



# You can't **out-train** **a sedentary lifestyle**

## PART ONE

Following the overwhelming feedback FitPro received after our free webinar, *Targeting the Sedentary Market*, join us for the first in a six-part series about how we can understand this demographic better, the impact COVID-19 has had on the sedentary market and what fit pros need to know if we are to truly tackle the sedentary global pandemic.

**T**hroughout our evolution, physical activity has been intrinsically linked to the structure and function of all aspects of our organism, maintaining our bodies and keeping our brain functioning.

Between 50,000 and 150,000 years ago, our bodies evolved to search and hunt for food through constant cycling of 'feast and famine', causing the body to develop specific metabolic protocols to regulate the amount of food available for energy. Thrifty genes evolved to ensure adequate food storage during the feast period that could be used during the famine period. During periods of feasting, metabolic adaptations evolved to store fuel as fat, which could be used to forage or hunt for more food or build shelter.

Today, a combination of a sedentary lifestyle and access to freely available energy-dense food has almost eliminated

these metabolic processes that were so important in our development. Metabolic genes that were once programmed for physical activity have been turned down, leading to greater fuel storage.

Our gene pool was shaped by environmental conditions requiring constant movement that no longer exist today in our new sedentary society. With the elimination of hunger, thirst and danger we have effectively eradicated the powerful motivation and connection between moving, food gathering and survival. Ironically, our bodies are still designed for an active Stone Age lifestyle.

For over 65 years, starting with the famous Dr Jeremy Morris London bus driver/conductor studies, there has been extensive research published supporting physical activity as the most effective intervention strategy for improving health and fitness and

reducing obesity levels.

Armed with increased knowledge, improved public health policies, increased gym memberships and increased leisure time pursuits, there is still a reluctance for mainstream society to increase its physical activity levels, culminating in physical inactivity now being the fourth most significant risk factor causing death. Even though we are now living longer, we are also suffering from an increased risk of metabolic disorders, obesity, cardiovascular disease and cancer-related illnesses, often in the presence of increasing obesity levels. While our longevity might have increased significantly, so too has our morbidity. We are kept alive by a plentiful supply of food, various medications, excellent healthcare facilities, greater medical knowledge and improved surgical procedures.

Lifestyle-related diseases, sometimes referred to as the 'disuse syndrome', are now responsible for over 70% of all the major causes of death. More specifically, inactivity is responsible for 22% of cardiovascular disease, 22% of colon cancer, 18% of bone fractures, 12% of hypertension and 5% of breast cancers, accounting for 2.4% of the US healthcare expenditure, which translates into \$24,000,000,000 per year! More people die from inactivity-related illnesses than from car accidents, gun deaths, sexually transmitted diseases and drug overdoses combined. In fact, three to five million people globally die every year from inactivity-related illnesses, which is almost as many as die from smoking.

In a recent landmark study conducted at Sydney University (Australia), researchers reported that heart disease, stroke, breast cancer and colon cancer and the loss in productivity and disability adjusted life years of inactivity across 142 countries (representing 93.2% of the world's population).

They found that, globally, annual inactivity costs the healthcare system USD \$67.5 billion, of which the public sector paid \$31.2 billion, while \$12.9 billion was paid by the private sector and \$9.7 billion by households. Inactivity-related deaths contributed to \$13.7 billion in productivity losses alone. Interestingly, high-income countries shouldered the largest proportion of these healthcare costs to the tune of 80.8%. The changes in lifestyle over the past

40 years have been so dramatic that we are only now recognising the unique devastating responses that a sedentary lifestyle creates.

Fitness programmes today largely focus on dietary manipulation, training methods, exercise technique and equipment, postural alignments, functional training, correcting muscle imbalances, etc. (all of which are very important), usually conducted during a specific training session comprising on

***“The impact of sedentary lifestyles should be regarded as a legitimate component of health behaviour and fitness centre management”***

average 2-5% of a person's 24 hours/day. While current moderate-vigorous fitness programmes (MVFP) have been very successful in getting clients fitter, the same cannot be said for long-term weight loss, weight management, reducing sedentary behaviour, reducing the incidence of chronic diseases or convincing more people to adopt a more active lifestyle.

As our knowledge of sedentarism increases, the suggestion is that it may no longer be possible to counteract the new mismatch between physical activity and sedentary behaviour by training for 30-60 minutes per day or three to five times per week at MVFP.

The overriding message is that sedentary time for >10 hours per day is a significant risk factor, irrespective of what we do for the rest of the day. While moderate-to-vigorous exercise is a critical component of good health, we should also recognise that additional extensive sedentary time is an independent risk factor and should be addressed separately. We need to also be active all day, not just for 2-5% of our waking time. The obvious conclusion is that exercising three times per week to gain three hours of muscular activity is far from the perfect remedy for problems caused by

sedentary behaviour, which is commonly characterised by sitting down >350 times per week and reduced muscle activity for approximately 70 hours per week.

To overcome the new mismatch diseases between our body and the new environment, multiple movements throughout the day at low-to-moderate levels of intensity are required and need to be inclusive of our lifestyle, as well as a formal fitness programme.

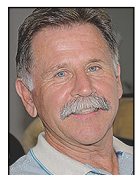
It is difficult for sedentary people to be motivated to join fitness programmes that have low penetration rates, poor retention rates and below average participation rates, given that the success of the behavioural change is based on sustainability and long-term participation. In sedentary groups, the new behaviour must become habit and be performed without any conscious effort or thought on a regular basis.

