Astrand Rhyming Test

Patient information	
Name:	Age:
Height: cm	Weight: kg
Gender: ◯ Male ◯ Female	Test date:

Equipment

- Body weight scale
- Cycle ergometer
- Clock or stopwatch
- Heart rate monitor
- Score sheet
- ECG monitor (optional)

Test procedure

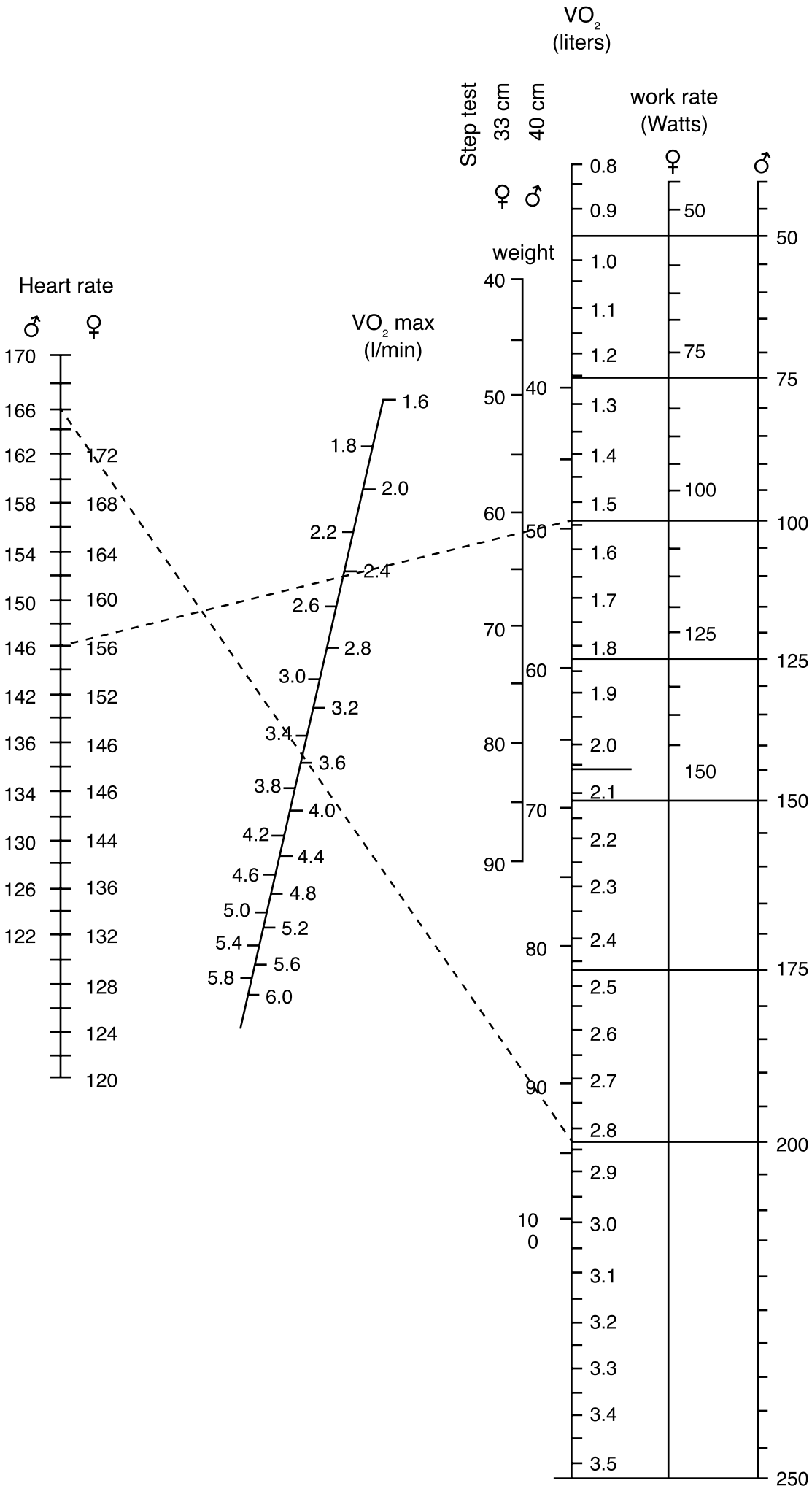
1. Explain the test procedures, perform health risk screening, obtain informed consent, and record basic information including the patient's weight and resting heart rate.
2. Calibrate the cycle ergometer, attach the heart rate monitor, and allow the subject to warm up for 2-3 minutes at 0 kg resistance with a cadence of 50.
3. Calculate the patient's target heart rate using the Karvonen formula. Start the stopwatch and have the subject begin biking at 100 watts for females and 150 watts for males, recording the heart rate every minute.
4. Adjust the wattage as needed during the first two minutes to reach a steady heart rate close to the target heart rate. Continue recording the heart rate every minute for a total of six minutes, motivating the patient to complete the test.
5. Cool down at a low wattage for 1 minute after the test. Calculate the average heart rate from minutes five and six, and use the nomogram or provided formula to estimate VO2max, applying the age correction factor.
6. Compare the patient's V02max to the normative data tables.

