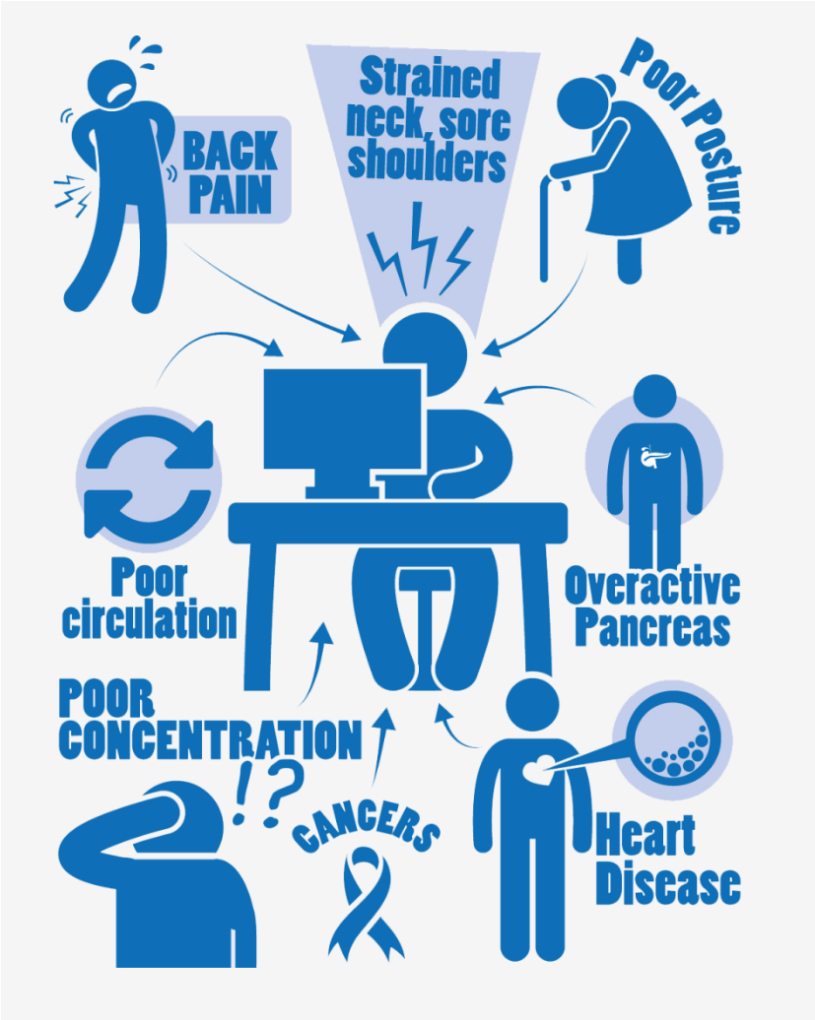
10 Foundation Principles of Sedentary Behaviour



Dr Paul Batman
www.drpaulbatman.com.au

Sedentary Behaviour Principle # 1

Despite reports that fitness is booming, with record numbers of people better educated and joining fitness centres, sedentary time is still rapidly increasing.

From 1987 there has been a 146% growth in the number of health clubs in the US, which translates to 36,540 centres. The weight loss industry alone is now worth over $79 billion globally. A recent search on **Amazon.com** revealed 738,712 fitness related and 246,242 diet items offered for sale online! According to the latest figures from IHRSA more than 66 million Americans used a fitness centre in 2016, which is the highest numbers recorded since 1987. Individual memberships increased to 57.3 million, a rise of 3.6% more than in 2015. Members attended fitness centres an average of 106 times in 2016, which is an all-time high, with more than 19% of 295,000,000 Americans 6 years and older being health club members. There has been a 26.5% increase in club membership since 2009 with over 5 billion club visits in 2016, with now 1 in 5 Americans using fitness clubs as their main choice for physical activity. "The missing link is the lack of daily high duration frequent muscle contractions needed to replace the large amounts of sedentary time"

Sedentary Behaviour Principle # 2

Too much sedentary time is NOT the same as too little exercise. Sedentary time for > 10 hours per day is a significant risk factor irrespective of what we do for the rest of the day.

