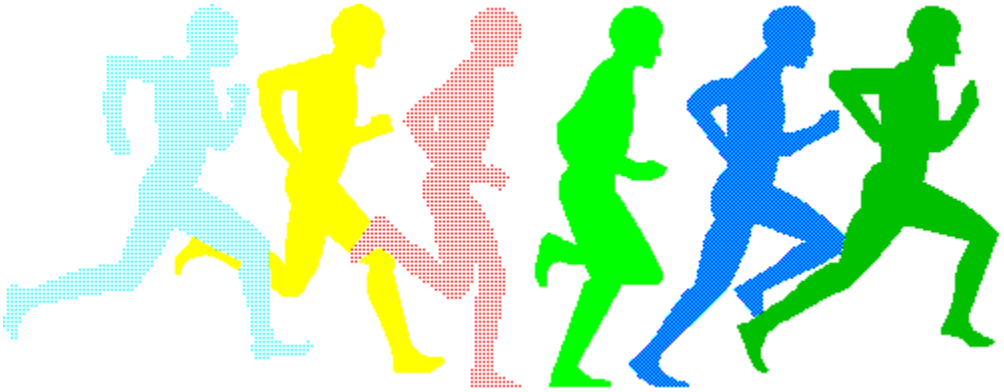
Aerobicalc



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Note

If you have not been actively exercising or are not in good health, do us all a favor and see a physician before attempting rigorous exercise.

Purpose

The purpose of Aerobicalc is to provide an easy means for the computation of interesting parameters related to athletic performance. The broad categories of these are

- Computing caloric expendature and aerobic points for various activities
- Estimation of VO2 max
- Estimation of Body Fat percentage

Aerobicalc also now allows the user to

- Record personal (aerobic) workout data and provide the ability to summarize groups of workouts, and plot them on the screen or printer.
- Manage many athletes each of which with a personal workout log.

How Do I

- Compute VO2 max?

Select VO2 Max in the folder tabs at the top of the window. This brings up the VO2 Max page.

See Vo2 Max Calculation

- Compute Body Fat?

Select Body Fat in the folder tabs at the top of the window. This brings up the body fat page.

See Body Fat Calculation

- Calculate caloric output and aerobic points?

Select "Calculator" in the folder tabs at the top of the window. This brings up the calculator page.

See Calculator Page

- Summarize workouts?

Select the Personal Log folder tab. Use the cursor to select a block of workouts, then click the right mouse button with the cursor over the personal log. The last option is "Add summary". Note that the summary is the sum for some activities (distance, time, calories, aerobic points) and the average for others (weight, body fat, VO2 max).

See Personal Log Page

- Plot workouts?

From the Personal Log Page, select a block of workouts and then click on the Plot button.

See Plotting Workouts

- Add athletes to the athlete list?

Go to the Athlete List page and type in the person's name, age, and gender in the appropriate columns. Then click on the load button. If the file is not specified, then you will be prompted for a filename to use. Type a name in. This name will be automatically added to the filename field for the athlete.

See Athlete List

- Load a personal log for an athlete?

Go to the Athlete list page and click anywhere on the row for the athlete whose workout you wish to view. Then click on the Load button.

See Athlete List

- Change Spreadsheet colors?

On either the Personal Log page or the Athlete List page, position the cursor within the spreadsheet and click the right button. A menu will popup; select Background Color or Foreground Color to set the appropriate colors. These colors will be retained the next time you load Aerobicalc.

VO2 Max Calculations

VO2 max is the maximal amount of oxygen your body can process. It is normally expressed in milliliters of O2/kg body weight / minute, although sometimes you see it as an absolute figure of liters of O2 / minute. VO2 max is the best single indicator of aerobic performance, however, different people can run continuously at differing percentages of their VO2 max. This means that even if your VO2 max is relatively low, your PR might be better than someone with a higher VO2 max provided that you can maintain a higher percentage of your VO2 max than they can.

