

CASE STUDY 4

» INTERPRETING NORMATIVE VALUES FROM MUSCULOSKELETAL TESTS

Directions

We will be looking at the scores measured during a patient's fitness assessment, and determining their score based on current normative values charts.

Information

Christen is a 35 year old female. She is 5'6" and weighs 162 lbs. During her assessment we conducted the RMCRI treadmill test, the curl up test, and the sit and reach test. Her scores are below.

VO₂max : 33.5 mL/kg/min

Curl Up Test: 36

Sit and Reach Test: 16.5 in

Test	Category
VO ₂ max	
Curl Up Test	
Sit and Reach Test	

Body Composition Norms: Females

Percentile	Age				
	20-29	30-39	40-49	50-59	60-69
90	14.5	15.5	18.5	21.6	21.1
80	17.1	18.0	21.3	25.0	25.1
70	19.0	20.0	23.5	26.6	27.5
60	20.6	21.6	24.9	28.5	29.3
50	22.1	23.1	26.4	30.1	30.9
40	23.7	24.9	28.1	31.6	32.5
30	25.4	27.0	30.1	33.5	34.3
20	27.7	29.3	32.1	35.6	36.6
10	32.1	32.8	35.0	37.9	39.3

Body Composition Norms: Male

Age					
Percentile	20-29	30-39	40-49	50-59	60-69
90	7.1	11.3	13.6	15.3	15.3
80	9.4	13.9	16.3	17.9	18.4
70	11.8	15.9	18.1	19.8	20.3
60	14.1	17.5	19.6	21.3	22.0
50	15.9	19.0	21.1	22.7	23.5
40	17.4	20.5	22.5	24.1	25.0
30	19.5	22.3	24.1	25.7	26.7
20	22.4	24.2	26.1	27.5	28.5
10	25.9	27.3	28.9	30.3	31.2

Muscular Strength Norms: Hand Grip Dynamometer, Female

Age	15-19	20-29	30-39	40-49	50-59	60-69
Above Avg.	64-70	65-70	66-72	65-72	59-64	54-59
Average	59-63	61-64	61-65	59-64	55-58	51-53
Below Avg.	54-58	55-60	56-60	55-58	51-54	48-50
Poor	≤53	≤54	≤55	≤54	≤50	≤47

Muscular Strength Norms: Hand Grip Dynamometer, Male

Age	15-19	20-29	30-39	40-49	50-59	60-69
Above Avg.	103-112	113-123	113-122	110-118	102-109	98-101
Average	95-102	106-112	105-112	102-109	96-101	86-92
Below Avg.	84-94	97-105	97-104	94-101	87-95	79-85
Poor	≤83	≤96	≤96	≤93	≤86	≤78

Get Up and Go Scoring

- 1 Normal
- 2 Very slightly abnormal
- 3 Mildly abnormal
- 4 Moderately abnormal
- 5 Severely abnormal

Cardiovascular Fitness Norms: VO₂max (ml*kg⁻¹*min⁻¹), Female

Age	20-29	30-39	40-49	50-65
Low	≤ 28	≤ 27	≤ 25	≤ 21
Fair	29-34	28-33	26-31	22-28
Average	35-43	34-41	32-40	29-36
Good	44-48	42-47	41-45	37-41
High	49-53	48-52	46-50	42-45
Superior	54+	53+	51+	46+

Cardiovascular Fitness Norms: VO₂max (ml*kg⁻¹*min⁻¹), Male

Age	20-29	30-39	40-49	50-59	60-69
Low	≤ 38	≤ 34	≤ 30	≤ 25	≤ 21
Fair	39-43	35-39	31-35	26-31	22-26
Average	44-51	40-47	36-43	32-39	27-35
Good	52-56	48-51	44-47	40-43	36-39
High	57-62	52-57	48-53	44-48	40-44
Superior	63+	58+	54+	49+	45+

3-minute Step Test Norms, Female

Age	18-25	26-35	36-45	46-55	56-65	65+
Excellent	52-81	58-80	51-84	63-91	60-92	70-92
Good	85-93	85-92	89-96	95-101	97-103	96-101
Above Avg.	96-102	95-101	100-104	104-110	106-111	104-111
Average	104-110	104-110	107-112	113-118	113-118	116-121
Below Avg.	113-120	113-119	115-120	120-124	119-127	123-126
Poor	122-131	122-129	124-132	126-132	129-135	128-133
Very Poor	135-169	134-171	137-169	137-171	141-174	135-155

3-minute Step Test Norms, Male

Age	18-25	26-35	36-45	46-55	56-65	65+
Excellent	50-76	51-76	49-76	56-82	60-77	59-81
Good	79-84	79-85	80-88	87-93	86-94	87-92
Above Avg.	88-93	88-94	92-88	95-101	97-100	94-102
Average	95-100	96-102	100-105	103-111	103-109	104-110
Below Avg.	102-107	104-110	108-113	113-119	111-117	114-118
Poor	111-119	114-121	116-124	121-126	119-128	121-126
Very Poor	124-157	126-161	130-163	131-159	131-154	130-151

Partial Curl-up Norms, Female

Age					
Percentile	20-29	30-39	40-49	50-59	60-69
90	70	55	50	48	50
80	43	43	43	30	30
70	37	34	33	23	24
60	32	28	28	16	19
50	27	21	25	9	13
40	21	15	20	2	9
30	17	12	14	0	3
20	12	0	5	0	0
10	5	0	0	0	0

