19)	81 (20)	0.1287
Rectus Femoris (ml)	312 (33)	318 (44)	0.4385	461 (70)	388 (82)	0.0026
Sartorious (ml)	292 (39)	284 (51)	0.6994	341 (45)	318 (54)	0.0868
Semimembranosus (ml)	357 (75)	390 (100)	0.2169	519 (101)	498 (111)	0.4706
Semitendinosus (ml)	262 (46)	279 (55)	0.6522	345 (58)	325 (64)	0.1902
Short External Rotators (ml)	88 (12)	94 (6)	0.3653	108 (18)	100 (20)	0.1572
Tensor Fasciae (ml)	131 (32)	131 (42)	0.9487	169 (42)	150 (33)	0.1472
Vastus Intermedius (ml)	643 (141)	658 (98)	0.3653	921 (138)	946 (166)	0.2939
Vastus Lateralis (ml)	742 (156)	717 (127)	0.2703	1,080 (153)	1,046 (205)	0.6186
Vastus Medialis (ml)	551 (114)	552 (75)	0.4385	775 (116)	763 (131)	0.9931

[1]Mean (SD)
[2]Wilcoxon rank sum test

Table S9. Summary of total leg-muscle volume for the GLP-1RA case-control cohort, separated by sex. Values are reported as mean and standard deviation. The Bonferroni corrected p-value threshold for statistical significance is 0.00010417.

IDP	Women			Men		
	control $n = 11$[1]	GLP-1RA $n = 11$[1]	p-value[2]	control $n = 27$[1]	GLP-1RA $n = 27$[1]	p-value[2]
Adductor Brevis (%)	12.0 (4.72)	8.0 (1.78)	0.0192	5.5 (1.28)	6.6 (2.94)	0.2486
Adductor Longus (%)	8.9 (4.35)	5.9 (1.24)	0.0128	7.2 (2.48)	8.3 (3.81)	0.5029
Adductor Magnus (%)	9.5 (5.47)	6.2 (1.55)	0.0879	6.1 (2.19)	7.9 (4.91)	0.2193
Biceps Femoris (%)	18.8 (9.26)	10.7 (3.35)	0.0158	9.9 (4.53)	13.5 (7.64)	0.0691
Gluteus Maximus (%)	32.3 (12.46)	22.9 (5.61)	0.0400	20.5 (8.30)	27.3 (12.38)	0.0388
Gluteus Medius (%)	19.4 (10.52)	10.7 (2.39)	0.0473	10.6 (4.18)	13.2 (5.62)	0.0852
Gluteus Minimus (%)	23.7 (10.98)	15.5 (5.20)	0.0759	10.7 (5.57)	12.5 (6.04)	0.1902
Gracilis (%)	24.1 (12.93)	15.7 (6.00)	0.1932	9.8 (4.34)	13.8 (8.20)	0.1331
Pectineus (%)	12.7 (5.46)	9.7 (2.30)	0.2426	6.6 (1.81)	7.8 (2.34)	0.0693
Pelvic Floor (%)	25.3 (8.18)	18.8 (5.19)	0.0557	11.6 (3.69)	13.1 (5.88)	0.4094
Piriformis (%)	24.7 (9.56)	20.5 (6.39)	0.3000	13.7 (4.76)	17.3 (6.96)	0.0441
Rectus Femoris (%)	12.7 (5.46)	8.1 (2.91)	0.0104	5.6 (1.53)	7.6 (3.18)	0.0035
Sartorious (%)	27.2 (9.97)	18.6 (7.77)	0.0400	12.3 (4.25)	15.7 (7.43)	0.1287
Semimembranosus (%)	25.3 (11.43)	15.1 (5.59)	0.0128	15.0 (7.36)	18.7 (9.29)	0.1472
Semitendinosus (%)	16.0 (9.20)	9.3 (3.68)	0.0473	8.6 (3.58)	11.8 (7.45)	0.0970
Short External Rotators (%)	20.8 (10.60)	12.6 (4.79)	0.0473	8.6 (4.01)	10.9 (5.88)	0.0868
Tensor Fasciae (%)	35.4 (10.97)	25.4 (9.60)	0.0557	18.1 (8.85)	23.8 (10.84)	0.0260
Vastus Intermedius (%)	8.6 (4.13)	5.7 (1.40)	0.0759	5.4 (2.24)	5.9 (2.37)	0.4600
Vastus Lateralis (%)	9.8 (5.54)	7.1 (2.12)	0.2703	5.3 (1.77)	6.7 (3.10)	0.0720
Vastus Medialis (%)	9.8 (4.84)	6.8 (1.98)	0.2426	5.2 (1.87)	6.3 (3.16)	0.2213

