

Table 1. Summarises research conducted into the effect of obesity on muscle strength in adolescence (14-17 years old).

Study	Gender	Sample	Muscle Group	Measures	Findings
Blimkie <i>et al.</i> (1990)	M	11 obese (16.5yrs) 10 non-obese (16.6yrs) Range-15-18yrs	KE	- IM KE MVC - 90°, 120°, 140°, 160° - IK KE MVC - 30°/s, 60°/s, 120°/s, 180°/s - Thigh CSA using CT scans - MUA - Bioelectrical impedance	- IM MVC all angles p=ns - IK MVC all speeds p=ns - IM/BM ↓ obese - IM/CSA all angles p=ns - IK/CSA all angles p=ns - MUA ↓ obese
Maffiuletti <i>et al.</i> (2008)	M	10 obese (15.6yrs) 10 non-obese (14.9yrs) Range-13-17yrs	KE	- IM KE MVC - 40°, 80° - IK KE MVC - 180°/s - Bioelectrical impedance	- IM MVC 40° ↑ obese - IM 40°/FFM p=ns - IM MVC 80° p=ns - IM 80°/FFM p=ns - IK MVC ↑ obese - IK/FFM p=ns
Abdelmoula <i>et al.</i> (2012)	M	12 obese (14.2yrs) 10 non-obese (14.4yrs) Range-12-15yrs	KE	- IM KE MVC - 60° - DEXA	- IM MVC ↑ obese - IM/BM ↓ obese - IM/FFM p>0.05 - IM/LM thigh ↑ obese - IM/MM thigh ↑ obese

Key M=males, F=females, KE=knee extensor, IM=isometric, IK=isokinetic, CSA=cross sectional area, MUA=motor unit activation, BM=body mass, LM=lean mass, MM=muscle mass, FFM=fat free mass

Table 2. Summarises research conducted into the effect of obesity on muscle strength through young to old adulthood (18-80 years old).

Study	Gender	Sample	Muscle Group	Measures	Findings
Hulens <i>et al.</i> (2001)	F	173 Obese (39.9yrs) 80 Lean (39.7yrs) Range 20-65yrs	- KE - KF - TE - TF - Forearm	- IK KE MVC 60°/s - IK KF MVC 60°/s - TE 60°/s - TF 60°/s - Handgrip MVC - Bioelectrical impedance	- IK KE MVC 60°/s ↑ obese - IK KF MVC 60°/s p=ns - TE 60°/s ↑ obese - TF 60°/s ↑ obese - Handgrip MVC p=ns
Hulens <i>et al.</i> (2002)	F	241 Obese (39.2yrs) range 18-65yrs <u>Two Groups</u> Y=18-40yrs O=41-65yrs	- KE - KF - TE - TF	- IK KE MVC 60°/s, 240°/s - IK KF MVC 60°/s, 240°/s - TE 60°/s, 120°/s - TF 60°/s, 120°/s - Bioelectrical impedance - Baeke physical activity questionnaire	- Y obese ↑ IK KE MVC 60°/s, 240°/s - Y obese ↑ IK KF MVC 60°/s, 240°/s - Y obese ↑ TE 60°/s, 120°/s - Y obese ↑ TF 60°/s, 120°/s
Lafortuna <i>et al.</i> (2005)	M & F	28 M Obese (29.2yrs) 8 M NW (30.8yrs) 67 F Obese (29.4yrs) 10 F NW (30.0yrs)	- Upper limb - Lower limbs	- CP IT MVC - LP IS MVC	- M ↑ IT CP MVC - M ↑ IT LP MVC - obese vs. NW IT CP MVC p=ns (both M&F) - M obese ↑ IT LP MVC - F obese ↑ IT LP MVC - M obese vs. NW IT LP/FFM p=ns - F obese vs. NW IT LP/FFM p=ns
Maffiuletti <i>et al.</i> (2007)	M	10 Obese (25.3yrs) 10 Lean (27.0yrs)	- KE	- IM KE MVC - 40°, 60°, 80° - IK KE MVC - 60°/s, 120°/s, 180°/s - Bioelectrical impedance	- obese ↑ IM MVC 40°, 60°, 80° - obese ↑ IK MVC - 60°/s, 120°/s, 180°/s - obese ↑ IM MVC/BM 40°, 60°, 80° - obese ↑ IK MVC/BM - 60°/s, 120°/s, 180°/s - IM MVC/FFM 40°, 60°, 80° p=ns - IK MVC/FFM - 60°/s, 120°/s, 180°/s

