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Okeefe L. Simmons, B.S. Jochen Kressler, Ph.D Mark S. Nash, Ph.D, FACSM.

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Running Title: Reference Fitness Values in SCI

Reference Fitness Values in the Untrained Spinal Cord Injury Population

*[1]Okeefe L. Simmons, B.S., *[1]Jochen Kressler, Ph.D, [1]Mark S. Nash, Ph.D, FACSM.

***These authors contributed equally to this work.**

University of Miami Miller School of Medicine Miami, FL.

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Corresponding Author:

Okeefe L. Simmons

1095 NW 14th Ter, Miami, Fl 33136

Phone: 305 243 7122, fax: 305 243 3215

OLSimmons@med.miami.edu

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Abstract

OBJECTIVE: Establish reference values of cardiorespiratory (CR) fitness applicable to the general, untrained SCI population

DESIGN: Data were retroactively obtained from twelve studies (May 2004 to May 2012)

SETTING: Applied Physiology Research Laboratory at the University of Miami Miller School of Medicine's Miami Project to Cure Paralysis

PARTICIPANTS: 153 males and 26 females aged 18 to 55 with chronic SCI were included. Participants were not involved in training activities for ≥ 1 month before testing, and able to complete a progressive resistance exercise test to determine peak aerobic capacity (VO2peak)

INTERVENTIONS: Not Applicable

MAIN OUTCOME MEASURE: Percentile ranking (poor<20%, fair 20-40%, average 40-60%, good 60-80%, excellent 80-100%) used to establish reference values

RESULTS: Reference CR fitness values based on functional classification as paraplegic (PP) or tetraplegic (TP) were established (PP: median=16.0ml/kg/min, range=1.4-35.2ml/kg/min, and TP: median = 8.8ml/kg/min, range=1.5-21.5ml/kg/min) for untrained men and women. For the primary outcome measure (VO_{2peak}), persons with PP had significantly higher values than TP ($p < .001$), while men had higher values than women though these differences did not reach significance ($p = .256$). Regression analysis revealed that motor level of injury (LOI) was associated with 22.3% of the variability in VO2peak (p<.001), and an additional 8.7% was associated with BMI (p<.001). No other measure accounted for additional significant variability.

CONCLUSION: Established reference fitness values will allow investigators/clinicians to stratify relative fitness of subjects/patients from the general SCI population. Key determinants are motor LOI and body habitus, yet most variability in aerobic capacity is not associated with standard measures of SCI status or demographics.

KEY WORDS: Aerobic exercise, paraplegia, tetraplegia

ABBREVIATIONS: CR = cardiorespiratory; SCI = spinal cord injury;
VO2peak = peak aerobic capacity, PP = paraplegic; TP = tetraplegic;
LOI = level of injury; QOL = quality of life; PO_{peak} = peak aerobic power output;
ASIA = American Spinal Injury Association; AIS = ASIA Impairment Scale;
BMI = body mass index; R-VO_{2peak} = relative peak aerobic capacity;
A-VO_{2peak} = absolute peak aerobic capacity; W_{peak} = peak anaerobic power;
1-RM = one-repetition maximum strength; ANOVA = Analysis of Variance;
TSI = time since injury

Spinal cord injuries (SCI) resulting from trauma and disease are life-altering events that result in varying degrees of sensorimotor deficit, and are typically accompanied by a loss or decline of functional capacities, independence, and health [1-3]. These losses can be counterbalanced to varying degrees by high levels of exercise [4-6]. In addition, more fit, physically active people with SCI have a higher overall quality of life (QOL) [7] further highlighting the need to improve/maintain fitness levels in this population. The first step in achieving this goal is to identify the current fitness status of the individual, particularly for those aspects of fitness that most closely relate to overall functionality and health.