[1] Mean (SD)
[2] Wilcoxon rank sum test

Table S10. Median relative fat fraction of the twenty bilateral muscle groups in the hips and thighs for the GLP-1RA case-control cohort, separated by sex. Values are reported as mean and standard deviation. The Bonferroni corrected p-value threshold for statistical significance is 0.00010417.

Sex	IDP	Intercept	Slope	p-value	R^2
Female	Adductor Brevis	23.51	0.62	0.017	0.406
	Adductor Longus	18.59	0.85	0.025	0.806
	Adductor Magnus	56.39	0.88	0.040	0.718
	Biceps Femoris	19.95	0.88	0.033	0.783
	Gluteus Maximus	31.52	0.98	0.171	0.883
	Gluteus Medius	36.14	0.85	0.028	0.773
	Gluteus Minimus	14.36	0.77	0.024	0.591
	Gracilis	12.16	0.85	0.033	0.707
	Pectineus	6.66	0.92	0.059	0.722
	Pelvic Floor	12.45	0.86	0.044	0.619
	Piriformis	8.07	0.79	0.028	0.586
	Rectus Femoris	17.79	0.91	0.048	0.792
	Sartorious	9.71	0.92	0.041	0.844
	Semimembranosus	14.06	0.93	0.063	0.786
	Semitendinosus	18.57	0.89	0.045	0.706
	Short External Rotators	8.25	0.81	0.029	0.621
	Tensor Fasciae Latae	10.53	0.82	0.027	0.683
	Vastus Intermedius	32.38	0.91	0.044	0.814
	Vastus Lateralis	28.01	0.88	0.033	0.792
	Vastus Medialis	38.64	0.89	0.041	0.747
Male	Adductor Brevis	17.50	0.78	0.021	0.675
	Adductor Longus	26.06	0.86	0.032	0.724
	Adductor Magnus	110.17	0.86	0.036	0.671
	Biceps Femoris	46.85	0.85	0.030	0.727
	Gluteus Maximus	71.84	0.96	0.090	0.819
	Gluteus Medius	47.25	0.85	0.027	0.773
	Gluteus Minimus	26.31	0.71	0.019	0.555
	Gracilis	24.11	0.78	0.025	0.587
	Pectineus	10.74	0.84	0.033	0.646
	Pelvic Floor	17.69	0.80	0.028	0.617
	Piriformis	12.57	0.70	0.019	0.520
	Rectus Femoris	39.13	0.84	0.033	0.652
	Sartorious	25.26	0.83	0.024	0.763
	Semimembranosus	37.71	0.88	0.038	0.719
	Semitendinosus	29.57	0.87	0.040	0.688
	Short External Rotators	14.14	0.77	0.024	0.593
	Tensor Fasciae Latae	14.46	0.81	0.029	0.637
	Vastus Intermedius	67.92	0.87	0.032	0.752
	Vastus Lateralis	96.44	0.80	0.024	0.671
	Vastus Medialis	70.56	0.84	0.029	0.723

Table S11. Regression coefficients and model statistics for the linear models (right volume = intercept + slope $*$ left volume) in Figures S2 and S3. The p-value is for the hypothesis test H_0 : slope = 1 vs H_1 : slope $\neq$ 1. IDP: image-derived phenotype.