Test procedure

Weight:	**Resting heart rate:**
kg	bpm

Target heart rate: (using Karvonen formula)
Karvonen formula: [(max heart rate-resting heart rate)/target percentage of intensity] + resting heart rate
bpm
Heart rate recording:
Minute 1: bpm
Minute 2: bpm
Minute 3: bpm
Minute 4: bpm
Minute 5: bpm
Minute 6: bpm
Additional minute (if needed): bpm
Steady-state heart rate (HRss) after 6 minutes of exercise:
bpm
Workload:
bpm
Average heart rate (minutes 5 & 6):
bpm
VO_2max estimation:
Using nomogram: L/min
Using formula: • Females: VO2max = (0.00193 x workload + 0.326) / (0.769 x HRss - 56.1) x 100 • Males: VO2max = (0.00212 x workload + 0.299) / (0.769 x HRss - 48.5) x 100
Adjusted VO_2max:
L/min (V02max estimation x Correction factor according to age)

Nomogram


VO2 (liters)
Step test
33 cm
40 cm
work rate (Watts)
♀
♂
weight
Heart rate
VO2 max (l/min)
170
166
162
158
154
150
146
142
136
134
130
126
122
172
168
164
160
156
152
146
146
144
136
132
128
124
120
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
3.2
3.4
3.6
3.8
4.0
4.2
4.4
4.6
4.8
5.0
5.2
5.4
5.6
5.8
6.0
40
50
60
70
80
90
0.8
0.9
1.0
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2.0
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3.0
3.1
3.2
3.3
3.4
3.5
50
75
100
125
150
175
200
250

Age correction factor table	
Age	**Correction factor**
15	1.2
16	1.1
17 – 35	1.0
> 35	0.87
> 40	0.83
> 45	0.78
> 50	0.75
> 55	0.71

Normative data

Compare your patient's performance to the tables below:

Female

Age	Very poor	Poor	Fair	Good	Excellent	Superior
13 – 19	< 25.0	25.0-30.9	31.0-34.9	35.0-38.9	39.0-41.9	> 41.9
20 – 29	< 23. 6	23.6-28.9	29.0-32.9	33.0-36.9	37.0-41.0	> 41.0
30 – 39	< 22.8	22.8-26.9	27.0-31.4	31.5-35.6	35.7-40.0	> 40.0
40 – 49	< 21.0	21.0-24.4	24.5-28.9	29.0-32.8	32.9-36.9	> 36.9
40 – 49	< 20.2	20.2-22.7	22.8-26.9	27.0-31.4	31.5-35.7	> 35.8
60 +	< 17.5	17.5-20.1	20.2-24..4	24.5-30.2	30.3-31.4	> 31.4

Male

Age	Very poor	Poor	Fair	Good	Excellent	Superior
13 – 19	< 35.0	35.0 – 38.3	38.4 – 45.1	45.2 – 50.9	51.0 – 55.9	> 55.9
20 – 29	< 33.0	33.0 – 36.4	36.5 – 45.4	42.5 – 56.4	46.5 – 5432	> 54.2
30 – 39	< 31.5	31.5 – 35.4	35.5 – 40.9	41.0 – 44.9	45.0 – 49.4	> 49.4
40 – 49	< 30.2	30.2 – 33.5	33.6 – 38.9	39.0 – 43.7	43.8 – 48.0	> 48.0
40 – 49	< 26.1	26.1 – 30.9	31.0 – 35.7	35.8 – 40.9	41.0 – 45.3	> 45.3
60 +	< 20.5	20.5 – 26.0	26.1 – 32.2	32.3 – 36.4	36.5 – 44.2	> 44.2

Additional notes

Healthcare professional information	
Name:	Signature: 
Date:	

References

Buono, M. J., Roby, J. J., Micale, F. G., & Sallis, J. F. (1989). Predicting maximal oxygen uptake in children: Modification of the Astrand–Ryhming test. Pediatric Exercise Science, 1(3), 278–283. https://doi.org/10.1123/pes.1.3.278

Physiotutors. (2023, January 16). Astrand bike test | maximal aerobic capacity / vo2max calculation. https://www.physiotutors.com/wiki/astrand-bike-test/