



ON-LINE FIGURE. Paired water (A) and fat (B) separated axial 2-point Dixon images at L3 from a 33-year-old healthy female volunteer. ROIs defining multifidus (red) and erector spinae (longissimus and iliocostalis, blue) muscles are indicated. 3D images (C, viewed superiorly, D, viewed posteriorly) represent volumetric data for the right and left paravertebral muscles spanning L4 and L5 in the same volunteer.

On-line Table 1: Fat signal fraction (%) for lumbar multifidus and erector spinae muscles, according to sex, age group, and lumbar level^a

Lumbar Level	20–29 Years	30–39 Years	40–49 Years	50–62 Years	All Age Groups
Women					
MF + ES					
L1	9.1 ± 2.4	10.3 ± 2.3	10.5 ± 2.5	13.2 ± 7.5	10.7 ± 4.3
L2	8.9 ± 2.2	10.7 ± 3.4	10.0 ± 2.6	13.7 ± 8.6	10.8 ± 4.9
L3	10.9 ± 1.9	13.7 ± 4.7	14.5 ± 5.0	16.4 ± 9.3	13.9 ± 6.0
L4	17.9 ± 3.7	21.1 ± 8.9	21.9 ± 8.0	23.7 ± 13.6	21.2 ± 9.2
L5	29.9 ± 5.4	30.2 ± 10.3	31.6 ± 7.0	35.9 ± 13.0	31.9 ± 9.3
All (L1–L5)	15.4 ± 2.6	17.7 ± 5.5	18.0 ± 4.6	20.7 ± 9.8	17.8 ± 10.7
MF					
L1	16.5 ± 5.7	18.9 ± 3.8	21.9 ± 7.7	23.9 ± 8.6	20.2 ± 7.0
L2	12.9 ± 4.8	16.6 ± 4.0	15.9 ± 4.6	20.2 ± 10.0	16.3 ± 6.5
L3	14.5 ± 3.7	18.8 ± 5.9	20.3 ± 7.9	19.9 ± 10.5	18.4 ± 7.5
L4	18.6 ± 3.9	23.1 ± 8.0	24.5 ± 8.5	24.7 ± 13.4	22.7 ± 9.1
L5	27.9 ± 6.2	27.9 ± 9.6	29.7 ± 6.8	33.9 ± 13.0	29.9 ± 9.3
All (L1–L5)	20.2 ± 4.2	23.0 ± 7.0	24.2 ± 6.3	26.0 ± 10.9	23.4 ± 7.5
ES					