IDP	BMI Group	Sex	Intercept	Slope	p-value	R^2
Adductor Brevis	BMI (10,20]	Women	3.41	−0.05	0.164	0.027
		Men	6.92	−0.11	0.071	0.189
	BMI (20,25]	Women	1.56	−0.02	0.135	0.003
		Men	1.11	−0.01	0.508	0.001
	BMI (25,30]	Women	0.54	−0.01	0.722	0.000
		Men	3.22	−0.04	0.001	0.019
	BMI (30,35]	Women	−0.99	0.02	0.602	0.002
		Men	2.62	−0.04	0.145	0.011
	BMI (35,Inf]	Women	2.17	−0.03	0.646	0.005
		Men	−0.94	0.02	0.729	0.004
Adductor Longus	BMI (10,20]	Women	8.68	−0.15	0.003	0.119
		Men	−2.60	0.02	0.830	0.003
	BMI (20,25]	Women	1.08	−0.02	0.169	0.003
		Men	2.22	−0.04	0.049	0.009
	BMI (25,30]	Women	0.74	−0.02	0.439	0.001
		Men	1.45	−0.03	0.070	0.006
	BMI (30,35]	Women	−1.83	0.02	0.648	0.001
		Men	3.25	−0.06	0.062	0.018
	BMI (35,Inf]	Women	19.57	−0.31	0.011	0.129
		Men	1.95	−0.06	0.466	0.016
Adductor Magnus	BMI (10,20]	Women	7.57	−0.11	0.239	0.019
		Men	−8.32	0.13	0.495	0.030
	BMI (20,25]	Women	1.33	-0.02	0.613	0.000
		Men	4.95	−0.10	0.025	0.011
	BMI (25,30]	Women	4.73	−0.08	0.056	0.007
		Men	5.20	−0.12	0.007	0.012
	BMI (30,35]	Women	8.51	−0.15	0.074	0.020
		Men	7.04	−0.15	0.079	0.016
	BMI (35,Inf]	Women	−5.76	0.04	0.833	0.001
		Men	13.70	−0.33	0.360	0.025
Biceps Femoris	BMI (10,20]	Women	4.76	−0.08	0.133	0.031
		Men	0.70	−0.03	0.792	0.004
	BMI (20,25]	Women	0.01	0.00	0.906	0.000
		Men	1.94	−0.04	0.180	0.004
	BMI (25,30]	Women	−3.80	0.05	0.028	0.009
		Men	3.16	−0.07	0.018	0.010
	BMI (30,35]	Women	−1.90	0.01	0.783	0.000
		Men	7.23	−0.14	0.027	0.025
	BMI (35,Inf]	Women	−5.93	0.09	0.442	0.013
		Men	6.33	−0.14	0.534	0.011
Gluteus Maximus	BMI (10,20]	Women	20.51	−0.35	0.011	0.087
		Men	−10.84	0.11	0.656	0.013
	BMI (20,25]	Women	4.33	−0.08	0.077	0.005
		Men	9.72	−0.20	0.004	0.018
	BMI (25,30]	Women	1.27	−0.04	0.513	0.001
		Men	7.04	−0.17	0.006	0.013
	BMI (30,35]	Women	13.96	−0.25	0.090	0.018
		Men	8.78	−0.21	0.197	0.009
	BMI (35,Inf]	Women	6.62	−0.13	0.690	0.003
		Men	−11.67	0.00	0.996	0.000
Gluteus Medius	BMI (10,20]	Women	5.21	−0.09	0.059	0.049
		Men	−0.55	−0.01	0.951	0.000
	BMI (20,25]	Women	2.13	−0.04	0.030	0.007

