

Research Summary – Waist Circumference (WC) – Other Physiological Systems

Author Year Country Research Design Setting	Demographics and Injury Characteristics of Sample	Validity	Reliability	Responsiveness Interpretability
<p>Sumrell et al. 2018</p> <p>Cross-sectional</p> <p>Not specified</p>	<p>N=22, 100% male</p> <p>N=14 paraplegic, N=8 tetraplegic</p> <p>Mean age: 36±10 years</p> <p>Legion level: C5-T11</p> <p>Time since injury: 8±8 years</p>	<p>Low density lipoprotein, non-high-density lipoprotein and total cholesterol were positively associated with seated/supine abdominal and waist circumferences after controlling for age; $r = 0.50-0.61$, $r = 0.46-0.58$, $r = 0.52-0.58$, $P < 0.05$, respectively.</p> <p>Tumor necrosis factor alpha was associated with seated/supine abdominal and waist circumferences after accounting for age; $r = 0.49-0.51$ and $r = 0.48-0.56$, $P < 0.05$ respectively.</p>		<p>Interpretability</p> <p>Seated Abdominal Circumference (cm) 100.3±13.5 Seated Waist Circumference (cm) 88.8±9.3 Supine Waist Circumference (cm) 85.9±11.8 Supine Hip Circumference (cm) 97.5±10.0</p>

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<p>Cragg et al. 2015</p> <p>Observational cross-sectional</p> <p>Canadian public research institution</p>	<p>N = 27 with SCI, 70% male Mean (SD) age = 40 (11) years Mean time since injury (SD) = 14 (10) years</p> <p>59% cervical, 41% thoracic The breakdown according to AIS severity was: 52% AIS A, 22% AIS B, 19% AIS C and 7% AIS D.</p>	<p>WC is strong predictor of CVD risk (Framingham risk score) Pearson's $r=0.66$, $p<.05$</p> <p>WC is strong predictor of obesity: Pearson's $r=0.82$ with abdominal fat (kg) Pearson's $r=0.73$ with total fat (kg) Pearson's $r=0.76$ with abdominal fat (%) Pearson's $r=0.70$ with total fat (%)</p> <p>all $p<.05$</p>		<p>Interpretability</p> <p>Mean (SD) WC = 87.4 (11.7) cm; range = 68-111</p>
<p>Willems et al. 2015</p> <p>Cross-sectional</p>	<p>n = 14; 7 walkers (non-SCI, wheelchair independent during non-sporting activities) and 7 non-walkers (motor</p>		<p>Correlation between WC and Dual-energy X-ray Absorptiometry (DXA): Walkers: $r=0.79$, $p<.05$</p>	<p>Interpretability</p> <p>Mean (SD) WC:</p>

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Elite wheelchair athletes from United Kingdom	complete SCI, daily wheelchair users). All male. Walkers: Mean (SD) age = 26 (8) years Time since injury mean (SD) = 19 (10) years Non-walkers: Mean (SD) age = 32 (7) years Time since injury mean (SD) = 12 (7) years		Non-Walkers: $r=0.62$, $p>.05$ Anthropometric measurements were used to predict body fat percentage with existing regression equations established for able-bodied persons. Body fat percentage calculated from most existing regression equations was significantly lower than that from DXA, by 2 to 9% in walkers and 8 to 14% in non-walkers.	Walkers = 85.5 (8.6) Non-walkers = 77.9 (7.8) Standard error of the estimate (SEE): Walkers = 4.00 Non-Walkers = 7.61
Ravensbergen et al. 2014 Cross-sectional Not specified	N = 27 with SCI (19M, 8F) Mean (SD) age = 40 (11) years Duration of injury	Pearson correlation between WC and body composition: Total body fat (g) = 0.68, $p=0.0002$ Total body fat (%) = 0.44, $p=0.03$		Interpretability Mean (SD) WC = 87.4 (11.7) Optimal cutoff = 94cm (95% confidence)