Cardiorespiratory (CR) fitness is a common component of physical fitness related to health outcomes. It is best represented quantitatively by the peak aerobic capacity ($VO_{2\ peak}$) and peak aerobic power output (PO_{peak}) [7]. A number of studies have demonstrated the association between physical activity, $VO_{2\ peak}$, and PO_{peak} with health and functional outcomes in various populations [8-12]. In persons with SCI, physical activity is inversely related to risk factors for chronic diseases [13]. In addition, PO_{peak} and muscular strength have the greatest impact on the ability to perform functional wheelchair maneuvers [14], which are important for maintaining independence. Further, higher PO_{peak} and VO_{2peak} values are associated with less sickness, as well as higher functional status [15].

In order to identify a person's CR fitness status, reference values for $VO_{2\ peak}$ have been established for the non-disabled population [16]. For the SCI population, standardized values have been described for several components of fitness [17-19]. However, these studies either extrapolated values from subpeak exercise tests, reported on relatively small sample sizes, failed to include people with tetraplegia (TP), or had disproportionate levels of athletes [1]. The most complete study to assesses $VO_{2\ peak}$ in this population examined 166 individuals with SCI [1], provided categories for functional classification (i.e., paraplegia (PP) vs. TP) and explored determinants of $VO_{2\ peak}$ based on standard SCI measures and demographics [1]. However, the sample contained a proportion of athletes (~40%) that is considerably larger than represented in the general population [20] and did not provide separate categories for women [1]. Thus, the current study developed stratified reference values of CR fitness for untrained men and women with SCI resulting in both PP, and TP. We further examined predictors for levels of CR fitness.

METHODS:

Data Collection:

Data were retroactively obtained from twelve studies conducted in the Applied Physiology Research Laboratory at the Miami Project to Cure Paralysis spanning May 2004 to May 2012. Written and verbal informed consent was obtained from all participants. All protocols were approved by the Human Subjects Research Office, Miller School of Medicine, University of Miami. All participants were: (1) generally healthy (i.e. no diagnosed disease or injury beyond SCI), (2) untrained for at least 1 month, (3) used a wheelchair as their primary means of propulsion following SCI diagnosis, (4) able to complete peak aerobic capacity testing while seated in a wheelchair, (5) at least 6 months post-injury, and (6) between 18 and 55 years of age.

Subject characteristics are detailed in Table 1 (PP: *n* = 109 (62%), TP: *n* = 68 (38%), AIS A: *n* = 42 (67%), B: *n* = 17 (27%), C: *n* = 3 (5%), D: *n* = 1 (1%)). A total of

179 male (*n*=153) and female (*n*=26) subjects aged 18 to 53 years were included in this study. The motor level of injury (LOI) ranged from C3 to L5 and the ASIA (American Spinal Injury Association) impairment scale (AIS) ranged from A to D.

Data Modification and Analysis:

Separate sequential numeric systems were used to code the motor LOI and ASIA impairment of each subject. A numeric value of 1 was assigned to C1, and each successive vertebral level was assigned the next ascending full number. For instance, a motor LOI value of 8 referred to C8, 9 indicated a T1 LOI, and the value 10 was assigned to a T2 injury level. Functional classification was described based on observations during exercise testing, in which subjects were subsequently categorized as TP or PP. Missing functional classifications were filled according to motor LOI (C1-C8 = paraplegic, T1-L5 = tetraplegic). An AIS A was coded as the number 1, B = 2, C = 3, and D = 4. AIS A was coded as a complete SCI while AIS B, C, and D were designated as incomplete. Other subject characteristics such as time since injury, height, body mass, BMI, and physical fitness measurements were also extracted from data files.