	BMI (25,30]	Men	1.81	−0.04	0.095	0.006
		Women	2.59	−0.05	0.017	0.011
	BMI (30,35]	Men	3.24	−0.07	0.002	0.016
		Women	2.65	−0.06	0.197	0.011
	BMI (35,Inf]	Men	6.36	−0.12	0.006	0.038
		Women	7.13	−0.14	0.128	0.049
		Men	0.24	−0.05	0.664	0.006
Gluteus Minimus	BMI (10,20]	Women	1.81	−0.04	0.033	0.061
		Men	−0.83	0.01	0.765	0.006
	BMI (20,25]	Women	1.17	−0.03	0.000	0.022
		Men	1.87	−0.03	0.000	0.042
	BMI (25,30]	Women	0.73	−0.02	0.010	0.013
		Men	1.92	−0.04	0.000	0.044
	BMI (30,35]	Women	−0.10	−0.01	0.538	0.002
		Men	0.72	−0.02	0.211	0.008
	BMI (35,Inf]	Women	3.42	−0.06	0.093	0.059
		Men	3.06	−0.06	0.161	0.057
Gracilis	BMI (10,20]	Women	2.14	−0.03	0.121	0.033
		Men	−3.72	0.07	0.099	0.161
	BMI (20,25]	Women	−0.81	0.01	0.117	0.004
		Men	−0.08	0.00	0.988	0.000
	BMI (25,30]	Women	−0.64	0.01	0.389	0.001
		Men	0.65	−0.02	0.166	0.003
	BMI (30,35]	Women	−2.13	0.03	0.176	0.012
		Men	0.32	−0.01	0.556	0.002
	BMI (35,Inf]	Women	2.25	−0.03	0.514	0.009
		Men	−2.02	0.00	0.995	0.000
Pectineus	BMI (10,20]	Women	2.79	−0.04	0.017	0.076
		Men	0.13	0.00	0.938	0.000
	BMI (20,25]	Women	0.61	−0.01	0.368	0.001
		Men	0.32	0.00	0.553	0.001
	BMI (25,30]	Women	0.25	0.00	0.930	0.000
		Men	−0.39	0.00	0.528	0.001
	BMI (30,35]	Women	1.20	−0.01	0.475	0.003
		Men	1.07	−0.02	0.160	0.010
	BMI (35,Inf]	Women	2.76	−0.04	0.285	0.024
		Men	0.17	−0.01	0.812	0.002
Pelvic Floor	BMI (10,20]	Women	1.31	−0.02	0.211	0.022
		Men	−0.22	0.00	0.836	0.003
	BMI (20,25]	Women	0.52	−0.01	0.192	0.003
		Men	0.16	0.00	0.584	0.001
	BMI (25,30]	Women	0.28	0.00	0.787	0.000
		Men	−0.12	0.00	0.878	0.000
	BMI (30,35]	Women	0.79	−0.01	0.384	0.005
		Men	0.05	0.00	0.794	0.000
	BMI (35,Inf]	Women	0.10	0.00	0.872	0.001
		Men	0.16	0.00	0.987	0.000
Piriformis	BMI (10,20]	Women	2.45	−0.04	0.005	0.103
		Men	−1.25	0.02	0.392	0.046
	BMI (20,25]	Women	0.66	−0.01	0.013	0.010
		Men	0.29	−0.01	0.081	0.007
	BMI (25,30]	Women	0.38	−0.01	0.210	0.003
		Men	0.13	0.00	0.219	0.003
	BMI (30,35]	Women	0.41	−0.01	0.536	0.002
		Men	−0.23	0.00	0.714	0.001

	BMI (35,Inf]	Women	−0.32	0.00	0.760	0.002
		Men	−0.39	0.01	0.727	0.004
Rectus Femoris	BMI (10,20]	Women	9.73	−0.16	0.001	0.136
		Men	4.99	−0.11	0.546	0.023
	BMI (20,25]	Women	−0.68	0.00	0.791	0.000
		Men	0.89	−0.03	0.287	0.003
	BMI (25,30]	Women	−3.18	0.04	0.009	0.013
		Men	−1.29	0.00	0.846	0.000
	BMI (30,35]	Women	−3.05	0.03	0.308	0.007
		Men	−0.42	−0.02	0.600	0.001
	BMI (35,Inf]	Women	−5.69	0.08	0.355	0.018
		Men	−1.28	−0.01	0.932	0.000
Sartorious	BMI (10,20]	Women	3.39	−0.04	0.257	0.018
		Men	4.83	−0.07	0.207	0.097
	BMI (20,25]	Women	0.39	0.01	0.550	0.001
		Men	−0.51	0.02	0.298	0.002
	BMI (25,30]	Women	−1.41	0.03	0.021	0.010
		Men	2.07	−0.03	0.079	0.005
	BMI (30,35]	Women	0.28	0.00	0.945	0.000
		Men	3.63	−0.05	0.056	0.019
	BMI (35,Inf]	Women	1.40	−0.02	0.828	0.001
		Men	5.93	−0.11	0.168	0.055
Semimembranosus	BMI (10,20]	Women	4.24	−0.10	0.076	0.043
		Men	6.65	−0.16	0.194	0.103
	BMI (20,25]	Women	0.26	−0.03	0.215	0.002
		Men	2.35	−0.06	0.022	0.012
	BMI (25,30]	Women	-0.65	−0.02	0.466	0.001
		Men	4.01	−0.09	0.003	0.015
	BMI (30,35]	Women	−3.35	0.01	0.880	0.000
		Men	10.00	−0.18	0.003	0.045
	BMI (35,Inf]	Women	7.34	−0.14	0.171	0.039
		Men	5.67	−0.16	0.529	0.012
Semitendinosus	BMI (10,20]	Women	1.90	−0.04	0.386	0.010
		Men	−7.01	0.09	0.336	0.058
	BMI (20,25]	Women	−0.77	0.01	0.415	0.001
		Men	−0.03	−0.01	0.726	0.000
	BMI (25,30]	Women	−3.14	0.04	0.004	0.016
		Men	0.59	−0.02	0.329	0.002
	BMI (30,35]	Women	−2.99	0.04	0.276	0.008
		Men	1.05	−0.02	0.386	0.004
	BMI (35,Inf]	Women	−3.48	0.05	0.517	0.009
		Men	−2.38	0.02	0.922	0.000
Short External Rotators	BMI (10,20]	Women	1.95	−0.03	0.100	0.037
		Men	0.71	−0.02	0.630	0.015
	BMI (20,25]	Women	0.47	0.00	0.368	0.001
		Men	0.92	−0.01	0.033	0.010
	BMI (25,30]	Women	0.29	0.00	0.463	0.001
		Men	0.06	0.00	0.540	0.001
	BMI (30,35]	Women	0.00	0.00	0.950	0.000
		Men	0.30	−0.01	0.433	0.003
	BMI (35,Inf]	Women	−2.03	0.03	0.196	0.035
		Men	-0.10	0.00	0.980	0.000
Tensor Fasciae Latae	BMI (10,20]	Women	2.85	−0.05	0.001	0.132
		Men	4.25	−0.08	0.185	0.107
	BMI (20,25]	Women	0.06	0.00	0.789	0.000

