Introduction:
The ability to jump, sprint, throw the javelin, or perform fast starts as would be required of sprinters and linemen are a few examples of athlete’s converting energy to power. The ability to develop considerable power is a prime factor in athletic success. Power is performance of work expressed per unit of time. The term explosive power has been associated with this anaerobic metabolism and the tests to measure the results. However “explosive” itself connotes power, leaving us to consider the term “explosive power” as redundant. Consequently, we will simply use the term anaerobic power test to reflect such measurement.

As you may recall, the development of power is related to muscular strength and especially to the contribution of the ATP-PC and lactic acid system. Therefore, the test that follows reflects primarily the ability of anaerobic systems to supply high rates of ATP for high power muscular contraction. However, keep in mind that during the test subject will still be using both aerobic and anaerobic energy systems. This test is set up to make the body primarily depend upon the anaerobic system to supply the majority of the energy needed, but it still does not supply all the energy.

Purpose:
The purpose of this lab is to assess the anaerobic power of the subject.

Equipment/Personnel:
Leg Ergometer, two subjects, stopwatch, ruler/measuring tape, and stairs.

Definitions:
1. Energy System Capacity- The total amount of energy that can be produced by an energy system.
2. Energy System Power- The maximal amount of energy that can be produced per unit of time.
3. Peak Power (PP)- The maximum power (FxD÷T) exerted during very short (5 sec or less) duration work.
4. Mean Power (MP)- The average power (FxD÷T) exerted during short (typically 30 sec) duration work.
5. Fatigue Index (FI)- Percentage of peak power drop-off during high-intensity, short-duration work.

Procedures:
The subject will be performing the Wingate anaerobic bicycle protocol. This calls for a maximal pedaling speed at a set resistance, for 30 seconds. After the test is completed observations and calculations will be discussed.

The Magaria-Kalamen Step Test requires a subject to climb eight stairs as fast as possible. Subject must touch the second and eighth steps but may skip any other steps. The height of the riser on each step is measured and summed.

Subjects get a running start and when the foot contacts the second step the timer is started. The clock stops when the foot contacts the eighth step.

Readings:
Plowman - 86-89, 93-96
TODAY’S TESTS:
Calculations necessary to know for today’s lab:
→ $kpm\cdot min^{-1} = kp \times m/rev \times rev/min$; $this\ is\ a\ power\ expression$
→ $kpm\cdot min^{-1} \div 6.12 = Watts$; $Watts \times 6.12 = kpm\cdot min^{-1}$
   (we often approximate with just using 6 instead of 6.12)
→ $kpm\cdot min^{-1} \div 426.8 = kcal/min$; $kcal \times 426.8 = kpm\cdot min^{-1}$
→ $Watts \times 0.01433 = kcal/min$; $kcal/min \times 0.01433 = Watts$
→ On Monark ergometers: $kp \times rev/min \times 6m/min = kpm\cdot min^{-1}$
What setting to use??  Guidelines for leg testing using Monark:
   Male = kg bodyweight $\times$ 0.095 for kp setting
   Female = kg bodyweight $\times$ 0.086 for kp setting
NOTES: *Watts = kp $\times$ revs $\times$ 11.765
   5sec
*Monarch 834E tray weighs 1kg
→ body weight $\times$ sum of risers = work (can be expressed as ft-lbs. or kg-m)
→ work $\div$ time = power (can be expressed in kg-m/sec; kg-m/min; ft-lbs./sec; ft-lbs./min)

Subject A = _____kg $\times$ _____ = _____kp
Subject B = _____kg $\times$ _____ = _____kp

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1. Plot the results from the test.
   Subject A
   Subject B

Watts

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2. Subject’s peak power? A______Watts  _____Watts/kg  _____kcal/min
   B______Watts  _____Watts/kg  _____kcal/min

3. Subject’s mean power? A______Watts  _____Watts/kg  _____kcal/min
   B______Watts  _____Watts/kg  _____kcal/min

4. Percentage power decline (FI) from peak power for
   A______  B______
   (Subtract minimum observed power in 5sec period from the maximum observed 5sec power output; that’s the power drop. Then calculate the percentage drop)
Subject A body wt. ________kg _________lbs.

Subject B body wt. ________kg _________lbs.

Sum of riser heights ________cm _________inches

Subject A times Trial 1 ________ secs Trial 2 ________ secs Trial 3 ________ secs

Subject B times Trial 1 ________ secs Trial 2 ________ secs Trial 3 ________ secs

1. Subject A work output___________kg-m/sec _____________ft-lbs/sec?

Subject A work output___________kg-m/sec _____________ft-lbs/sec?

2. Convert these values to Watts. Are they the same as the values for the Wingate Test? Explain why they are the same or why they differ.