Body Fat vs. SWR

Which is the most useful measure, body fat or strength-to-weight ratio, may be just an issue of simplifying the process.

By Rick Osbourne

While both exercise physiologists and aeronautical engineers are concerned with efficiency issues, they approach this issue in two distinctively different ways. A comparison of these two approaches can be enlightening, especially for fitness enthusiasts.

The efficiency comparison

Exercise physiologists determine the efficiency of a human body using a concept called body composition. And body composition is calculated according to a ratio known as percentage of body fat. So, to determine your efficiency, exercise physiologists need to know how much you weigh (say 200 pounds), and how much of that total body weight is made up of fat (say 50 pounds). With this information, they'll divide the former (200) into the latter (50) and give you your percent body fat (in this case, 25 percent). The lower your percent body fat, the more physically efficient (and fit) you are.

In contrast, aeronautical engineers determine the efficiency of jet airplanes and rockets using the thrust-to-weight ratio (TWR). To determine a plane's efficiency, aeronautical engineers need to know how much the jet plane weighs (say 100,000 pounds), and how much thrust (like horsepower) the engines generate (say 30,000 pounds of thrust). They'll divide the former (100,000 pounds) into the latter (30,000 pounds) and tell you the plane's TWR (.3333 in this case). The higher the plane's thrust-to-weight ratio, the more physically efficient it is.

The difference between the two is that the physiologist compares a passive element (fat) to the overall body weight of the human being (it's effectively a fat-to-weight ratio), while the aeronautical engineer compares an active element (pounds of thrust) to the overall weight of the plane. And both yield efficiency ratios upon which their respective professions depend.

Interestingly enough, pilots are acutely aware of their TWR, figure it regularly and must stay within certain guidelines to stay airborne. In contrast, fitness enthusiasts almost completely ignore the efficiency issue, and almost never get any regular percentage of body fat feedback, even though change in percentage of body fat (efficiency) is the best indicator of fitness improvement.

The strength-to-weight ratio

But, what happens if exercise physiologists change their approach, and measure efficiency as an aeronautical engineer does?

In human physical efficiency, the concept comparable to TWR is called the strength-to-weight ratio (SWR).[1] It compares muscle (not fat) to a person's overall body weight. And muscle, unlike fat, is active and easy to measure, since significant changes in muscle mass are reflected by significant changes in strength. And, so long as you perform some type of regular resistance training, the SWR approach has some important advantages over the percentage of body fat approach, including getting accurate and immediate feedback without special equipment, technicians, added time or added money. Also, clients can easily do it themselves.

Feedback from the SWR is also more functional and user-friendly than the feedback from percentage of body fat. For example, SWR gives you specific feedback on the relationship between antagonistic and protagonistic muscles, and imbalances that may be present and may encourage injury. It can also give you the relationship between the upper and lower body, core muscle strength and proportionality that can affect performance.

None of this information comes with a percent body fat reading, yet many exercise physiologists ignore SWR. The problem is that, even though the SWR concept has been around for more than a decade, exercise physiologists continue to use body fat measurements to determine fitness.

The SWR concept, which is technically an indicator of relative strength, may have never been tested for its ability to measure and document changes in human physical efficiency, even though engineers effectively use the corresponding concept every day. And, if nobody takes the time to test it, then the field of exercise physiology may be worse off because of it.

But, if you'd like to use the SWR, think about what you might do for your members and clients, who can get regular feedback on changes to their physical efficiency. FM

Calculating SWR

SWR is most commonly perceived as a measurement of relative strength, or strength compared to overall body weight. So the SWR formula for a particular exercise is strength divided by body weight. For example, if you can bench press 250 pounds (ideally a 10-rep max), and your body weight is 200 pounds, you'd divide 250 by 200 and find that your bench press SWR is 1.25 (the higher the better). If you calculate SWRs for several well-chosen exercises (upper- and lower-body pushing and pulling, and core muscle exercises), add them together, and divide the result by the number of exercises you calculated for, you'll have a cumulative picture known as an SWR Profile. For example, if you calculated SWRs for five different exercises, and the results were 1.25, 0.85, 1.55, 0.70 and 0.60, you'd add them up and get 4.95. You'd then divide 4.95 by 5 (the number of exercises you calculated) and get a 0.99 SWR Profile. This is comparable to percent body fat. Since bodyweight exercise (pull-ups, push-ups, dips, sissy squats) performance depends on relative strength/physical efficiency anyway, they're all figured at a 1.00 SWR.

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