On the other hand, even without relative predictive ability, VO2 max is a great way to monitor cardiovascular improvement, since as you get fit, your VO2 max will improve. If you are going to monitor aerobic fitness with a single value, this is the one to use.

Three distinct ways of calculating VO2 max are provided.

12 Minute Run
1 Mile Run/Walk
5 Km Run

The calculated VO2 max data may be added to the current Personal Log by clicking on the Add to Personal Log Button.

See also

Improving your VO2 Max
Personal Log

12 Minute Run

This method is based on Cooper's work in using a 12 minute run/walk to estimate VO2 max. This method tends to overestimate VO2 max, but if used to maintain a personal history, it can record improvement in VO2 Max.

Note

To be accurate, this should be a maximal effort. If you are not in good shape, see a physician prior to performing this test. Also, work up to the effort level required slowly over time before attempting a maximal effort!

1 Mile Run

Recently ("VO2 Max Estimation from a Submaximal 1-Mile Track Jog for Fit College-Age Individuals" Medicine and Science in Sport and Exercise, vol. 25(3) pp. 401-406 1993), exercise physiologists have characterized a method for VO2 max estimation from an easy 1 mile run. To use it:

1. Warm up by jogging a few minutes
2. Jog 1 mile at an easy, steady pace making sure that you take longer than 8 minutes (males) or 9 minutes (females). Enter how long it takes you.
3. Check your heart rate immediately after finishing. Enter this value in the dialog box.

Remember!

This method is calibrated for easy running and relys on the finishing heart rate for computation of VO2 max. If you run faster than 8 minutes (male) or 9 minutes (female) then the results will not be accurate!

5 Km Run

The 5 Km run is a classic outdoor method for estimating VO2 max. The main reason for its popularity is that the during a maximal 5 Km run, you are running at very close to your VO2 max (95% during a 5K race). Not much fun, but probably pretty accurate.

Note

To be accurate, this should be a maximal effort. If you are not in good shape, see a physician prior to performing this test. Also, work up to the effort level required slowly over time before attempting a maximal effort!

Improving your VO2 Max

There are a number of ways to improve your VO2 max -- All of the efficient ones involve pain. Well, not pain, really, but some discomfort. The best way to improve your VO2 max is to work out at close to it. There are a number of ways to do this:

- A 5K race/run is one way. Typically, such a race is run at 95% or so of VO2 max continuously.
- 1200 meter intervals at current 5K race pace is another good way. Make sure you don't rest longer than it takes to do the 1200 meter run. This ensures a high average O2 utilization.
- Fartlek training can be used effectively, but requires a runner who is in "tune" with him/herself. Racers tend to undertrain while animals tend to overtrain with this method. Each burst should be fast, from 2 mile race pace to 10K race pace and last from 2 to 6 minutes. The easy portions should last half as long as the fast ones.
- Mile repeats at 8K race pace (92% VO2 max). What fun. Rest no longer than 4 minutes between repeats.
- Jog for 15 minutes, then run 800 meters at 10K race pace. Jog for 2 minutes, then run 400 meters at 5K race pace. Jog for 1 minute then run 400 meters at 2 mile race pace, then immediately do 800 meters at 5K race pace. Jog for 4 minutes then repeat until regurgutation. A 30 mile/week runner can do two of these per workout.

How Often?

It is important (especially for you animals out there) not to overdo VO2 max training. A common guideline is 10% or less of your weekly mileage.

Personal Aerobic Workout Log

The Personal Log page is accessed by clicking on the Personal Log folder tab at the top of the Aerobicalc window. From here, you may

- Manually enter workouts
- Adding computed information to Personal Log

Data computed from the Calculator, Body Fat, and VO2 Max pages may be added to the current Personal Log. Just enter the data on the appropriate page, click on the Calculate Button, and then click on the Add to Personal Log Button. The data will be inserted into the current Personal Log with the current date and time. This date and time may be changed manually on the Personal Log Page.