Available fitness measures were relative (R-, i.e normalized to body mass) and absolute (A-)$VO_{2\ peak}$ (N = 179, *n* = 179; median age: 35, standard deviation: 10, age range:18-53), relative and absolute PO_{peak} (*n* = 144), peak anaerobic power (W_{peak}, *n* = 95), and one-repetition maximum (1-RM) strength (*n = 54*). $VO_{2\ peak}$ was obtained in all applicable studies via indirect calorimetry during incremental exercise protocols to exhaustion on arm ergometers. Protocols varied across studies, but consistently included 3 min stages with progressively increasing resistance workloads, and breath by breath gas exchange measurements. W_{peak} measures were determined by Wingate testing as described elsewhere [21]. Muscle strength was assessed by 6 full range bilateral maneuvers for the major muscle groups of the upper body: Horizontal Row (HR); Butterfly (BF); Dip (DIP); Overhead Press (OHP); Lat Pull Down (LPD); Pulley Curl (PC) [22, 23]. Only subjects who could perform the movement (only subjects with incomplete injuries for high level TP) were included; those who had difficulty with grip strength were provided assistive devices, such as cuffs and hooks. For correlation/regression analysis (see below) the 1-RM of these 6 exercises were ranked and recorded as a percentile. The mean of these 6 percentiles were then ranked to yield a final 1-RM percentile rank representative of muscle strength; only this single value was used in the regression analysis. All data from subjects that participated in multiple studies were averaged to yield a single value.

Physical fitness values for each subject were grouped into reference categories according to percentile ranking as described previously (i.e. poor<20%, fair 20-40%, average 40-60%, good 60-80%, excellent 80-100%) [1].

Statistical Analysis:

Data are presented as means ± standard deviation unless otherwise indicated. Pearson correlations were used to derive the correlation matrix. Stepwise linear regression was used to explore associations in variability between subject characteristics and physical fitness measures. Differences between functional classifications and sex were analyzed with 2-way Analysis of Variance (ANOVA). Significance level for all analyses was set a priori at $\alpha = .05$.

RESULTS:

Reference Values:

Reference male and female values for CR fitness parameters, categorized by the functional designation as paraplegic (PP) or tetraplegic (TP) are presented in Table 2. For the primary outcome measure (R-VO_2), persons with PP had significantly higher values than TP ($p < .001$), while men had higher values than women though these differences did not reach significance ($p = .256$).

Correlation Matrix:

Pearson correlation coefficients are presented in Table 3. Sample sizes for each correlation varied, as some subjects did not have available data for all variables. Both motor LOI and functional classification had strong correlations with R-VO_{2peak} (r = 0.488, $p < .001$ and r = -.473, $p < .001$, respectively) and other fitness measures, except muscular strength. BMI and body mass had statistically significant correlations with most fitness measures, including R-VO_{2peak} (r = -.244, p = .001 and r = -.240, p = .001, respectively). Sex was significantly correlated with certain fitness measures, but not R-VO_{2peak} (r = .-105, p = .160). By contrast, age, TSI, and AISA Classification did not have statistically significant correlations with any of the fitness measures (p =.080 to .998).

Regression Analysis:

Stepwise linear regression analyses of physical fitness parameters were performed for subject characteristics having the largest available sample sizes (motor LOI (n = 178), functional classification (n = 179), sex (n = 179), age (n = 179), body mass (n = 179), BMI (n = 175)). Motor LOI was associated with 22.3% of the variability in $VO_{2\ peak}$ (F(1, 173) = 49.66, p < .001), while an additional 8.7% was associated with BMI (F(1, 172) = 21.75, p< .001). Based on these findings, $VO_{2\ peak}$ is expected to increase by 0.57 ml/kg/min for each spinal segment of motor LOI, and to decrease by 0.32 ml/kg/min for each kg/m^2 of increase in BMI score (Table 4). Other measures of CR fitness showed similar regression patterns to those described for $VO_{2\ peak}$ and are presented in Table 4.

Peak Anaerobic Power and Muscular Strength:

Data incorporated in analyses of W_{peak} and 1-RM were derived from 95 and 54 subjects, respectively. Persons with PP had higher values for W_{peak} (p = .001) as well as for measures of anaerobic fatigue resistance and strength (Table 5). Similarly, males tended to have higher values than females for W_{peak} (p = .004) as well as for measures of anaerobic fatigue resistance and strength. Stepwise analyses revealed that motor LOI, sex, and functional classification were associated with significant variability in both W_{peak} and 1-RM values (Table 4).