A good analogy is “exercising intensely daily will cancel out the long-term effects of sedentary time” is similar thinking to “exercising daily will offset the chronic problems of smoking”. To assess whether the adverse effects of sitting could be overcome by one hour a day of vigorous exercise per day, healthy subjects were trained in three activity regimes for 4 days. 1. Sit for 14 hours per day. 2. Sit at for 13 hours per day and exercise vigorously for one hour per day. 3. Sit for 6 hours per day, walked for 4 hours per day and stood for two hours per day. When daily energy expenditure remained equal, the third physical activity regime of mixing waking and standing while restricting sitting to 6 hours per day was more effective in improving insulin levels and lipid profiles than one hour of vigorous exercise. Reports suggest 7 hours of vigorous exercise per week can still result in a 50% increased all-cause mortality risk and a two-fold increased risk in cardiovascular mortality in those who sit for prolonged periods.

Sedentary Behaviour Principle # 3

Specificity of Fitness a foundation principle of exercise science is Specificity of Fitness, which states that specific biological responses will occur at different levels of intensity, duration and frequency.

In sports performance, specificity is one of the key elements to any training selection. A marathoner will finely tune the aerobic energy system by overloading with continuous low to moderate volume training performed over many hours, training Type 1 muscle fibres (slow twitch), increasing blood flow to the fibres and increasing the size and number of mitochondria. Based on the specificity principle it seems reasonable to conclude that

periods of sedentary time might produce specific biological responses that cannot be changed by a more intense fitness regime. In other words, fitness activities of shorter duration, but more intense might not correct the sedentary periods whose responses occur over a longer time frame. Exercising 3 times per week to gain 1.5-3 hours of muscle activity is not specific enough to overcome long bouts of sedentary time accumulated over 70 hours (420 minutes) per week.

Sedentary Behaviour Principle # 4

Don't dismiss intermittent low intensity physical activity as a means of replacing sedentary time.

Nothing can cause such rapid changes in metabolic rate than instantaneous physical activity. While the metabolic rate of a muscle fibre is very low at rest, it can increase 50-100 fold immediately upon activation. At rest, the muscle fibre reverts back to its low metabolic rate. Replacing sedentary time multiple times throughout the day with spontaneous low to moderate physical activity allows muscle fibres to be reactivated numerous times, initiating multiple increases in metabolic rate. These "immediate benefits of exercise" can be experienced 100s of times per day at the lower levels of intensity. Sounds like a form of interval training.

Sedentary Behaviour Principle # 5

In sedentary behaviour, not all muscle fibres are created equal.

The force output in large weight bearing muscles is graded by the recruitment of more motor units, not by the intensity within the muscle fibres, which explains why light physical activity can produce powerful changes in cellular signalling and metabolism. Local muscle contractile activity within fatigue resistant slow twitch oxidative muscle fibres plays a dominant role in combating diseases associated with too much sustained sedentary time. The recruitment of Type 1 fibres permits multiple low to mode rate intensity intermittent movements throughout the day.

Sedentary Behaviour Principle # 6

Prolonged sedentary time produces distinct metabolic and cardiovascular responses through sedentary physiology that are not sufficiently prevented by a single bout of exercise.

One such response is the expression of the gene LPP1 responsible for controlling homeostasis, cancer and inflammation which is rapidly reduced significantly within one day of inactivity. LPP1 will remain low throughout periods of prolonged sitting even in those who perform 60 minutes of daily intense exercise. Lipoprotein lipase (LPL) is an enzyme found in the fat cells, responsible for converting triglycerides into free fatty acids and glycerol and clearing it from the blood into the skeletal muscle, increasing the concentration of High-Density Lipoproteins (HDL). Muscular inactivity reduces LPL activity resulting in lower triglyceride uptake into the skeletal muscle, reducing HDL activity contributing to an increased risk for metabolic syndrome and can only be reversed through all day low to

moderate intensity intermittent muscle contractions. Deep vein thrombosis (DVT) is caused by blood clots developing within the veins during prolonged periods of inactivity that can only be controlled with intermittent postural changes.