Hilton <i>et al.</i> (2008)	M & F	6 Obese (58.0yrs: 4 men, 2 women) 6 overweight (58.0yrs: 4 men, 2 women)	- PF - DF	- PF & DF IM MVC 0° (neutral) - PF & DF IK MVC - 60°/s, 120°/s - MV (PF DF muscle group) using MRI - IMAT	- ↓ obese PF & DF IM MVC 0° - ↓ obese PF & DF IK MVC - 60°/s, 120°/s - Muscle Volume p=ns - obese ↑ IMAT
Lafortuna <i>et al.</i> (2013)	M & F	21 M (50.5 yrs, range 31-71yrs) 18 F (55.0yrs, range 32-76yrs)	- Lower limb	- Lower limb MV using CT	- M MV vs. Adiposity $r^2=0.683$ ; $p<0.001$ - F MV vs. Adiposity $r^2=0.214$ ; $p=0.05$
Tomlinson <i>et al.</i> (2014a)	F	54 Y (26.7yrs) 48 O (65.1yrs) 18 Y Obese (30.9yrs) 11 O Obese (62.5yrs) 13 Y Normal (23.2yrs) 15 O Normal (63.5yrs)	- PF - DF	- PF & DF IM MVC 0° - Co-contraction (using sEMG) - MUA - DEXA	- ↑ Y obese PF & DF IM MVC 0° - O PF & DF IM MVC 0° p=ns - Y Co-Contraction p=ns - O Co-Contraction p=ns - Y MUA catergorised by BMI p=ns - ↓ Y MUA catergorised by Body Fat% p=ns - O MUA catergorised by BMI p=ns - O MUA catergorised by Body Fat% p=ns
Tomlinson <i>et al.</i> (2014b)	F	49 Y (25.5yrs) 45 O (64.8yrs) 16 Y Obese 11 O Obese 12 Y Normal 14 O Normal	- PF	- GM IM PF MVC/MV - GM specific force	- ↓ Y obese GM IM PF MVC/MV - Y GM specific force p=ns - O GM GM IM PF MVC/MV p=ns - O GM specific force p=ns
Tomlinson <i>et al.</i> (2014c)	F	52 Y (25.0yrs) 48 O (65.1yrs) 17 Y Obese (30.9yrs) 11 O Obese (62.5yrs)	- PF	- GM MV - GM PCSA - GM Lf - GM pennation angle	- ↑ Y obese GM MV - ↑ Y obese GM PCSA - Y GM Lf p=ns - ↑ Y obese GM pennation angle

		13 Y Normal (23.2yrs) 15 O Normal (63.5yrs)			- O GM MV p=ns - O GM PCSA p=ns - O GM Lf p=ns - ↑ O obese GM pennation angle
Zoico <i>et al.</i> (2004)	F	167 F (range 67-78yrs) - NW - Overweight - Obese	- KE	- KE IM MVC	- KE IM MVC p=ns
Rolland <i>et al.</i> (2004)	F	215 Obese (80.0yrs) 630 NW (80.2yrs) 598 Lean (80.7yrs)	- EE - KE	- EE IM MVC - KE IM MVC - Physical activity screen	- obese ↑ EE IM MVC (both NW & Lean) - EE IM MVC p=ns (corrected for PA) - obese ↑ KE IM MVC 90° vs. Lean - Sedentary KE IM MVC p=ns - Active obese ↑ KE IM MVC 90°

Key M=males, F=females, NW=normal weight, KE=knee extensor KF=knee flexion, IM=isometric, IK=isokinetic, IT=isotonic, CSA=cross sectional area, MUA=motor unit activation, BM=body mass, LM=lean mass, MM=muscle mass, FFM=fat free mass, TE=trunk extension, TF=trunk flexion, Y=young, O=old, CP=chest press, LP=leg press, IMAT=intra muscular adipose tissue, MRI= magnetic resonance imagery, CT=computed tomography, MV=muscle volume, sEMG=surface electromyography, GM=gastrocnemius medialis, PCSA=physiological cross sectional area, Lf fascicle length, PA=physical activity