

K-STATE CROSSFIT PROGRAM EVALUATION SYSTEM – NORMATIVE VALUES

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HEALTH MEASURES**Body Mass Index (BMI)**

Body Mass Index (BMI) is an estimate of body composition. It is a weight-to-height ratio, calculated by: (weight in pounds / height in inches²) x 703.

Body Mass Index (BMI) ¹			
Underweight	Normal Weight	Overweight	Obese
< 18.5	18.5 – 24.9	25.0-29.9	30+

Waist Circumference

Waist circumference (WC) is an indicator of health risk associated with excess fat around the waist.

Health Risk Categories for Waist Circumference in Adults ²				
	Very Low	Low	High	Very High
Male	< 31.5 in	31.5-39.0 in	39.1-47.0 in	> 47.0 in
Female	< 28.5 in	28.5-35.0	35.1-43.0 in	> 43.0 in

Body Fat %

Body composition was measured using the Tanita bioelectrical impedance scale, which passes a very light level of electricity through the body. Based on how much resistance that electricity meets within the body, the Tanita estimates body composition (% lean mass, % fat mass). Body Fat % is an estimate of one's body fat and includes essential body fat and stored body fat. Essential body fat is necessary to maintain life and reproductive functions. Two measures are included, "Standard" and "Athletic". Tanita defines "athletic" as a person involved in intense physical activity for approximately 12 hours per week or more.

Body Composition (Body Fat %) Normative Values - Males²					
	Age				
Percentile	20-29	30-39	40-49	50-59	60+
Excellent	7.1-9.4	11.3-13.9	13.6-16.3	15.3-17.9	15.3-18.4
Above Average	11.8-14.1	15.9-17.5	18.1-19.6	19.8-21.3	20.3-22.0
Average	15.9-17.4	19.0-20.5	21.1-22.5	22.7-24.1	23.5-25.0
Below Average	19.5-22.4	22.3-24.2	24.1-26.1	25.7-27.5	26.7-28.5
Poor	25.9	27.3	28.9	30.3	31.2

Body Composition (Body Fat %) Normative Values - Females²					
	Age				
Percentile	20-29	30-39	40-49	50-59	60+
Excellent	14.5-17.1	15.5-18.0	18.5-21.3	21.6-25.0	21.1-25.1
Above Average	19.0-20.6	20.0-21.6	23.5-24.9	26.2-28.5	27.5-29.3
Average	22.1-23.7	23.1-24.9	26.4-28.1	30.1-31.6	30.9-32.5
Below Average	25.4-27.7	27.0-29.3	30.1-32.1	33.5-35.6	34.3-36.6
Poor	32.1	32.8	35.0	37.9	39.3

Resting Heart Rate

The normal resting heart rate for adults, including older adults, is between 60 and 100 beats per minute (bpm). Highly trained athletes may have a resting heart rate below 60 bpm, sometimes reaching 40 bpm.

Resting Heart Rate Normative Values - Males³						
Age	18-25	26-35	36-45	46-55	56-65	65+
Athlete	49-55	49-54	50-56	50-57	51-56	50-55
Excellent	56-61	55-61	57-62	58-63	57-61	56-61
Good	62-65	62-65	63-66	64-67	62-67	62-65
Above Average	66-69	66-70	67-70	68-71	68-71	66-69
Average	70-73	71-74	71-75	72-76	72-75	70-73
Below Average	74-81	75-81	76-82	77-83	76-81	74-79
Poor	82+	82+	83+	84+	82+	80+

Resting Heart Rate Normative Values - Females ³						
Age	18-25	26-35	36-45	46-55	56-65	65+
Athlete	54-60	54-59	54-59	54-60	54-59	54-59
Excellent	61-65	60-64	60-64	61-65	60-64	60-64
Good	66-69	65-68	65-69	66-69	65-68	65-68
Above Average	70-73	69-72	70-73	70-73	69-73	69-72
Average	74-78	73-76	74-78	74-77	74-77	73-76
Below Average	79-84	77-82	79-84	78-83	78-83	77-84
Poor	85+	83+	85+	84+	84+	84+

Resting Blood Pressure

Optimal blood pressure is typically defined as >120 mmHg systolic (which is the pressure as your heart beats) over >80 mmHg diastolic (which is the pressure as your heart relaxes).

Resting Blood Pressure ³		
Category	Systolic	Diastolic
Normal	< 120	< 80
Prehypertensive	120-139	80-89
Hypertension I	140-159	90-99
Hypertension II	≥ 160	≥ 100

FITNESS MEASURES

For some of the measures below, there are no standardized normative values. We have listed mean (average) values ± the standard deviation from previous K-State CrossFit members who participated in the an earlier Program Evaluation study (N=89).

Balance Tests

The Agility Hop Test assesses coordination, balance, and accuracy, which include the ability to combine several distinct movement patterns together, to maintain the center of gravity over the base of support, and to control movement in a given direction. The number of errors during the test are recorded and the norms presented below are from previous K-State CrossFit members. As an alternative, the Single Leg Stance Test is a measure of balance on a single leg. Norms are provided by age group below.