DISCUSSION:

The primary benefit of this study was the establishment of reference values for CR fitness in untrained men and women with SCI. Others have described similar values for various populations including SCI [17, 19, 24-27]. These studies, however, did not provide separate reference values for persons with TP, despite the widely reported lower physical capacity of these individuals [28, 29]. Janssen et al., 2002 [1] established reference CR values for persons with PP and TP but athletes comprised a large percentage (~40%) of the sample population and values were combined for men and women, potentially overestimating values for the largely more sedentary SCI population [13, 20, 30]. In addition, the current study is the first to provide spate reference values for women with SCI, who represent about 20% of the population [31]. This is especially important as women are typically underrepresented in studies examining exercise conditioning after SCI and studies consistently show that women in various populations have lower physical fitness values than males [24, 25, 27, 29, 32, 33]. It is therefore important to provide, whenever possible, sex specific-fitness data.

Determinants of Physical Fitness:

Exploratory analysis of determinants of VO_{2peak} revealed that motor LOI was the most highly associated measure with CR fitness. This positive association was in accordance with previous data that showed a lower lesion level to correlate with increased physical capacity, likely because these individuals have more voluntarily functional muscle mass [34], although possibly due to greater trunk stability during physical activity. The only other study [1] to analyze determinants of CR fitness also identified motor LOI as the most highly associated measure. However, in contrast to the current study, they focused on A-$VO_{2\ peak}$ where activity level, body mass, and age were also identified as significant determinants. Evidently any associations with activity levels cannot be compared across studies as the study by Janssen et al., 2002 [1] included 40% athletes while the current study included only untrained individuals and activity levels were not available. As for body habitus, Janssen et al. 2002 [1] reported a positive association of body mass and A-$VO_{2\ peak}$, whereas our study showed the opposite for BMI (and R- A-$VO_{2\ peak}$). These disparate findings may reflect key differences in the two study populations, namely representation by trained individuals. While speculative, in the Janssen et al. 2002 study [1] greater body mass may reflect greater muscle mass of more fit individuals, whereas a higher body mass/BMI in our subjects may reflect higher levels of body fat related to lower fitness. It is not clear why age did not explain significant variability in our study, as it is estimated that $VO_{2\ peak}$ declines in sedentary non-disabled individuals by an average of 8-10% per decade, which is largely due to a loss in muscle mass [35]. By contrast, Janssen et al. 2002 (18) reported a 0.01 L/min decline in A-VO_{2peak} per year. Using the values from the average category reported for their sample this would equate to ~10-13% decline per decade. However, while this association was statistically significant it only accounted for an additional 2% of the variability in $VO_{2\ peak}$ (beyond lesion and activity level, sex and body mass). It is therefore likely that any effect of aging on VO_{2peak} is largely overlapping with changes body mass/composition. Additional studies investigating measures of body composition will be needed to determine whether a loss in muscle mass, rather than aging per se causes VO_{2peak} to decline.

Implications:

While it is not surprising that motor LOI accounts for a large part of the variability in VO_{2peak} it is important to note that this still represents less than one quarter of the total variability. No other measures related to SCI (e.g., AIS grade) or any non-modifiable measures (e.g., age) accounted for a significant portion of the variability (beyond BMI). All people with SCI should therefore be encouraged to undertake efforts to increase their level of fitness. To this end scientists and clinicians may use the reference values provided in this study to identify fitness status in subjects/patients and tailor recommendations for interventions/treatment accordingly. In addition, these values also allow for classification of population samples for clinical/research interventions and epidemiological assessment.

