Re: Physical fitness and evolution

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From: Emile (*emile27_at_hotmail.com*)
Date: 06/24/04

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Peter Webb wrote:
> "Tim Tyler" <tim@tt1lock.org> wrote in message
>>>thinking you need muscle for other purposes, so it alters the balance
>>>towards the less efficient storing of food as muscle.
>>>
>>>The adaptations that occur in response to cardio training are harder to
>>>explain. These include increased capillaries, more mitochondria, and
>>>numerous others. However, none of these seem to have a downside.
>>
>>They all have energetic costs to maintain. If you are not using muscles,
>>they are probably not needed. Maintining them would be a significant
>>energy drain. That's basically why muscles that are not used eventually
>>atrophy.
>
>
> Yes, the argument as to why muscles atrophy is clear, and I used it as an
> example myself above (the energy cost involved in carrying around muscle is
> higher than the energy cost in carrying fat, per gram of energy stored).
>
> But what are the energetic costs of being fit in a cardio sense? Certainly
> people who exercise use more energy, but not because they are fit per se;
> its because they are exercising. I have never heard any suggestion that at a
> given level of energy expenditure (eg walking 10 kms in two hours) that a
> (cardio) fit person uses more calories than an unfit person − indeed, my
> personal experience is quite the opposite.
>
You agree that being cardio fit requires maintenance, and thus energy.
Those people spending an hour a day in the gym definitely spend more
energy than couch potatoes. I don't think though you can simply
disregard this investment. It adds to the costs of being cardio fit.

couch potato: energy spent = a1 * activity
cardio freak: energy spent = a2 * (activity + gymActivity)

I don't think the 10 km walk comparison is fair. One would assume the
body is optimised to perform most efficiently for a constant given level
of activity. If a1>a2 ("fit" person more efficient), at high activity,
the low cardio fitness individual may perform less efficiently per

meter. Below a certain level of activity, the reverse may also be true.

If the cardio fit person is not blessed with an ability to be cardio fitter than others at the same level of activity (with the same rate of expenditure), at that level, eventually they will become equally cardio fit. In that sense it is analogous to the muscle−fat example.

There must be a cost to building and maintaining the structures you describe, like mitochondria and capillaries. This would increase a2 toward a1. The bulk of the increase would occur in the muscles, and we're disregarding that here.

Whether it is really a simple linear relationship remains to be seen though. My other post in this thread mentions a study that claims that mitochondria run more efficiently at higher metabolic rates, resulting in longer life span. In that case the formula should contain a term with exponent activity.

E