Agility Hop Balance Test ⁴	
Age	Average # of Errors
>20 (n=11)	4.1 ± 1.7
20-29 (n=42)	4.3 ± 1.3
30-39 (n=18)	6.1 ± 2.8
40-49 (n=6)	6.2 ± 2.6
50-59 (n=7)	9.4 ± 2.6
60-69 (n=11)	8.8 ± 2.7

Single Leg Stance Test⁸					
Age & Gender Groups		Best of 3 trials (sec) Mean (SE)	Age & Gender Groups		Best of 3 trials (sec) Mean (SE)
18-39	Female (n=44)	45.1 (0.1)	60-69	Female (n=50)	30.4 (16.4)
	Male (n=54)	44.4 (4.1)		Male (n=51)	33.8 (16.0)
	Total (n=98)	44.7 (3.1)		Total (n=101)	32.1 (16.2)
40-49	Female (n=47)	42.1 (9.5)	70-79	Female (n=45)	16.7 (15.0)
	Male (n=51)	41.6 (10.2)		Male (n=50)	25.9 (18.1)
	Total (n=98)	41.9 (9.9)		Total (n=95)	21.5 (17.3)
50-59	Female (n=50)	40.9 (10.0)	80-99	Female (n=22)	10.6 (13.2)
	Male (n=48)	41.5 (10.5)		Male (n=37)	8.7 (12.6)
	Total (n=98)	41.2 (10.2)		Total (n=59)	9.4 (12.8)

Pro Agility Test

The pro-agility test is a measure of the ability to change direction rapidly and requires speed, coordination, and agility to complete. While norms are available for college and pro athletes, they are not relative to participants in our study. Below are the average values by age group and gender for participants in the K-State CrossFit Program Evaluation studies.

Males Agility Test Average Times (sec)⁴			
Age	25th percentile	50th percentile	75th percentile
<20	5.1	4.9	4.7
20-29	5.5	5.4	5.2
30-39	5.4	5.2	5.0
40-49	6.0	5.9	5.2
50-59	6.6	6.5	6.1
60-69	8.4	6.3	6.1
70+	15	7.4	6.7
Females Agility Test Average Times (sec)⁴			
Age	25th percentile	50th percentile	75th percentile
<20	5.7	5.3	5.0
20-29	6.4	6.0	5.7
30-39	6.4	6.2	5.5
40-49	7.0	6.2	5.8
50-59	8.3	6.9	6.7
60-69	8.4	7.3	6.8
70+	8.9	8.2	7.1

Sit & Reach (in)

Flexibility is the lower body periarticular structures (i.e., muscle, tendon, fascia) and hamstring extensibility. Normative values are provided from the American College of Sports Medicine.²

Sit & Reach Normative Values (cm)²										
Age										
Category	20-29		30-39		40-49		50-59		60-69	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Excellent	40.6	40.6	38.1	40.6	35.6	40.6	35.6	38.1	33	35.6
Very Good	33-38.1	38.1	33-35.6	35.6-38.1	27.9-33	33-35.6	27.9-33	33-35.6	25.4-30.5	30.5-33
Good	30.5	33-35.6	27.9-30.5	33	22.9-25.4	30.5	22.9-25.4	30.5	20.3-22.9	27.9
Fair	25.4-27.9	27.9-30.5	22.9-25.4	27.9-30.5	20.3	25.4-27.9	17.8-20.3	25.4-27.9	15.2-17.8	25.4
Needs Improvement	24.1	26.7	21.6	25.4	17.8	22.9	15.2	22.9	14	22.9

Standing Long Jump

The standing long jump is a measure of power. Power is a clustering of neuromuscular factors related to maximal force production and rate of force development. The norms presented below may not be applicable for older participants.

Standing Long Jump Normative Values (cm)⁵		
Category	Males	Females
Excellent	>249.9	>199.9
Very Good	241-249.9	191-199.9
Above Average	230.9-240	181.1-190
Average	221-230.1	170.9-180.1
Below Average	211.7-220	161-169.9
Poor	191-210.1	150.9-160
Very Poor	<191	<151

Push-Ups

Push-ups are a measure of upper-body muscular endurance. Muscular endurance is the ability to voluntarily produce force or torque repeatedly against submaximal external resistances and tests the ability of the active musculature to resist fatigue. Participant norms in the table are from the ACSM. Averages for participants ages 70+ are shown below the table.