- Summarize blocks of workouts

See Summarixing Workouts

- Change Colors of the Personal Log

Changing Colors

- Save the log

Click on the Save Button.

- Load a new Personal Log

Click on the Load Button. If changes have been made to the current log, you will be asked whether or not to save it before the new log is loaded.

- Insert or delete rows or workout entries

Select the row to insert or delete (or select a block of rows to delete) and click on the Insert or Delete Buttons.

- Print or Copy workouts

Clicking on Print Button prints the workouts; clicking on the Copy button copies the workouts to the Windows clipboard. If a block of workouts is selected, then only that block is sent, otherwise the entire log is printed or copied.

- Search for workouts

See Searching the Personal Log

- Plot workout parameters

See Plotting Workout Parameters

Summarizing Workouts

To summarize a set of workouts, select a block of workouts on the Personal Log page. With the mouse cursor still over the spreadsheet, click the right mouse button. A small menu will popup. Click with the left button on Add Summary.

The Activity column of a summary will contain the word "SUMMARY." Elapsed time, distance, calories, and aerobic points are summed. Other fields, including weight, VO2 max, and body fat percentage are averaged.

Changing Colors

Both the Personal Log and the Athlete List foreground and background colors may be changed. Position the cursor over the spreadsheet on either of these pages and press the right button of the mouse. A small menu will pop up. Select either Background or Foreground Color to change the color. These colors are retained for the next time you start Aerobicalc.

Searching

Starting a search

Both the Personal Log and the Athlete List can be search for the occurrence of a string. If you click on the Find Button on either of these pages, the Find dialog appears. You must select the category (same as a column from the page) and a seach string.

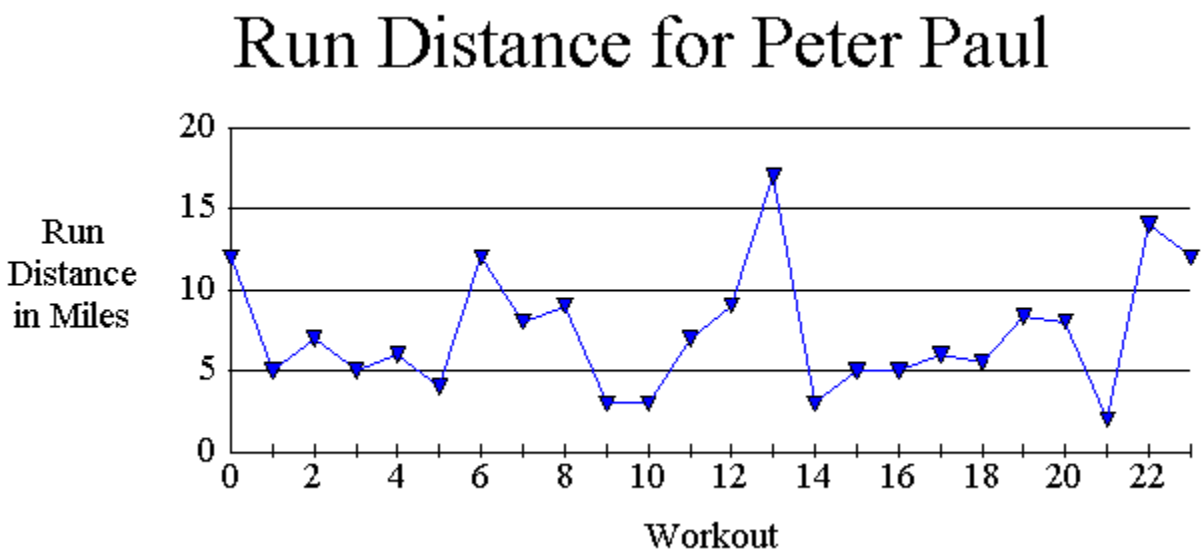
The string will be searched for ONLY in the specified category. For example, to find a Treadmill workout, you can select the Activity category and search for the text "mil" (no quotes) which appears in the word "Treadmill." Note that the seach is not case- or position-sensitive.

