In this issue of the *American Journal of Lifestyle Medicine*, McMurray and Ondrak provide a comprehensive and interesting overview of the effect of physical activity on cardiometabolic risk factors in children. The authors go thoroughly through established and novel risk factors and discuss possible mechanisms of how physical activity exerts its effect. From a scientific point of view, it is interesting to know exactly which parameters physical activity can modify, but the most important message may be that effects of physical activity are extremely widespread. The change in each risk factor may in some cases be modest, but the total effect on health is substantial. The concept of early intervention is based on some degree of tracking either in health parameters or in physical activity. However, the strength of a tracking coefficient depends on the stability of the true mean, short-term fluctuations, and measurement error. We therefore have little knowledge of how well physical activity actually tracks, because substantial error variation and short-term fluctuations exist in the measurement of physical activity even when objective assessment is used. Some of the biological health parameters do show a high degree of tracking, so most scientists tend to agree that early intervention is desirable. There is little doubt that atherosclerosis is a gradual process, so no matter if it can be measured in a study at this early stage, it may still decrease the speed of the process to improve cardiovascular disease (CVD) risk factor levels, and it therefore makes sense to promote early prevention.

The authors have primarily reviewed studies looking at the behavior physical activity and only touched fitness and obesity slightly. One argument not to focus on physical fitness is that there is a large component of genetic influence on fitness. It is correct that the highest attainable fitness level is largely determined by genes, but the genetic component of the lower limit is questionable. Sedentary living can decrease fitness very fast independent of genes, and after just a few weeks of bed rest a substantial decrease will occur. Sedentary and obese children can get very low fitness levels, which is associated with adverse CVD risk factor levels. Fitness is much stronger associated with CVD risk factors than physical activity mainly because fitness is determined with much less error variation. There is one key difference though, that is, fitness is mainly affected by aerobic exercise of higher intensity. The authors’ approach highlights that the total amount of physical activity including lower intensity activity may affect some risk factors while others are mainly affected by high intensity or even resistive training. The latter is difficult to assess by objective physical activity assessment methods but is easy to measure by strength tests. Recent research has shown association between muscle strength and CVD risk factors in children. However, including...
studies assessing fitness and CVD risk factors would only strengthen and not alter the main conclusions in the review of McMurray and Ondrak.

Another issue of importance for choice of intervention is whether physical activity, fitness, and obesity have independent effects on CVD risk factors and which is more important. Also, it is discussed whether the association between physical activity and health is confounded by obesity. To be a confounder, a variable must be associated with both the exposure and the outcome, and it must not be a part of the causal chain leading from exposure to outcome. Obesity is definitely associated with both physical activity/fitness and CVD risk factors; however, it is at least partly an intermediate in the causal chain. Obesity is therefore only partly a confounder, and adjusting for obesity will remove part of the association of interest. It is questionable if it is possible to make an effective exercise intervention in subjects at risk without changing body composition. Body weight may be altered with a decrease in fat mass and an increase in muscle mass, but even if fat mass decreases, we would still consider the exercise as the cause of the possible CVD risk factor change. The distinction between these exposures may therefore be of more academic interest.

A major question arises when all the benefits of physical have been highlighted. Which intervention would be most effective, and how can it be implemented in children. In principle, interventions can target whole populations or children at risk such as obese children. Brown and Summerbell reviewed school-based interventions to prevent obesity. They concluded that school-based physical activity interventions may help children maintain a healthy weight, but the results are inconsistent and short term. Physical activity interventions may be more successful in younger children and in girls. If the target is to decrease or prevent obesity, interventions must be focused on a major increase in physical activity and target children at risk.

One advantage related to physical activity is that there are virtually no negative side effects. Therefore, it is not an ethical issue to include healthy children and the choice therefore depends on what is easier to implement and what intervention is sustainable. In adults with metabolic syndrome or diabetes, drugs might be the doctor’s first choice, but behavioral intervention would be preferred in children unless the condition is extreme. Kriemler et al recently reviewed school-based interventions and found positive health effects of increased physical activity, but the exposure needs to be substantial, and major effects were not seen before physical activity got close to 1 hour a day. The physical activity requirements need not be physical education lessons but can be included in school breaks or academic lessons. This type of intervention may even improve cognitive function and is therefore suitable in the school system.

There is good evidence that physical activity increases brain-derived neurotrophic factor, which stimulates growth of hippocampus, and further is associated with insulin sensitivity. This link between metabolic disorders and cognitive function may prove important when school teachers and politicians decide about including more physical activity in the school curriculum.

Another type of intervention includes changes in everyday living or environment. We recently conducted a randomized trial where children who were driven to school were randomized into a cycling group and a control group. Commuter cycling is not a highly intense activity, because children travel in normal clothes, but they travel twice a day. We found a decrease in a composite risk factor score including HOAMA score, sum of 4 skinfolds, blood lipids, blood pressure, and inverse of fitness of 0.58 standard deviation, which is a substantial change in just 8 weeks given the fact that children had quite normal CVD levels at baseline.

The review of McMurray and Ondrak provides a very important knowledge base. Mechanisms explaining why physical activity improves health in children are important, and they provide a comprehensive review including most of the novel risk factors, which improves our understanding of the benefits of physical activity. Future research should focus not only to improve this knowledge but also to find the most effective ways of implementing a more physically active lifestyle in children. Studies have shown that it is possible to increase physical activity and improve health in populations, but we still lack knowledge of how interventions are sustained and effectively implemented. Targeting children at risk is difficult, because most of the sedentary children are not attracted to sports activities, and the school system is therefore a good option to start because all children participate.

References