Push-up Normative Values²										
Age (years)										
Category	20-29		30-39		40-49		50-59		60-69	
	M	F	M	F	M	F	M	F	M	F
Excellent	36	30	30	27	25	24	21	21	18	17
Very Good	29-35	21-29	22-29	20-26	17-24	15-23	13-20	11-20	11-17	12-16
Good	22-28	15-20	17-21	13-19	3-16	11-14	10-12	7-10	8-10	5-11

Fair	17-21	10-14	12-16	8-12	10-12	5-10	7-9	2-6	5-7	2-4
Needs Improvement	16	9	11	7	9	4	6	1	4	1

NOTE: K-State CrossFit 70+ Normative Push-Up Values: Women (17.5 ± 5.7), Men (15.8 ± 8.9)

Plank Hold Test

The Plank Hold Test was used as an alternative for push-ups starting in May 2019. Normative data for the plank hold was taken from a sample of males aged 20.4 ± 0.2 and females aged 20.2 ± 0.2 , but will be updated as we collect more data.

Timed Forearm Plank Test¹⁰		
Category	Time (Min:Sec) Females	Time (Min:Sec) Males
Excellent	2:01+	2:21+
Above Average	1:31-2:00	1:45-2:20
Average	1:20-1:30	1:34-1:44
Below Average	1:03-1:19	1:17-1:33
Poor	<1:03	<1:17

NOTE: K-State CrossFit 70+ Normative Plank Hold Values: Women N/A, Men ($2:00 \pm 0.02$)

Squats

Squats are a measure of lower-body muscular endurance. Muscular endurance is the ability to voluntarily produce force or torque repeatedly against submaximal external resistances and tests the ability of the active musculature to resist fatigue.

1-minute Squat Test Normative Values⁴												
Age (years)												
Category	20-29 (n=60)		30-39 (n=25)		40-49 (n=14)		50-59 (n=13)		60-69 (n=33)		70+ (n=26)	
Sex	M	F	M	F	M	F	M	F	M	F	M	F
Excellent	53	48	49	54	50	49	52	40	38	40	42	36
Very Good	51	46	47	50	43	47	48	38	37	37	41	30
Good	49	42	47	41	41	46	45	35	37	35	41	27
Fair	48	40	46	41	40	44	44	34	37	30	40	26
Needs Improvement	47	39	45	39	40	43	43	34	36	29	38	24

Chair Stand Test (CST)

The CST assesses the ability to rise from a chair and sit back down, as well as lower body strength and power. This test is scored based on the number of repetitions completed in 30 seconds, with higher scores representing better performance.

Chair Stand Test – Males⁹							
Age Groups	60-64	65-69	70-74	75-79	80-84	85-89	90-94
Mean Score	14-19	12-18	12-17	11-17	10-15	8-14	7-12

Chair Stand Test – Females⁹							
Age Groups	60-64	65-69	70-74	75-79	80-84	85-89	90-94
Mean Score	12-17	11-16	10-15	10-15	9-14	8-13	4-11

500-meter Row

The 500-meter row is a measure of cardiorespiratory endurance. Percentiles were provided by Concept 2.

500-meter Row Percentiles - Males⁶				
Age	90th	75th	50th	25th
19-29	01:20.7	01:24.9	01:31.3	01:40.0
30-39	01:24.9	01:29.6	01:35.6	01:43.7
40-49	01:28.0	01:32.9	01:38.8	01:46.7
50-59	01:30.6	01:36.0	01:42.9	01:50.9
60-69	01:35.7	01:39.8	01:47.5	01:55.0
70-79	01:40.7	01:46.0	01:54.0	02:01.8
80-89	01:52.0	01:56.6	02:08.5	02:18.0

500-meter Row Percentiles - Females⁶				
Age	90th	75th	50th	25th
19-29	01:37.6	01:41.7	01:49.4	01:58.5
30-39	01:39.5	01:46.2	01:54.0	02:04.7
40-49	01:43.0	01:49.0	01:56.0	02:05.5
50-59	01:47.5	01:54.5	02:01.3	02:13.0
60-69	01:53.9	02:02.4	02:12.1	02:24.3
70-79	02:03.6	02:13.7	02:24.4	02:31.6

3 Repetition Maximum Deadlift

Strength is the ability of a muscle or group of muscles to produce force against an external resistance. Strength was measured with a 3 repetition maximum (RM) hex bar deadlift.

Pounds	3 RM Deadlift – Adult Males⁷				
Body Weight	Untrained	Novice	Intermediate	Advanced	Elite
114	89	168	192	281	361
123	98	182	206	300	389
132	107	196	225	318	412
148	117	220	253	356	450
165	126	239	276	384	478
181	140	257	295	412	515
198	145	271	314	431	529
220	154	285	328	450	548
242	159	300	342	459	557
275	164	304	351	468	562
319	168	314	356	473	571
320+	173	318	365	478	576

Pounds	3 Rep Max Deadlift - Adult Females⁷				
Body Weight	Untrained	Novice	Intermediate	Advanced	Elite
97	51	98	112	164	215
105	56	107	121	178	225
114	62	112	131	187	239
123	65	121	140	196	248
132	72	126	150	206	257
148	77	140	164	225	276
165	86	150	178	243	300
181	89	164	192	257	309
198	93	173	201	267	328
199+	103	182	215	281	342

References

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