Exercise and energy balance: going to extremes to show that body weight is not the best outcome

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Although we all agree that obesity has reached epidemic proportions worldwide, there is still a heated debate in the literature as to whether we should focus on diet or on physical activity/exercise to deal with the problem. Some investigators have suggested that the obesity epidemic is largely explained by the increase in food intake (1). In addition, it is frequently mentioned in the media that exercise is pretty much useless for losing weight and rather that we should focus on diet and energy intake to achieve body weight loss (2).

On the other hand, matching energy intake to expenditure becomes a challenge among very sedentary individuals (3). Because a sedentary lifestyle has become the norm in North America and in many parts of the world, it is of little surprise that food intake would then largely drive the obesity epidemic at the population level. When daily energy expenditure is low, there is no buffer to combat the excess calories provided by an energy-dense, highly refined diet, which is consumed by so many of us.

It is also documented that previously obese individuals who have been successful in maintaining a reduced body weight have a lifestyle that includes high levels of physical activity (4). Thus, it does not take a rocket scientist to figure out that the low level of physical activity that characterizes one-third of our population (5) makes many individuals exquisitely susceptible to a potentially obesogenic diet.

As a consequence, being myself a busy scientist confined to countless hours of sedentary sitting time (writing papers and grants and holding meetings with colleagues and students), I have tried to make sure that there are 1–2 h/d devoted to endurance exercise despite my busy agenda. The objective of putting these daily periods of vigorous and prolonged physical activity in my schedule has been 2-fold: 1) to induce the expression of numerous genes that confer protection against the development of metabolic diseases and 2) to significantly increase my total daily energy expenditure, providing a buffer against occasional exposure to our ubiquitous obesogenic diet. We have previously shown that such a strategy contributes to mobilizing dangerous visceral adipose tissue/ectopic fat depots and improves numerous cardiometabolic risk markers (6).

With age, I have moved from being a long-distance runner to a recreational biker, devoting at least 10 h/wk to road cycling. Of course, this volume of exercise is way beyond the recommended 150 min of moderate physical activity/wk (7), but this level of exercise-related energy expenditure has clearly provided me protection against my potentially obesogenic environment (very sedentary work and not always consuming an optimal diet). Thus, contrary to the notion disseminated in the media that exercise is useless for remaining in energy balance, experimental evidence and personal experience have convinced me that a substantial physical activity/exercise prescription is a win-win approach, not only providing protection against obesity but, more importantly, generating the metabolic flexibility compatible with cardiometabolic health.

In this regard, the article by Rosenkilde et al. (8) published in this issue of the Journal provides extreme energy expenditure data that are very relevant to the above debate. In this spectacular study, the daily exercise “prescription” was huge because the authors wanted to test the ability of these elderly and fit recreational cyclists to match their energy intake to their energy expenditure. Despite substantially increasing their intake, the cyclists could not fully match it to their large energy expenditure. These results suggest that a very large exercise prescription reduces the probability of an individual being in positive energy balance, despite what can be considered by any standard as consuming a tremendously large amount of energy. This notion is compatible with the concept put forward by Hill et al. (9) that the body better regulates its energy balance at a high level of energy turnover compared with very sedentary individuals who, as mentioned before, are very prone to being in positive energy balance.

Another striking and important finding of the study by Rosenkilde et al. (8) is that despite the huge energy expenditure associated with the 2700-km bike expedition, participants did not lose weight. However, this lack of change in body weight was misleading in terms of energy balance. Indeed, the cyclists lost 2.2 kg of body fat while gaining 2.5 kg of fat-free mass, a remarkable finding considering that this was observed

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over a period of only 2 wk. These results provide additional evidence that body weight is a poor outcome measure when assessing the effect of a physical activity/exercise program. In our previously published exercise training studies, a common observation was the disconnect between changes in body weight and changes in body composition, the latter being sometimes observed even in the absence of major weight loss (10). Because weight poorly tracks changes in body composition, it is not surprising that exercise is indeed perceived as not being helpful in losing weight. On that basis, we proposed that body weight is sometimes a misleading outcome (11). Rather, it would have been interesting for the authors to report changes in waist circumference, because this metric has been shown to be more sensitive to regular exercise than body weight (6). For instance, it has been my anecdotal experience when performing similar biking expeditions involving a very large exercise volume over several days (12) to not lose a single ounce of body weight while dropping my waistline by a few centimeters, clearly showing the limitation of body weight as an outcome.

It is also relevant to point out that the study was conducted in elderly male recreational cyclists. More than 30 y ago, we suggested that women tend to protect their healthy body fat stores to a greater extent than men when involved in an exercise training program that did not provide dietary recommendations (13). For instance, exercise could increase appetite in women, whereas it could have temporary anorexic effects in men, a sensation that many recreational runners or cyclers may have experienced for a couple of hours after a strenuous exercise session.

In summary, although this study was conducted in a sample of obviously well-trained elderly men, it provides further data to shed some light on the role of exercise in energy balance. Evolution has made us competent for physical work and for making sure that we consume a lot of calories when they are available (14). It is therefore of no surprise that sedentary behaviors are very detrimental to our cardiometabolic health and that it is difficult for us to limit our intake of calories when they are plentiful. We were designed to move and eat: this is compatible with cardiometabolic health. Rather than conveying the message that there is no other option other than caloric restriction to maintain body weight, we should focus on eating a diet of good nutritional quality and on putting physical activity and exercise in our daily routine. Finally, replacing the beam scale by a simple and cheap tape measure to assess waist circumference rather than body weight may also be a smart idea.

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