Finding the next occurrence

If you click on the Next Button, then the search continues looking for the next occurrence of the specified string. If you are at the last occurrence, a Not Found message will be displayed. The next Next Button click starts again looking for the first occurrence of the specified search string.

Plotting Workouts

The plotting facility allows you to plot several parameters and eiher view the block on the screen, copy it to the Windows clipboard as a Windows metafile, or print it to the printer. A sample copied to the cli[board is shown below.



To plot data, you must

- Select the parameter. You may plot Run Distance, Cycle Distance, Swim Distance, Walk Distance, Treadmill Distance, Calories, Weight, VO2 Max, Body Fat Percentage, or workout time.
- Select the Plot type: 2D Bar Chart, 3D Bar Chart, Line Graph, or Area Graph.

Aerobicalc then gets the data matching the selected parameter from the current Personal log and plots it. This plot may then be printed or copied.

Note

The size of the print out or the metafile copied to the Windows Clipboard is dependent on the size of the displayed window. To get the largest possible printout, maximize the plot window on the screen prior to printing.

Body Fat Percentage

A three-measurement body fat model is presented which requires measurements with a skin folder caliper. To operate the skin fold calipers correctly, take a fold of skin between your (usually left) thumb and forefinger. Roll the fold back and forth and ensure that you do not have muscle or connective tissue between your thumb and finger. Use the calipers in the middle of the fold. Repeat the entire procedure 3 times and use the average number as the measurement. You will find that with practice, your repeatability will improve. The main problem beginners have is that they include too much in the skin fold. Remember, you are only trying to include the skin and the fat immediately underneath it.

Three positions are used for the body fat model:

Triceps
Subscapulae
Suprailiac

Remember: the accuracy of the result depends on the accuracy of the measurements!

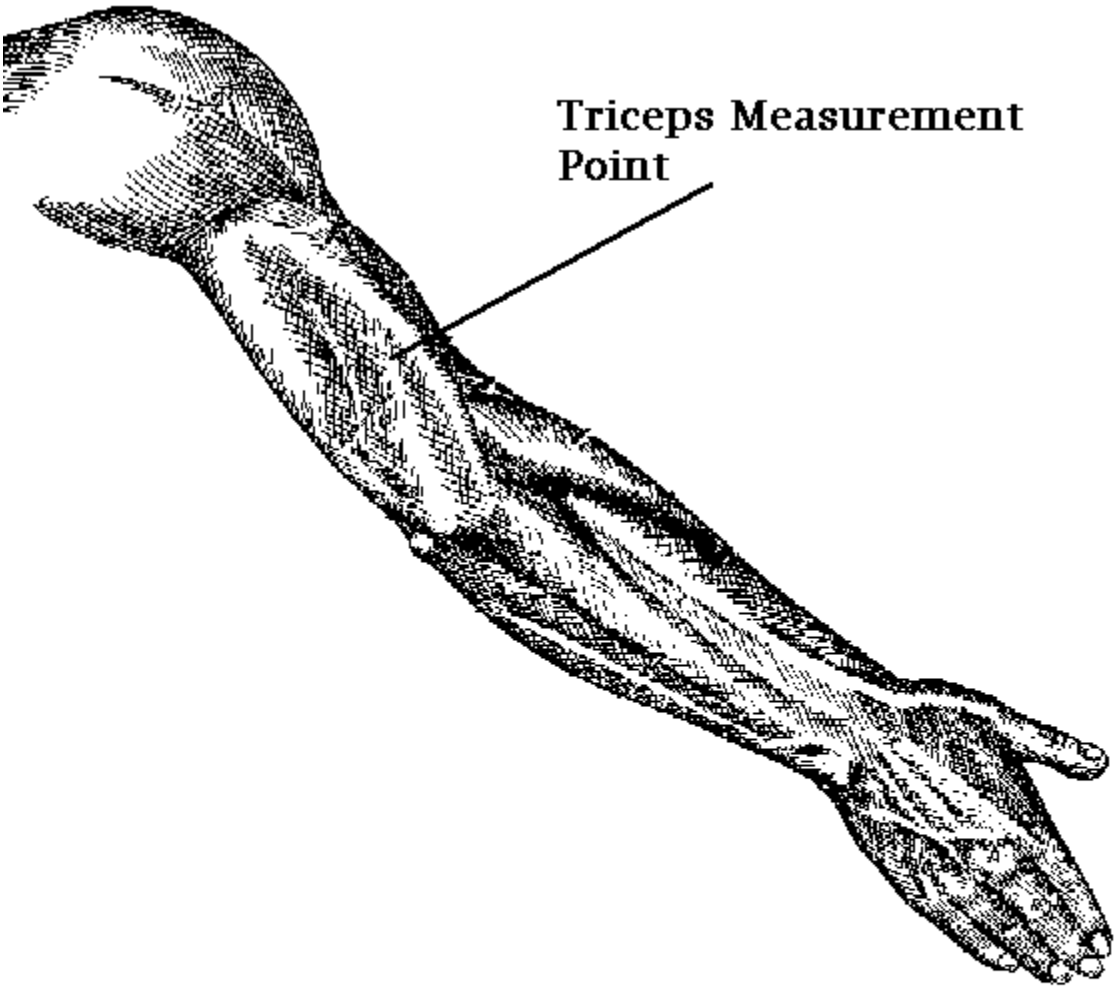
The computed Body Fat Percentage may be added to the Personal Log by clicking on the Add to Personal Log Button.