Sedentary Behaviour Principle # 7

Sedentary behaviour is as much about the psychological as it is about the physical. Sedentary people tend to be less sensitive and unresponsive to moving signals from either the muscles or the brain.

Movers are sensitive to moving neurochemicals and have a strong feedback loop from the muscles to the brain that encourages movement. The movers' brains are hard wired to move. While we are the product of our DNA, our environment will still impact it. DNA provides our structure but if the structure is either enhanced or destroyed then there are consequences. As with other organs if the brain is not stimulated it will eventually turn off and become as dormant as the sedentary lifestyle its body leads. If we choose to be sedentary for most of the day our brain will adapt to the inactive environment. The brains of people leading sedentary lives form a sedentary structure due to its interaction with their environment. Just as a muscle adapts to movement, so will the brain. As sedentary sitters become the majority, the environment could further evolve to meet their sedentary lifestyle by introducing more labour-saving devices, motorised transport, office sitting and more screen-based entertainment.

Sedentary Behaviour Principle # 8

The Keystone habit to reducing sedentary behaviour is the "sit to stand to stroll" transitions at least 30 times throughout the day.

In the Nurse's Health study two (2) hours per day of TV viewing was associated with a 23% increase in obesity and a 14% increase in diabetes, while sitting at work was associated with a 9% increase in obesity and a 7% increase in diabetes. Conversely, standing or walking around at home for 2 hours per day reduced the prevalence of obesity by 9% and 12% in diabetes. A NASA scientist, Dr Vernikos instituted an intermittent postural change protocol for Astronauts returning to earth by having them rise from a reclining position to sitting and then to standing once every 15-20 minutes over 8 hours completing 24-32 transitional movements per day. She found that these transitions stimulated vascular reflexes disabled during spaceflight and prolonged bed rest. Astronauts responded to this protocol better than any other exercise regime

Sedentary Behaviour Principle # 9

The root problems of sedentary behaviour can be traced back to the inability of the cell membrane to constantly change shape.

From birth to starting to walk we are constantly trying to overcome gravitational forces, which continues throughout our lives. As we age, we begin to withdraw gravity from our lifestyle. Tensegrity states that molecules, cells, tissues, organs and systems need to be

exposed to constant intermittent tension and mechanical forces in order to develop. When this stops there is a breakdown in their structure leading to problems with cell and tissue growth and development. Today's new mismatch chronic diseases are due to new reduced movement patterns, load distributions and reduced cell deformations. A changing environment forces the cells of the body to continually adjust to maintain their shape always working against gravity to create new loads on different parts. When the same position is maintained for many hours e.g. sitting, cells will react by creating unnatural overloads on the specific muscles. The secret to cell health is increasing our daily reliance on gravity, increasing ground reaction forces by interacting with the environment and supporting body weight many multiple times during the day

Sedentary Behaviour Principle #10

The most effective way of reducing sedentary time is to target it specifically, rather than simply relying on prescribing a moderate to vigorous exercise program (MVPA).

Assessing sedentary behaviour should be an important component of any initial consultation between health care professionals and their clients. For those sedentary clients, prescribing traditional exercise is generally not a realistic long-term solution. In a review of 33 studies and 25,446 participants with an age range from 18-94 years, results indicated that interventions emphasising MVPA physical activity and MVPA physical activity and sedentary behaviour resulted in only modest reductions in sedentary time. However, interventions that focussed solely on reducing sedentary time produced more clinically significant changes. By concentrating on breaking up sedentary time, an average of 90 minutes per day was replaced by low intensity alternatives. For every 30 minutes of sedentary time substituted with light intensity activity there is 2-4% improvement in triglyceride and insulin levels and B cell function.

Sometimes we "can't see the wood for the trees".