In Losing Weight, What is More Effective, Exercise or Fewer Calories?

By Chuck Dinerstein, MD, MBA — January 1, 2020

The new year brings a succession of ads prompting us to make healthy promises, to eat less and exercise more. The basis for the “science” behind those calls to healthful resolutions is called the Additive Energy Expenditure Model. But don’t be afraid; that merely means exercising more burns calories that you can use to eat something special.

Of course, anyone that has used these measures will tell you that at some point, the weight doesn’t continue to be lost, we plateau, and our bodies adjust to their new circumstances. That adjustment reflects the other “science” of energy expenditure, the constrained energy model – simply put, our body’s metabolism redistributes its energy resources seeking to maintain a set energy level.

A new study in Science Advances seeks to identify which is correct, additive, or constrained.

Some quick background
Our total energy expenditure serves to fuel our growth, reproduction, body maintenance, repairing cells and fighting off infections, and physical activity. Physical activity is active energy expenditure (AEE); all the other energetics can be summed as our resting energy expenditure, REE.

\[ \text{TEE} = \text{REE} + \text{AEE} \]

REE can be measured by our oxygen consumption and carbon dioxide production while resting. TEE can be measured using double-labeled water (DLW), water that uses heavier isotopes of hydrogen and oxygen that can be traced. [1]

The study

The researchers studied 14 children, age 5 to 12, without medical problems, of an indigenous hunter-gatherer tribe, the Shuar, of Ecuador. Their homes are not accessible by road, there is no running water or health clinics, and electricity is both limited and intermittent. Energetics of children from high-income countries came from published DLW studies of 20 children, ages 5 to 6 in the US, and an additional 20 children, age 7 to 9, from Northern Ireland. Accelerometers, think Fitbits, were used to capture the activity of the Shuar children, the movement of the Western cohort was obtained from studies of Canadian children.

- Shuar children’s REE and daily physical activity were elevated 213 kcal/day compared to the control group when adjusted for age, gender, and body composition.
- Shuar children were spending 31 minutes more a day (53%) in moderate-vigorous activity. [2]
- Total energy expenditure was essentially the same for both groups.

These findings are supportive of a constrained model; you cannot efficiently and equally exercise away what you swallow. The Shuar children spent 72% of their energy on their resting needs, compared to 58% for the control kids. Neither the active energy expenditure nor physical activity were reliable measures among these active children. Where did that additional resting energy go?

It was not a difference in body composition, nor were there high thermoregulatory expenditures; after all, the Shuar were in the tropics. Much of the difference went to fueling the immune system. They found that higher “environmental pathogenicity,” as exemplified by elevated levels of IgG, “the most common class of circulating antibody in humans,” could account for some of the resting energy expenditure. Other factors could include the energy cost of movement; it takes more energy to move a fat child than a thin one, as well as circadian alterations in resting energy expenditure, which are higher in industrialized cultures.

There are many pieces of the study that can be picked upon, but the data moves us towards an energy-constrained system, and constraints with adaptation are the hallmark of evolution.

Exercise is essential for our health, so that remains in the mix. But what the study suggests is what we eat has a greater effect on our energy balance than how active we are. So, if you are looking for a new year’s resolution, consider decreasing portion size as a higher priority than the 500 additional calories you burn walking 10,000 steps – especially if those steps take you past the donut shop. After all, "you are exercising more and deserve a treat."
For those who want a more satisfying explanation, see this Wikipedia entry.

That would equate to walking at 4mph or riding a bicycle at 10-12 mph.

Source: Constraints and trade-offs regulate energy expenditure during childhood Science Advances DOI: 10.1126/sciadv.aax1065