Title: Sedentary Behaviour and Chronic Disease

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The question of whether sedentary behaviour can be considered a cultural maladaptation was recently discussed by Wadsworth et al. (2014).¹ In their discussion, the authors highlighted arguments to support and oppose this proposal, concluding that at a societal level, *Homo sapiens*, living in mainly Westernised nations, represent an economic and social burden on society due to the health costs and problems associated with diseases linked to sedentariness. Sedentariness was considered a maladaptation. However, at an individual level, because survival of the fittest includes survival of the wealthiest, most intelligent, or best at seeking out opportunities, the authors consider contemporary *Homo sapiens* as well adapted to their current environment.

Wadsworth et al. (2014) advocate that success in contemporary society does not depend on physical prowess any longer, but on the ability of the individual to gather and successfully utilise information and that through specialisation of these information-gathering skills, *Homo sapiens* have created an environment conducive to sedentary behaviour. Such an environment may result in many of the sedentary-related ‘hypokinetic’ diseases common in such a society including obesity, cardiovascular disease and Type II diabetes.²⁻⁴

We would question the concept that sedentary behaviour is a maladaptation or an unhelpful trait. All biological traits are a mixture of positive and negative trade-offs

which will vary in different environments. For example, male peacocks have an enormous set of tail feathers which is crucial in their courtship displays; they will not obtain a mate without these feathers. However, the feathers are also a burden in that they take resources to grow and maintain and put the male at a higher risk from predators.⁵ Similarly, sedentary behaviour for our *Homo sapien* ancestors, probably had many functions, some of which were positive and some negative (conserving energy, avoiding predation, holding territory/resources, mate guarding were useful for individuals whereas increased risk of disease transmission and intra-species competition and aggression and the potential loss of locating more new resources were problems). Even in modern Westernised society, sedentariness can be viewed as having positive (allowing time for social interactions, pair-bond building, knowledge acquisition allowing specialisation in societal roles) and negative (obesity, glucose metabolism disruption) associations, therefore cannot be considered as a maladaptation. At most, sedentary behaviour may be considered an exaptation, where a trait's original function has changed to something quite different.⁶ To return to feathers as an example, feathers were found on many late Cretaceous dinosaur lineages ancestral to birds and were largely involved in thermoregulation and coloration whereas feathers in modern birds are largely involved in flight.⁷ Similarly, sedentary behaviour in our ancestors was likely largely about conserving energy whereas now used more to acquire knowledge and socialise.

Our main concern however, is with the author's premise that modern *Homo sapiens* of today's Westernised societies are more sedentary than their Pleistocene hunter-gatherer ancestors. Recent research has found that the total daily energy expenditure between contemporary Western populations and hunter-gatherers is not substantially different.⁸ While the hunter-gatherer may have been more physically active in their pursuit of foraging for food, they also had long periods of physical inactivity where they rested and slept (conserving calories). If this is indeed the case, the increased health problems occurring in today's society may not be due to the lack of physical activity but to other environmental changes including our consumption of energy-dense, nutrient-poor diets.⁹

It is also possible that the way in which energy is consumed may contribute to the health problems of contemporary Westernised society, rather than the total amount of energy expended. It is likely that individuals in hunter-gatherer societies regularly performed short bursts of high-intensity exercise interspersed with long periods of inactivity (particularly in winter). Compare this to a typical office worker in a Westernised society who will consume energy via long bouts of relatively low-intensity physical activity. Recent research has indicated that short bouts of high-intensity

activity provides greater protection against chronic health problems compared to bouts of longer duration low-intensity exercise.^{10, 11}

Evolutionary fitness drives all animal populations, including *Homo sapiens*, to complete a task using the least amount of energy, resulting in human societies becoming increasingly automated. However, it seems that this automation has not resulted in a decrease of total energy expenditure over time.⁸ The question therefore is not whether sedentary behaviour is a cultural maladaptation causing the chronic diseases of modern society, but how does physical activity interact with other environmental influences to create the *Homo sapiens* of today?

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