Partial Curl-up Norms, Male

Age					
Percentile	20-29	30-39	40-49	50-59	60-69
90	75	75	75	74	53
80	56	69	75	50	33
70	41	46	67	45	26
60	31	36	51	35	19
50	27	31	39	27	16
40	24	26	31	23	9
30	20	19	26	19	6
20	13	13	21	13	0
10	4	0	13	0	0

Source: ACSM's Guidelines for Exercise Testing and Prescription (7th ed.). Lippincott Williams & Wilkins. 2006

60 Second Squat Test Norms, Female

Age	18-25	26-35	36-45	46-55	56-65	65+
Excellent	> 43	> 39	> 33	> 27	> 24	>23
Good	37-43	33-39	27-33	22-27	18-24	17-23
Above Avg.	33-36	29-32	23-26	18-21	13-17	14-16
Average	29-32	25-28	19-22	14-17	10-12	11-13
Below Avg.	25-28	21-24	15-18	10-13	7-9	5-10
Poor	18-24	13-20	7-14	5-9	3-6	2-4
Very Poor	< 18	< 20	< 7	< 5	< 3	<2

60 Second Squat Test Norms, Male

Age	18-25	26-35	36-45	46-55	56-65	65+
Excellent	> 49	> 45	> 41	> 35	> 31	> 28
Good	44-49	40-45	35-41	29-35	25-31	22-28
Above Avg.	39-43	35-39	30-34	25-38	21-24	19-21
Average	35-38	31-34	27-29	22-24	17-20	15-18
Below Avg.	31-34	29-30	23-26	18-21	13-16	11-14
Poor	25-30	22-28	17-22	13-17	12-Sep	7-10
Very Poor	< 25	< 22	< 17	< 9	< 9	< 7

Flexibility Norms: Sit-and-Reach, Female

Percentile	Age		
	≤ 35 yr	36-49 yr	≥ 50 yr
99	70	55	50
95	18.7	19.2	15.7
90	17.9	17.4	15.0
80	16.7	16.2	14.2
70	16.2	15.2	13.6
60	15.8	14.5	12.3
50	14.8	13.5	11.1
40	14.5	12.8	10.1
30	13.7	12.2	9.2
20	12.6	11.0	8.3
10	10.1	9.7	7.5
05	8.1	8.5	3.7
01	2.6	2.0	1.5

Flexibility Norms: Sit-and-Reach, Male

Percentile	Age		
	≤ 35 yr	36-49 yr	≥ 50 yr
99	24.7	18.9	16.2
95	19.5	18.2	15.8
90	17.9	16.1	15.0
80	17.0	14.6	13.3
70	15.8	13.9	12.3
60	15.0	13.4	11.5
50	14.4	12.6	10.2
40	13.5	11.6	9.7
30	13.0	10.8	9.3
20	11.6	9.9	8.8
10	9.2	8.3	7.8
05	7.9	7.0	7.2
01	7.0	5.1	4.0

**Sit-and-reach scores measured to the nearest 0.25 inch*
 Source: Hoeger (1998). *Lifetime Physical Fitness and Wellness*, (5th ed.).

Flexibility Norm Rankings

99-90 = Superior, 80-70 = Excellent, 60-50 = Good, 40-30 = Fair, 20-10 = Low, 05-01 = Very low

Thirty Second Arm Curl Test, Female

Age	60-64	65-69	70-74	75-79	80-84	85-89	90-94
Below Avg.	< 13	< 12	< 12	< 11	< 10	< 10	< 8
Average	13-19	12-18	12-17	11-17	10-16	10-15	8-13
Above Avg.	> 19	> 18	> 17	> 17	> 16	> 15	> 13

Thirty Second Arm Curl Test, Male

Age	60-64	65-69	70-74	75-79	80-84	85-89	90-94
Below Avg.	<16	<15	<14	<13	<13	<11	<10
Average	16-22	15-21	14-21	13-19	13-19	11-17	10-14
Above Avg.	> 22	> 21	> 21	> 19	> 19	> 17	> 14

Flexibility Norms: Chair Sit-and-Reach, Female (Inches)

Age	60-64	65-69	70-74	75-79	80-84	85-89	90-94
Below Avg.	< -0.5	< -.05	< -1.0	< -1.5	< -2.0	< -2.5	< -4.5
Average	-0.5- 5.0	-0.5- 4.5	-1.0 -4.0	-1.5- 3.5	-2.0- 3.0	-2.5- 2.5	-4.5- 1.0
Above Avg.	> 5.0	> 4.5	> 4.0	> 3.5	> 3.0	> 1.5	> 1.0

Flexibility Norms: Chair Sit-and-Reach, Male (Inches)

Age	60-64	65-69	70-74	75-79	80-84	85-89
Below Avg.	< -2.5	< -3.0	< -3.5	< -4.0	< -5.5	< -5.5
Average	-2.5-4.0	-3.0-3.0	-3.5-2.5	-2.0-3.0	-2.5-2.5	-5.5-0.5
Above Avg.	> 4.0	> 3.0	> 2.5	> 2.0	> 1.5	> 0.5

End of Case Study 4