L1	7.3 ± 2.0	8.2 ± 2.6	7.8 ± 1.7	10.8 ± 7.4	8.5 ± 4.0
L2	7.6 ± 1.5	9.1 ± 3.1	8.2 ± 2.5	11.9 ± 8.5	9.1 ± 4.7
L3	9.4 ± 1.6	11.5 ± 4.9	12.0 ± 4.9	15.0 ± 8.8	12.0 ± 5.8
L4	17.4 ± 3.9	19.6 ± 10.2	19.9 ± 7.8	23.1 ± 14.2	20.0 ± 9.6
L5	34.6 ± 4.8	36.8 ± 13.2	36.5 ± 9.0	39.8 ± 13.4	36.9 ± 10.4
All (L1–L5)	12.4 ± 1.6	14.5 ± 4.9	14.1 ± 3.7	17.6 ± 9.2	14.7 ± 5.7
Men					
MF + ES					
L1	6.3 ± 0.7	8.6 ± 2.4	9.3 ± 2.3	8.7 ± 2.3	8.2 ± 2.3
L2	6.5 ± 0.6	9.0 ± 2.5	8.9 ± 2.2	10.5 ± 2.9	8.7 ± 2.6
L3	8.1 ± 1.1	10.8 ± 2.4	10.9 ± 2.2	13.2 ± 3.9	10.7 ± 3.1
L4	11.0 ± 1.8	16.3 ± 5.6	14.7 ± 3.5	19.0 ± 6.2	15.3 ± 5.3
L5	18.1 ± 5.0	28.2 ± 7.5	26.5 ± 6.6	29.7 ± 8.0	25.7 ± 8.0
All (L1–L5)	9.4 ± 1.5	14.0 ± 3.8	13.3 ± 2.9	15.5 ± 4.1	14.7 ± 7.8
MF					
L1	9.7 ± 1.7	14.4 ± 5.3	16.9 ± 5.9	16.1 ± 3.9	14.3 ± 5.2
L2	8.2 ± 1.3	12.0 ± 4.0	13.2 ± 5.9	16.3 ± 5.2	12.4 ± 5.2
L3	8.7 ± 1.0	12.3 ± 3.4	13.7 ± 5.4	17.8 ± 6.1	13.1 ± 5.4
L4	11.8 ± 1.9	17.5 ± 6.3	16.1 ± 4.5	21.2 ± 6.3	16.7 ± 6.0
L5	17.5 ± 5.2	27.5 ± 7.1	26.6 ± 7.0	29.3 ± 7.7	25.2 ± 8.0
All (L1–L5)	12.3 ± 2.4	18.6 ± 5.2	18.9 ± 5.0	22.2 ± 5.8	18.0 ± 5.9
ES					
L1	5.6 ± 1.0	7.4 ± 1.9	7.9 ± 1.7	7.2 ± 1.9	7.0 ± 1.8
L2	6.0 ± 0.8	8.1 ± 2.2	8.1 ± 1.6	9.2 ± 2.5	7.9 ± 2.2
L3	7.8 ± 1.4	10.2 ± 2.2	10.0 ± 1.6	11.2 ± 2.8	9.8 ± 2.4
L4	10.4 ± 1.9	15.4 ± 5.2	13.6 ± 3.3	17.2 ± 5.6	14.1 ± 4.8
L5	20.6 ± 5.8	31.1 ± 9.8	26.9 ± 8.2	30.9 ± 10.3	27.4 ± 9.4
All (L1–L5)	7.8 ± 1.1	11.3 ± 3.0	10.6 ± 1.8	11.8 ± 2.9	10.4 ± 2.7