See also

Personal Log

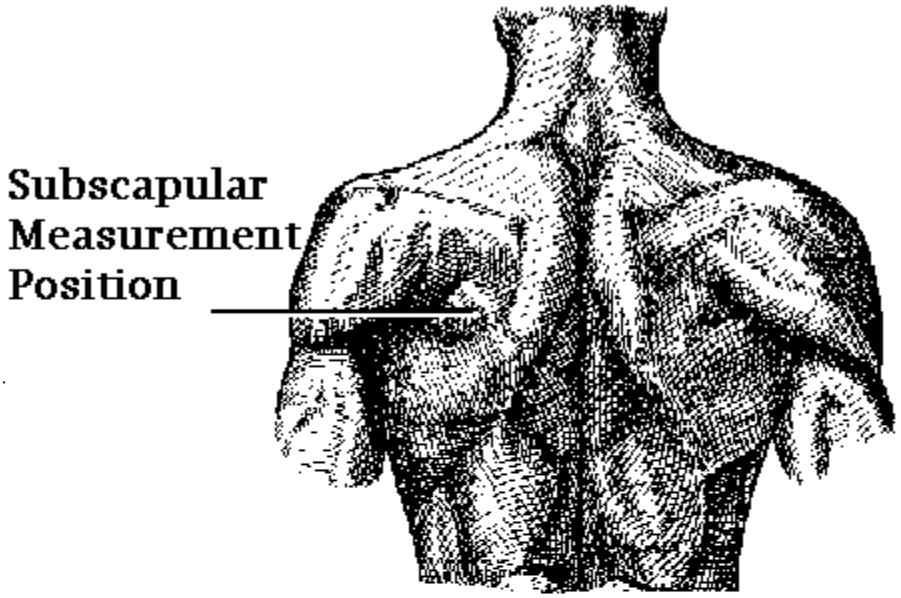
Triceps Position

Take the triceps skin fold measurement on the back of the upper arm where indicated.