Study Limitations:

Not all of the study data could be retrieved due to the retroactive nature of this study. This led to exclusion of selected subject characteristics from correlation and regression analysis. The generalizability of our results is limited, as our study population was comprised of a large proportion of adults in their thirties; approximately 14% of subjects were women, though women represent 20% of the general SCI population; and subject activity level may have varied prior to the untrained ‘control’ month which preceded participation in the study. Furthermore, data for aerobic fitness in women with SCI, as well as anaerobic fitness and muscular strength in men were only available for a subset of subjects. Since there are currently no data available on these measures we deemed it appropriate to display results even with these relatively small number of subjects. These results should therefore be considered descriptive and inferences should be met with caution. Last, regression analysis was not based on a pre-determined hypothesis but rather used a stepwise approach of available determinants.

Summary:

This study provides reference fitness values applicable to the majority of men and women with chronic SCI, and showed major determinants of CR capacity to be level of injury and body habitus. Among other applications, the reference data can be used to qualify subjects for participation in research studies, or as a clinical risk assessment tool to classify patients based on fitness and develop appropriate clinical training regimens.

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The present study do not constitute endorsement by ACSM.

Conflict of Interest:

The authors have no conflicts of interest.

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TABLE 1: Subject characteristics based on sex and functional classification.

Variable	Functional Classification	MALE			FEMALE		
		Range	Mean	SD	Range	Mean	SD
Age (years)	PP	18-53	36	9.3	19-49	33.6	10.2
	TP	19-53	35	10.3	30-49	40.0	7.0
TSI (years)	PP	1-45	11	9.6	1-25	9.4	8.1
	TP	1-36	13	11.3	2-28	15.0	18
Height (m)	PP	1.4-2.0	1.8	0.1	1.6-1.8	1.6	0.1
	TP	1.6-2.0	1.8	0.1	1.6-1.8	1.7	0.1
Body Mass (kg)	PP	45.9-157.7	82.0	18.2	42.0-106.5	62.7	15.5
	TP	49.4-120.3	78.11	14.7	47.7-138.0	78.13	35.0
BMI (kg/m^2)	PP	16.3-46.2	26.2	5.9	16.1-43.0	23.5	6.4
	TP	15.8-38.0	24.4	4.3	16.0-47.7	28.1	12.8

PP: Paraplegic. TP: Tetraplegic. TSI: Time Since Injury.

TABLE 2: Reference values of physical fitness parameters based on sex and functional classification.

MALES

Fitness Measure	Functional Classification	*n*	POOR (*n*)	FAIR (*n*)	AVERAGE (*n*)	GOOD (*n*)	EXCELLENT (*n*)
R-$VO2_{peak}$	TP	60	<5.30 (11)	5.30-7.90 (12)	7.91-9.50 (12)	9.51-15.18 (12)	>15.18 (13)
(mL/kg/min)	PP	93	<12.00 (18)	12.00-15.30 (18)	15.31-17.69 (19)	17.70-22.40 (18)	>22.40 (20)
A-$VO2_{peak}$	TP	60	<0.39 (11)	0.39-0.64 (12)	0.65-0.81 (12)	0.82-1.02 (12)	>1.02 (13)
(L/min)	PP	93	<1.06 (18)	1.06-1.27 (18)	1.28-1.41 (19)	1.42-1.68 (18)	>1.68 (20)
R-PO_{peak}	TP	42	<0.06 (8)	0.06-0.13 (8)	0.14-0.26 (9)	0.27-0.48 (8)	>0.48 (9)
(W/kg)	PP	81	<0.58 (15)	0.58-0.84 (16)	0.85-0.98 (17)	0.99-1.13 (16)	>1.13 (17)
A-PO_{peak}	TP	42	<5.00 (8)	5.00-10.83 (8)	10.84-24.44 (9)	24.45-35.00 (8)	>35.00 (9)
(W)	PP	81	<46.32 (15)	46.32-62.22 (16)	62.23-77.50 (17)	77.51-88.89 (16)	>88.89 (17)