	BMI (25,30]	Men	0.56	−0.01	0.258	0.003
		Women	−0.41	0.01	0.254	0.002
	BMI (30,35]	Men	−0.67	0.00	0.593	0.000
		Women	−0.42	0.01	0.526	0.003
	BMI (35,Inf]	Men	0.16	−0.01	0.735	0.001
		Women	−2.61	0.05	0.384	0.016
		Men	−3.37	0.05	0.332	0.028
Vastus Intermedius	BMI (10,20]	Women	6.30	−0.11	0.179	0.025
		Men	−0.81	−0.01	0.925	0.001
	BMI (20,25]	Women	1.52	−0.05	0.110	0.004
		Men	5.71	−0.11	0.005	0.017
	BMI (25,30]	Women	−1.79	−0.01	0.871	0.000
		Men	3.82	−0.09	0.010	0.012
	BMI (30,35]	Women	1.78	−0.07	0.261	0.008
		Men	2.85	−0.09	0.302	0.006
	BMI (35,Inf]	Women	−9.20	0.08	0.612	0.006
		Men	−23.27	0.27	0.315	0.030
Vastus Lateralis	BMI (10,20]	Women	7.07	−0.12	0.228	0.020
		Men	−22.25	0.32	0.146	0.127
	BMI (20,25]	Women	4.81	−0.10	0.004	0.013
		Men	8.17	−0.15	0.011	0.014
	BMI (25,30]	Women	−3.67	0.02	0.656	0.000
		Men	4.80	−0.11	0.038	0.007
	BMI (30,35]	Women	3.05	−0.10	0.214	0.010
		Men	11.48	−0.22	0.099	0.014
	BMI (35,Inf]	Women	−3.77	0.00	0.994	0.000
		Men	−9.80	0.05	0.912	0.000
Vastus Medialis	BMI (10,20]	Women	9.54	−0.19	0.040	0.057
		Men	1.71	−0.06	0.690	0.010
	BMI (20,25]	Women	−2.64	0.02	0.526	0.001
		Men	−0.06	−0.03	0.481	0.001
	BMI (25,30]	Women	−5.00	0.06	0.116	0.005
		Men	1.48	−0.06	0.143	0.004
	BMI (30,35]	Women	−2.79	0.01	0.884	0.000
		Men	6.10	−0.13	0.069	0.017
	BMI (35,Inf]	Women	−3.81	0.01	0.924	0.000
		Men	21.07	−0.41	0.130	0.066

Table S12. Regression coefficients and model statistics for the linear models (rate of change = intercept + slope ∗ age) in Figures S4–S23. The p-value is for the hypothesis test H_0 : slope = 0 vs H_1 : slope ≠ 0. BMI: body mass index, IDP: image-derived phenotype.