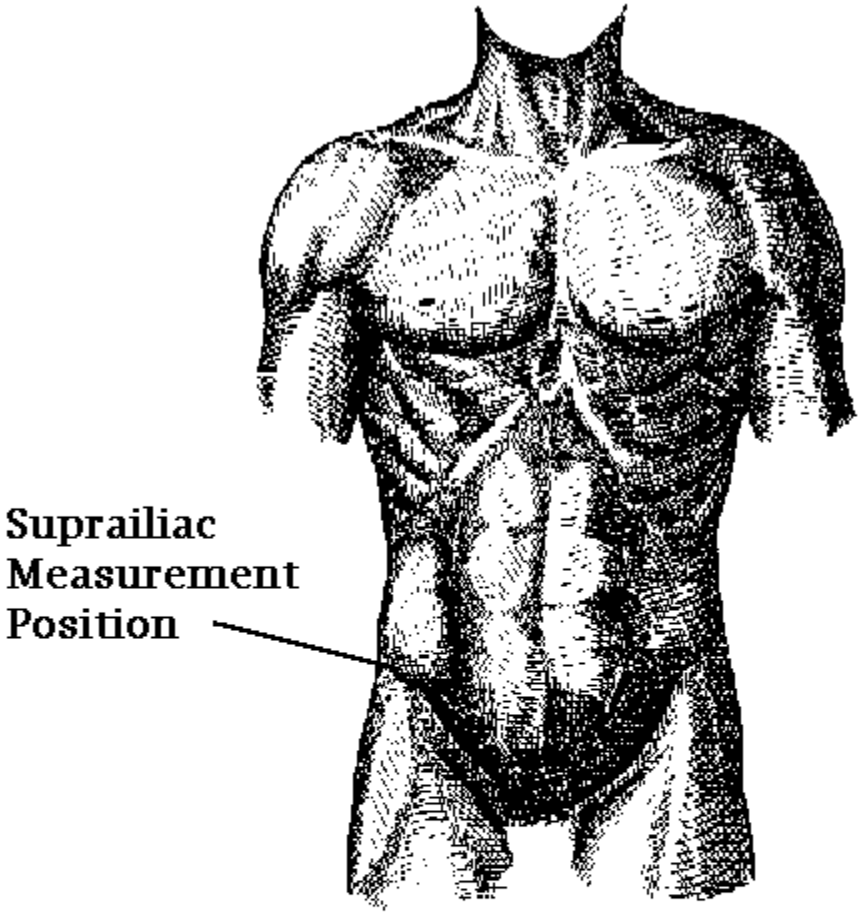
Subscapular Position

Take the subscapular position on the upper back below the scapulae, as shown below.



Suprailiac Position

In the marked position, take the skin fold measurement just above the iliac crest.



Using the Calculator

The calculator page allows you to enter workout data for a variety of workouts and compute calories expended, aerobic points, and average speed. For most activities, the values that must be entered are:

- Activity (selected from the list box)
- Workout time
- Distance
- Distance units (selected from the list box)
- Weight
- Weight Units (Selected from the list box)

For certain activities (treadmill running, stair climbing, and rope skipping), a data entry field for incline or rate will appear. For treadmill running, it is the % incline; for stair climbing and rope skipping, it is steps per minute.

Buttons

Buttons on this page allow you to compute the desired results, print the results, copy the results to the Window's clipboard, and bring up the help file. By clicking on the Add to Personal Log Button, the data will be copied to a new entry in the current Personal Log with the current date and time. This date and time may changed manually by going to the Personal Log page and editing those fields.

See also

Activities
Personal Log
Printing
Copying to the Clipboard

Activities

Clicking on the Calculate Button tells Aerobicalc to compute the calories burned and aerobic points for the activity you have selected.

Aerobicalc supports many activites. These include:

- Running
- Swimming
- Bicycling
- Walking
- Treadmill Running
- Stair Climbing
- Rope Skipping
- Karate and Judo
- Racketball
- Soccer
- Tennis
- Weight Training

Printing

The Print button located on many windows prints the data for that window. For some windows, the output is a graphical dump of the window (such as the calculate page or the plot window) and for others it is textual (such as the Personal Log).

Copying to the Clipboard

Whenever a Copy button is available, clicking on it will send either the text of the information to the clipboard, or a windows metafile (from the plot window). This information may then be pasted into another application such as a word processor.