FEMALES

Fitness Measure	Functional Classification	*n*	Median	Range
R-$VO2_{peak}$	TP	8	9.37	4.90-21.50
(mL/kg/min)	PP	18	13.21	5.40-19.20
A-$VO2_{peak}$	TP	8	0.68	0.30-1.09
(L/min)	PP	18	0.76	0.30-1.23
R-PO_{peak}	TP	6	0.19	0.00 – 0.63
(W/kg)	PP	15	0.71	0.25-1.27
A-PO_{peak}	TP	6	16.69	0.00-30.00
(W)	PP	15	45.00	15.00-70.00

R-$VO_{2\ peak}$: Relative Peak Aerobic Capacity. A-$VO2_{peak}$: Absolute Peak Aerobic Capacity.

R- PO_{peak}: Relative Peak Aerobic Power Output. A-PO_{peak}: Absolute Peak Aerobic Power Output.

PP: Paraplegic. TP: Tetraplegic.

TABLE 3: Pearson Correlation coefficients for subject characteristics and physical capacity parameters.

	Statistic	R-$VO2_{peak}$	A-$VO2_{peak}$	A-PO_{peak}	R-PO_{peak}	1-RM	W_{peak}
Motor LOI	*r*	.488**	.519**	.703**	.670**	.134	.605**
	p	<.001	<.001	<.001	<.001	.340	<.001
	n	178	178	143	143	53	94
Functional Classsification	*r*	-.473**	-.480**	-.693**	-.671**	-.048	-.578**
	p	<.001	<.001	<.001	<.001	.732	<.001
	n	179	179	144	144	54	95
Sex	*r*	-.105	-.247**	-.200*	-..087	.254	-.320**
	p	.160	.001	.016	.297	.063	.002
	n	179	179	144	144	54	95
Age	*r*	-.012	.049	-.036	-.077	.098	.067
	p	.876	.511	.670	.362	.479	.517
	n	179	179	144	144	54	95
TSI	*r*	-.130	-.101	-.059	-.071	.000	-.036
	p	.172	.288	.537	.455	.998	.728
	n	113	113	112	112	52	95
ASIA	*r*	.059	.047	-.202	-.133	.319	-.250
	p	.564	.646	.080	.252	.092	.098
	n	97	97	76	76	29	45
Completeness	*r*	-.076	-.038	-.201	-.194	.225	-.290*
	p	.424	.691	.053	.061	.174	.026
	n	114	114	94	94	38	59

BMI	r	-.244**	.155*	.084	-.205*	.995**	.336**
	p	.001	.040	.318	.014	<.001	.001
	n	175	175	144	144	54	95
Body Mass	r	-.240**	.210**	.072	-.275**	.885**	.405**
	p	.001	.005	.391	.001	<.001	<.001
	n	179	179	144	144	54	95

*: $p < .05$; **: $p < .01$

R-$VO_{2\ peak}$: Relative Peak Aerobic Capacity. A-$VO2_{peak}$: Absolute Peak Aerobic Capacity. R-PO_{peak}: Relative Peak Aerobic Power Output; A-PO_{peak}: Absolute Peak Aerobic Power Output. 1-RM: 1 repetition maximum' W_{peak}: Peak anaerobic power. LOI: Level of Injury. TSI: Time since injury. BMI: Body mass index.

TABLE 4: Results of stepwise linear regression for those subject characteristics with n > 175 to predict physical fitness. Values are reported as mean ± *SD*.