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	<p>mean (SD) = 166 (116) months</p> <p>AIS Grades: ASIA A = 14; ASIA B = 6; ASIA C = 5; ASIA D = 2</p>	<p>Abdominal fat (g) = 0.79, p<0.0001</p> <p>Abdominal fat (%) = 0.59, p<0.002</p> <p>Pearson correlation between WC and CVD risk factors: Insulin = 0.10, p=0.64 Fasting glucose = 0.46, p=0.03 Triglyceride = 0.46, p=0.03</p> <p>Total cholesterol (TC) = 0.57, p<0.01 HDL-C = -0.11, p=0.61 LDL-C = 0.43, p=0.04 TC/HDL-C ratio = 0.56, p<0.01 120-min glucose = 0.32, p=0.10 Insulin resistance = 0.20, p=0.35</p>		<p>interval [CI], 0.72–0.99; p<0.0001) Specificity = 100% Sensitivity = 79%</p>

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		Pearson correlation with Framingham risk score = 0.55, p=0.006		
Zwierzchowski et al. 2014 Cross-sectional Wheelchair rugby athletes in Poland	N = 14, all male Mean age (SD) = 32.6 (5.1) years Time since injury mean (SD) = 12.5 (5.7) years	Differences between the means of WC<94 and WC>94 (values reported below) are statistically significant (p<.01) Differences between BMI in groups with >13.5% and <13.5% visceral fat statistically significant (p<.01): Vfat <13.5% (n=8) = 86.63 +/- 4.6 Vfat >13.5% (n=6) = 99.67 +/- 5 Pearson correlation between BMI and visceral fat: Vfat <13.5% (n=8) = 0.7		Interpretability WC <= 94: n=7 mean (SD) = 85.7 (4.1) WC > 94: n=7 mean (SD) = 98.7 (5.2)

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		Vfat >13.5% (n=6) = 0.7 Total (n=14) = 0.9		
Alschuler et al. 2012 Cross-sectional Postal survey	n=488 with SCI (324M, 164F) Males: Mean age (SD) = 51.29 (13.8) Years since diagnosis mean (SD) = 15.91 (11.4) Females: Mean age (SD) = 47.49 (14.2) Years since diagnosis mean (SD) = 14.48 (11.0)	Correlation between BMI and waist circumference: Male = 0.46 Female = 0.45 p<.0001 Presence of group differences (between variables and conditions) in BMI but not waist circumference. Suggests WC may more accurately account for changes in body composition in people with disabilities.		Interpretability: Male: WC categories (%) Low risk = 253 (77.1) High risk = 75 (22.9) Female: WC categories (%) Low risk = 96 (58.5) High risk = 68 (41.5) *Risk defined with respect to developing medical conditions, according to NIH (1998) thresholds: 102cm in men & 88cm in women

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Eriks-Hoogland et al. 2011 Comparative cross-sectional study Convenience sample at outpatient clinic of spinal cord center	N = 23, all male Mean (SD) age = 43.3 (12) years Duration of injury mean (SD) = 14.6 (13.3) years AIS A = 22; AIS B = 1	Criterion validity: Pearson correlation between WC and bioelectrical impedance analysis (gold standard to estimate obesity) = 0.83		
Edwards et al. 2008 Cross-sectional Community/ Outpatient	n=31; 15 SCI (12M, 3F), 16 Able-Bodied (12 M, 4F) For SCI participants: traumatic, >= 1 year post-injury Mean (SD) age = 38.9 (7.9) years	Pearson correlation between WC and Visceral adipose tissue: Lowest rib = 0.925 Iliac crest = 0.905 Midpoint = 0.925 All p<.0001	Intra-rater Reliability Reproducibility (intra-rater, 2-3 repetitions): ICC (95%CI) = 0.999 (0.998-0.999)	Interpretability Mean (SD) WC (cm) in SCI group: Lowest rib = 92.3 (14.7); range = 66.8–123.3 Midpoint = 93.2 (15.5); range = 67.0–125.7 Iliac crest = 93.6 (14.5); range = 73.8–125.4

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Last updated: May 13th, 2024