List of Athletes

The next to last tab at the top of the Aerobicalc window brings up the Athlete List Page. Here you will find a spreadsheet and a button bar providing functions to manipulate the athlete list.

Adding a New Athlete
Deleting an Athlete
Load the Personal Log for an Athlete
Printing or Copying the Athlete List
Sorting the Athlete List
Searching the Athlete List
Changing Colors

Adding an Athlete

- Select the Athlete List page
- Using the cursor on the scroll bars, position the cursor to the points at which you want to add an athlete
- In the appropriate columns, enter the athlete's last name, first name, gender, and age
- To create a new personal log for the athlete, click on the Load button. You will be prompted for a filename. You may select a file that already exists, or a new name that does not yet exist.

Deleting an Athlete

- Go to the Athlete List Page
- Select the any cell in the row of the athlete in question or select a block of athletes
- Click on the Delete button. You will be prompted to ensure that you really wanted to do this.

Load the Personal Log for an Athlete

To load a personal log for an athlete:

- Go to the Athlete List page (use the folder tabs at the top of the window)
- Select the athlete by clicking the mouse anywhere on the row corresponding to the athlete
- Click on the Load button.

The personal log for that athlete will be loaded and the Personal Log page will appear.

Printing or Copying the Athlete List

To print the athlete list or copy its contents to the Window's Clipboard:

- Go to the athlete list (use the folder tabs at the top of the window)
- Select the block of athletes to print or copy (if a group is not selected, then the entire list is printed or copied)
- Click on the Print or Copy Button.

Sorting the Athlete List

The list of athletes may be sorted by name by going to the Athlete List page and clicking on the Sort Button.

Note

If there are many entries, the sorting procedure may be interrupted by clicking on the Canel Button of the Cancel Sort dialog. If you do this, the list will probably be partially sorted. If you wish to retain the list in its original order, then click on the Reload Button.

Running Research Newsletter

A very good publication for interested folks is the Running Research newsletter. I have nothing to do with it, other than being a subscriber. It presents the latest interesting news from the exercise physiology journals in a readable fashion. I highly recommend it. If you subscribe, please let them know where you heard about it. The price information is current as of Oct 1993.

Running Research News
PO Box 27041
Lansing, MI 48909
1-800-333-FEET (Voice order)
517-393-3150 Fax

One year $17
Two Years $31

Registering Your Copy of Aerobicalc

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What you get

For registering your copy, you get the latest version of Aerobicalc as well as a registration number which unlocks Aerobicalc so that you can have

- 1000 Athletes in the Athlete list (instead of 5)
- 10000 Workout entries (instead of 20)
- Technical support both with training and with using Aerobicalc.

References

Some of the material for this help file and for the program itself came from the running and sports physiology literature. The more readable of these are listed below.

- "Inside Running. Basics of Sports Physiology" David Costill, Benchmark Press, 1986
- "Individualized Fitness Programs" Frank Vitale, Prentice Hall, 1973
- "The Aerobics Program for Total Well-Being" Kenneth Cooper, Bantam Books, 1982
- Running Research News (several issues), 1993

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New Features

There are many new features in Aerobicalc revision 2.0. The most important of these are listed here.

- New help file
- TOTALLY new visual interface with tabs for bringing up screens, toolbar, spreadsheets for managing personal logs and lists of athletes, and a plotting facility.
- Personal log for maintaining histories of aerobic workouts. This is limited to just a few workouts for the demo version, and 1000 for the registered version.

  Personal log page allows you to add workouts or measurements, compute summaries of sets of workouts, copy workouts to the clipboard, print the workout information, and plot it on the screen or printer.
- List of athletes. For coaches managing multiple athletes, this page maintains a list of different athletes, each one of which may have one (or more) Personal Log.
- Ability to plot personal log data for trends. Fields that may be plotted include run, bike, swim, walk, or treadmill distance, calories per workout, VO2 max measurements, Body fat measurements, workout time, and body weight.