^aData are means.

On-line Table 2: Volume (cm³) of lumbar multifidus and erector spinae according to sex, age group, and lumbar level^a

Lumbar Level	20–29 Years	30–39 Years	40–49 Years	50–62 Years	All Age Groups
Women					
MF + ES					
L1	89.5 ± 14.2	92.3 ± 11.0	92.2 ± 17.5	92.3 ± 12.3	91.6 ± 13.5
L2	105.6 ± 17.8	104.0 ± 15.2	109.6 ± 17.1	107.8 ± 15.2	106.7 ± 15.9
L3	114.8 ± 24.2	126.6 ± 16.1	128.1 ± 28.8	129.3 ± 17.0	124.5 ± 22.2
L4	141.7 ± 24.9	149.2 ± 18.4	151.5 ± 35.3	136.8 ± 28.0	144.8 ± 26.9
L5	97.9 ± 22.9	102.9 ± 31.4	103.0 ± 18.2	107.2 ± 23.3	102.8 ± 23.7
All (L1–L5)	548.8 ± 92.5	575.1 ± 62.2	584.4 ± 101.0	553.4 ± 82.8	565.4 ± 83.8
MF					
L1	16.9 ± 2.9	18.1 ± 3.0	17.2 ± 2.9	17.6 ± 3.3	17.4 ± 2.9
L2	24.2 ± 9.1	23.2 ± 6.7	24.9 ± 4.0	25.2 ± 4.9	24.4 ± 6.3
L3	36.5 ± 12.3	40.2 ± 7.2	39.8 ± 12.1	38.8 ± 10.2	38.8 ± 10.3
L4	59.8 ± 12.6	63.9 ± 7.6	68.2 ± 18.2	61.5 ± 12.8	63.7 ± 13.2
L5	70.1 ± 15.9	69.5 ± 14.2	72.0 ± 13.3	70.4 ± 16.0	70.4 ± 14.3
All (L1–L5)	207.5 ± 45.7	216.4 ± 21.0	222.2 ± 40.2	209.1 ± 32.2	213.8 ± 35.1
ES					
L1	72.6 ± 12.3	74.2 ± 9.0	75.0 ± 15.4	74.7 ± 12.4	74.1 ± 12.0
L2	81.4 ± 14.6	80.8 ± 13.9	84.6 ± 15.5	82.6 ± 12.9	82.3 ± 13.8
L3	77.6 ± 21.0	86.5 ± 13.2	88.3 ± 23.9	90.5 ± 13.4	85.7 ± 18.5
L4	81.9 ± 15.9	83.8 ± 15.5	83.3 ± 20.9	75.4 ± 20.3	81.1 ± 17.9
L5	27.8 ± 11.9	33.4 ± 18.2	31.1 ± 17.3	36.8 ± 9.7	32.3 ± 14.5
All (L1–L5)	341.3 ± 60.9	358.7 ± 50.3	362.2 ± 71.2	344.3 ± 61.3	351.6 ± 59.7
Men					
MF + ES					
L1	158.7 ± 23.7	152.8 ± 19.5	142.9 ± 23.1	141.4 ± 32.0	148.9 ± 25.1
L2	181.6 ± 27.9	172.8 ± 19.9	171.2 ± 28.7	167.5 ± 29.2	173.3 ± 26.1
L3	190.3 ± 24.0	189.2 ± 28.1	182.5 ± 37.5	181.8 ± 29.9	186.0 ± 29.4
L4	187.8 ± 37.0	199.0 ± 19.2	183.3 ± 27.2	181.6 ± 21.9	187.9 ± 27.0
L5	105.5 ± 35.2	124.4 ± 16.5	115.2 ± 20.6	117.1 ± 35.9	115.6 ± 28.1
All (L1–L5)	823.9 ± 101.6	838.1 ± 74.1	795.1 ± 117.9	789.5 ± 104.6	811.6 ± 98.9
MF					
L1	26.7 ± 4.4	27.1 ± 3.7	22.3 ± 3.8	22.7 ± 4.9	24.7 ± 4.6
L2	39.4 ± 11.3	39.9 ± 11.9	29.1 ± 5.5	29.9 ± 7.5	34.6 ± 10.4
L3	56.6 ± 13.3	56.6 ± 17.0	47.0 ± 8.2	49.8 ± 11.7	52.5 ± 13.2
L4	84.0 ± 16.7	88.7 ± 8.1	75.9 ± 12.4	83.5 ± 16.2	83.0 ± 14.1
L5	79.4 ± 19.0	93.7 ± 8.5	86.3 ± 15.1	87.8 ± 15.8	86.8 ± 15.4
All (L1–L5)	286.0 ± 35.1	306.3 ± 34.5	260.5 ± 38.1	273.8 ± 46.0	281.7 ± 40.9
ES					
L1	131.9 ± 21.1	125.6 ± 18.4	120.6 ± 20.1	118.6 ± 27.8	124.2 ± 21.9
L2	142.2 ± 23.6	132.8 ± 15.4	142.1 ± 23.7	137.6 ± 23.0	138.7 ± 21.2
L3	133.8 ± 21.9	132.6 ± 21.9	125.5 ± 31.3	132.1 ± 24.8	133.4 ± 24.3
L4	103.8 ± 34.1	110.2 ± 15.2	107.5 ± 16.4	98.1 ± 28.2	104.9 ± 24.2
L5	26.1 ± 18.8	30.7 ± 10.9	28.9 ± 10.0	29.3 ± 27.8	28.8 ± 17.7
All (L1–L5)	537.9 ± 86.9	531.8 ± 54.9	534.6 ± 85.8	515.7 ± 82.1	530.0 ± 75.9

^aData are means.