Step Test Protocols

Harvard Step Test (Brouha 1943)
Age and sex: Young men
Stepping rate: 30 steps·min⁻¹
Bench height: 20 in.
Duration of exercise: 5 min

Scoring procedures: Sit down immediately after exercise. The pulse rate is counted in 1/2-min counts, from 1 to 1 1/2, 2 to 2 1/2, and 3 to 3 1/2 min after exercise. The three 1/2-min pulse counts are summed and used in the following equation to determine physical efficiency index (PEI):

\[
PEI = \frac{\text{duration of exercise (sec)} \times 100}{2 \times \text{sum of recovery HRs}}
\]

You can evaluate the performance of college-age males using the following PEI classifications: <55 = poor, 55-64 = low average, 65-79 = average, 80-89 = good, and ≥90 = excellent.

Three-Minute Step Test (Hodgkins and Skubic 1963)
Age and sex: High school- and college-age women
Stepping rate: 24 steps·min⁻¹
Bench height: 18 in.
Duration of exercise: 3 min

Scoring procedures: Sit down immediately after exercise. The pulse rate is counted for 30 sec after 1 min of rest (1 to 1 1/2 min after exercise). Use the recovery pulse count in the following equation:

\[
\text{CV efficiency} = \frac{\text{duration of exercise (sec)} \times 100}{\text{recovery pulse} \times 5.6}
\]

You can evaluate the performance of college-age women using the following classifications for cardiovascular (CV) efficiency: 0-27 = very poor, 28-38 = poor, 39-48 = fair, 49-59 = good, 60-70 = very good, and 71-100 = excellent.

OSU Step Test (Kurucz, Fox, and Mathews 1969)
Age and sex: Men 19-56 years
Stepping rate: 24 to 30 steps·min⁻¹
Bench height: Split-level bench 15 and 20 in. high with an adjustable hand bar
Duration of exercise: 18 innings, 50 sec each
  Phase I: 6 innings, 24 steps·min⁻¹, 15-in. bench
  Phase II: 6 innings, 30 steps·min⁻¹, 15-in. bench
  Phase III: 6 innings, 30 steps·min⁻¹, 20-in. bench
  (Each inning consists of 30 sec of stepping and 20 sec of rest.)

Scoring procedures: Exactly 5 sec into each rest period, take a 10-sec pulse count. Terminate the test when the heart rate reaches 150 bpm (25 counts × 6). The score is the inning during which the heart rate reaches 150 bpm.

APPENDIX B.3

Eastern Michigan University Step Test (Witten 1973)

**Age and sex:** College-age women

**Stepping rate:** 24 to 30 steps·min⁻¹

**Bench height:** Tri-level bench 14 to 20 in.

**Duration of exercise:** 20 innings, 50 sec each
  - Phase I: 5 innings, 24 steps·min⁻¹, 14-in. bench
  - Phase II: 5 innings, 30 steps·min⁻¹, 14-in. bench
  - Phase III: 5 innings, 30 steps·min⁻¹, 17-in. bench
  - Phase IV: 5 innings, 30 steps·min⁻¹, 20-in. bench
  (Each inning consists of 30 sec of stepping and 20 sec of rest.)

**Scoring procedures:** Exactly 5 sec into each rest period, take a 10-sec pulse count. Terminate the test when the heart rate reaches 168 bpm (28 counts × 6). The score is the inning during which the heart rate reaches 168 bpm.

Cotten Revision of OSU Step Test (Cotten 1971)

**Age and sex:** High school- and college-age men

**Stepping rate:** 24 to 36 steps·min⁻¹

**Bench height:** 17 in.

**Duration of exercise:** 18 innings, 50 sec each
  - Phase I: 6 innings, 24 steps·min⁻¹, 17-in. bench
  - Phase II: 6 innings, 30 steps·min⁻¹, 17-in. bench
  - Phase III: 6 innings, 36 steps·min⁻¹, 17-in. bench
  (Each inning consists of 30 sec of stepping and 20 sec of rest.)

**Scoring procedures:** As with the OSU Step Test, the score is the inning during which the heart rate reaches 150 bpm (25 counts in 10 sec). VO₂max in ml·kg⁻¹·min⁻¹ can be estimated using the following equation:

$$\dot{V}O_2\max = (1.69978 \times \text{step test score}) - (0.06252 \times \text{body weight in lb}) + 47.12525$$

Queens College Step Test (McArdle et al. 1972)

**Age and sex:** College-age women and men

**Stepping rate:** 22 steps·min⁻¹ for women; 24 steps·min⁻¹ for men

**Bench height:** 16 1/4 in.

**Duration of exercise:** 3 min

**Scoring procedures:** Remain standing after exercise. Beginning 5 sec after the cessation of exercise, take a 15-sec pulse count. Multiply the 15-sec count by 4 to express the score in beats per minute (bpm). VO₂max in ml·kg⁻¹·min⁻¹ can be estimated using the following equations:

- **Women:** $$\dot{V}O_2\max = 65.81 - (0.1847 \times \text{HR})$$
- **Men:** $$\dot{V}O_2\max = 111.33 - (0.42 \times \text{HR})$$
References