Aerobicalc

The Aerobics Calculator (c) 1993 Bruce Powel Douglass, PhD and A Priori Software

animals

Athletes who race only to justify their training. Animals just enjoy long hard workouts. God only knows why.

Bicycling

Bicycling computations assume that energy output is a linear function of speed. This is certainly not true -- at speeds greater than 20 mph, 90% or more of the energy is being used to move air around. Generally, expendature is a cubic function of speed. Other factors affecting efficency including clothing and bicycle efficiency. After all, if there were no difference among bicycles in terms of efficiency, why would racers spent thousands of dollars on a bike?

Distance units

Units may be selected from Miles, Kilometers, Yards, and Meters.

Karate and Judo

As a Tae Kwon Do and Escrima martial artist, I generally want to know about what my output is for this kind of training. It is difficult to estimate "intensity" so an average intensity is used.

Racers

An athlete who trains only so that they can race. If they could race well with no training, they would.

Racketball

The output for racketball is assumed to be linear in terms of weight and time. An estimated "average" intensity is used.

Rope Skipping

Rope skipping is presumed to be a linear function of weight, speed (steps per minute) and time. Typical speeds are 60 to 120 skips per minute.

Running Research newsletter

A useful and inexpensive publication about the latest in running and exercise research. Recommended! To order call 800-333-FEET.

Running

Running computations are most accurate for speeds from about 13 minutes per mile to about 4 minutes per mile. Accuracy of computation is due to many factors which are not easily measured, including stride efficiency, foot strike energy return, clothing, speed (air resistance adds work as the cube of the speed) and running style. Like walking, energy output is about 100 cal/mile for the hypothetical 150 lb (70 Kg) man, independent of speed. Computational methods are taken from references.

select a block

To select a block, position the cursor on the desired workout (row) and the hold the left button down while you drag the cursor to the ending desired row. You need not select more than a single column in the row to select the row.

Soccer

The output for SoccerI is assumed to be linear in terms of weight and time. An estimated "average" intensity is used.

Stair Climbing

Stair climbing is meant for climbing stairs; in particular, the calculations assume you go up and down a flight of 10 steps. The rate is the number of steps per minute. Eg. if you go up and down a flight of 10 steps 8 times in 1 minute, you've gone 80 steps/min. It will be less accurate for continuous stair climbing, as done on machines, and for single step stepping.

Swimming

Swimming is probably the most inaccurate of the computations here because the level of work output for a given speed is so dependent on stroke efficiency. As a water safety instructor, I have seen students exhausting themselves while not moving forward at all! However, these computations are derived from empirical measurements taken from many swimmers and so they assume "average" skill.

Tennis

The output for Tennis is assumed to be linear in terms of weight and time. An estimated "average" intensity is used.

Treadmill Running

Treadmill running is similar, but not identical, to terrain running, since it involves more skill and also may have some mental attentional differences (due to lack of visual stimulation). Additonally inclination of the treadmill must be taken into account. Interestingly, several published calorie expendature models of treadmill running, including those used by at least one manufacturer of computerized treadmills, are substantially incorrect! The computations performed here are an adaptation of different research results.

Walking

Walking efficiency is about 100 calories/mile for the hypothetical 150 lb (70 kg) man. It is approximately linear with weight, but for a given distance is (fairly) independent of speed. However, note that at some speed, it becomes more efficient to run rather than walk, and walking faster than that will actually burn more calories than running at the same speed! These fine points are not accounted for in these calculations. Since they are secondary effects, the accuracy of the linear model isn't too bad.

Weight Training

The output for Weight Training is assumed to be linear in terms of weight and time. An estimated "average" intensity is used. Generally, not that many calories are expended during an intense weight training workout even though the instantaneous work output might be very high!

Weight Units

Weight Units may be selected from Lbs and Kg.

Workout time

Time is entered in hr:min:sec format. If the workout is under an hour, then the minutes must still be entered after the first colon separator.