Fitness Parameter	n	Regression Coefficient + Intercept	Subject Characteristic	p	Cumulative R^2
$R\text{-}VO2_{peak}$ (mL/kg/min)	175	0.57 ± 0.07	Motor LOI	<.001	.223
		-0.32 ± 0.07	BMI (kg/m^2)	<.001	.310
		15.16 ± 1.89	(intercept)	<.001	-
$A\text{-}VO2_{peak}$ (L/min)	175	0.04 ± 0.01	Motor LOI	<.001	.253
		-0.33 ± 0.09	Sex	<.001	.311
		0.95± 0.13	(intercept)	<.001	-
$R\text{-}PO_{peak}$ (W/kg)	144	-0.30 ± 0.09	Functional Classification	.001	.451
		-0.02 ± 0.00	BMI (kg/m^2)	<.001	.509
		0.03 ± 0.01	Motor LOI	<.001	.565
		1.17 ± 0.22	(intercept)	<.001	-
A- PO_{peak} (W)	144	1.98 ± 0.56	Motor LOI	.001	.492
		-27.33 ± 6.71	Functional Classification	<.001	.531
		-18.05 ± 5.06	Sex	<.001	.570
		83.53 ± 17.24	(intercept)	<.001	-
W_{peak} (W)	94	1.98 ± 0.56	Motor LOI	.001	.492
		-18.05 ± 5.06	Sex	<.001	.531
		-27.33 ± 6.71	Functional Classification	<.001	.570
		83.53 ± 17.24	(intercept)	<.001	-

		-27.99 ± 6.23	Functional Classification	<.001	.399
1-RM		-34.88 ± 7.54	Sex	<.001	.585
(percentile rank)	52	1.51 ± 0.53	Motor LOI	.007	.650
		108.09 ± 15.68	(intercept)	<.001	-

R-$VO_{2\ peak}$: Relative Peak Aerobic Capacity. A-$VO2_{peak}$: Absolute Peak Aerobic Capacity. R-PO_{peak}: Relative Peak Aerobic Power Output; A-PO_{peak}: Absolute Peak Aerobic Power Output. 1-RM: 1 repetition maximum' W_{peak}: Peak anaerobic power. LOI: Level of Injury. TSI: Time since injury. BMI: Body mass index.

TABLE 5: Reference table for male measures of anaerobic power (W) and muscular strength (HR = Horizontal Row; BF = Butterfly; DIP = Dip; OHP = Overhead Press; LPD = Lat Pull Down; PC = Pulley Curl). Values are reported as mean ± standard deviation. The number of subjects used to derive the values varied due to missing data.

Fitness Measure	Test	Men PP	Men TP	Women PP	Women TP	Significance (*p*) PP vs. TP	Significance (*p*) Men vs. Women
Anaerobic Power (W)	Wingate	251 ± 85 (*n* = 56)	96 ± 61 (*n* = 25)	111 ± 38 (*n* = 11)	57 ± 76 (*n* = 2)	.001	.004
Ave Power* (W)	Wingate	163 ± 61 (*n* = 54)	65 ± 46 (*n* = 25)	68 ± 22 (*n* = 11)	8 ± 11 (*n* = 2)	.084	.171
Power decline* (W/s)	Wingate	14 ± 10 (*n* = 40)	3 ± 2 (*n* = 12)	5 ± 5 (*n* = 8)	2 ± 3 (*n* = 2)	.001	.004
Muscular Strength (lbs.)	HR	151 ± 31 (*n* = 31)	76 ± 27 (*n* = 15)	93 ± 11 (*n* = 5)	39 ± 14 (*n* = 2)	<.001	<.001
	BF	171 ± 40 (*n* = 31)	87 ± 32 (*n* = 15)	79 ± 11 (*n* = 4)	33 ± 30 (*n* = 2)	<.001	<.001
	DIP	139 ± 30 (*n* = 31)	50 ± 25 (*n* = 15)	76 ± 24 (*n* = 5)	31 ± 21 (*n* = 2)	<.001	.002
	OHP	152 ± 51 (*n* = 30)	59 ± 37 (*n* = 14)	80 ± 25 (*n* = 4)	23 (*n* = 1)	.007	.050
	LPD	158 ± 31	77 ± 24	94 ± 19	43 ± 25	<.001	<.001

	(n = 31)	(n = 15)	(n = 5)	(n = 2)		
PC*	75 ± 14 (n = 31)	67 ± 23 (n = 15)	36 ± 3 (n = 5)	29 ± 25 (n = 2)	.311	<.001

*Levene's test is significant ($p < .05$)