Armed with this new information, the impact of sedentary lifestyles should now be regarded as a legitimate component of health behaviour and fitness centre management. A behavioural change programme that focuses on nurturing the client to reduce their sedentary time by substituting it with active periods in the home, work/retirement, transport and during leisure periods could initially be more successful.

The global fitness industry needs to recognise that sedentary time and physical activity are independently protective against all-cause mortality and morbidity, not just for healthy people but also for the older adult, obese, chronically sick, unfit and inactive. By initially focusing on reducing sedentary behaviour and creating an active lifestyle, a large funnel is then created that could channel people into more formal fitness programmes and improve the penetration, retention and participation rates of current fitness programmes. **fp**

**BIOGRAPHY ►**

Dr Paul Batman has been involved in health and fitness for more than 40 years as a university lecturer, vocational educator, author, researcher, international conference presenter and workshop facilitator. Over the last 18 years, Paul has built, owned, operated and sold two leading health and fitness vocational training institutes, and has received a Lifetime Achievement award for his services to the Australian fitness industry. Paul originally contributed to our *Network* articles back in the 1990s.  
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# A tale of two pandemics: When COVID-19 collides with a sedentary lifestyle

## PART TWO

Following part one of our *Targeting the Sedentary Market* six-part series, where **Dr Paul Batman** discussed the impact COVID-19 has had on the sedentary market, part two looks at the devastating impact of the lockdown measures on the sedentary population's health.

Governments around the world have unanimously endorsed avoidance procedures to combat COVID-19. These include hand-washing, avoiding touching faces, keeping a distance from sick people and the wearing of personal protective equipment (PPE). The strategy that has had the greatest impact has been self-isolation, physical distancing and quarantining, which forces the youngest to the oldest, and the fittest to the unfit, to suddenly become inactive and more sedentary. A study in the US reported that over 33% of active people have become inactive, while the numbers who were previously sedentary remained the same<sup>1</sup>.

Controlling COVID-19 by self-isolation, social distancing, lockdowns and the heightened likelihood of additional waves

has led to a massive increase in sedentary behaviour. More people than ever before are opting for reduced physical activity in their lives as an online way of life takes over. While there is no disputing the importance of moderate-to-vigorous exercise for improved general health, penetration rates globally are historically low with an increase in sedentary behaviour, which is now regarded as a separate risk factor.

Opportunities to be physically active were suddenly closed down, including cardiac rehab programmes, school-based sport and PE, fitness centres, leisure centres, public facilities and community sporting programmes. Based on the first wave of COVID-19, global communities legislated that all members stay at home, with movement restrictions for a predetermined period<sup>1</sup>.

Prior to these quarantine restrictions, studies over the past 10 years report no change in exercise adherence rates and a sharp increase in sedentary lifestyles in the general population <50 years old. However, in those aged between 51 and 81 years, there has been a decline in moderate-to-vigorous exercise and a large increase in sedentary behaviour. This is the age group at the greatest risk of COVID-19 infections.

Prior to COVID-19 isolation, inactivity was already regarded as a significant public health problem, identified as early as 2012 as a pandemic, which has now escalated to an alarming new level. Globally, inactivity is the fourth leading cause of death due to preventable diseases, amounting to three to five million people dying annually of its comorbidities.

From a study of 387,109 people, examining lifestyle factors and hospital admissions, it was reported that 51% of COVID-19 cases were attributable to unhealthy lifestyle choices. They suggested that simple lifestyle changes could lower the risk of severe COVID-19 infections<sup>2</sup>.

Sedentary studies and step reduction studies report 7% decreases in VO<sub>2</sub>max and muscle atrophy in as little as two days of inactivity, these decreases being much higher in older adults >60 years, both of which correlate highly with increased mortality rates. Reductions in physical activity between one and four weeks cause detrimental effects on cardiovascular functioning with major increases in risk factors. More specifically, inactivity can cause cardiac atrophy, narrowing of blood vessels, arterial stiffening and a reduction in micro circulation, indicating that it does not take very long for adverse health changes to occur in confinement<sup>1</sup>.

While successful in limiting the transmission of the COVID-19 virus, quarantining has come at a substantial cost to metabolic health, immunity and mental health, resulting in increases in weight, obesity, loss of lean muscle mass (sarcopenia), increased blood glucose levels, insulin resistance, hypertension, diabetes, decreased levels of HDL and increased levels of LDL.

An irony of our new world order is that, when we can control COVID-19, we will be left with increases in metabolic syndrome, anxiety and depressive symptoms, a decreased immunity response and increased low-grade inflammation to not only COVID-19 but potentially to other chronic diseases.

## MENTAL HEALTH

During COVID-19, it is reported that over 30% of previously active participants have reduced their activity levels, while those who were previously sedentary remained inactive, with both groups spending more time sitting and watching TV. Additionally, with longer lockdowns and increased self-isolation, there has been worsening mental health reported with increased levels of loneliness, depression, stress and anxiety. People who were active for >30 minutes per day (MVPA) were 30% less likely to experience depressive symptoms and 30% less likely to experience anxiety. Those who sat and were sedentary for more than 10 hours per day were 39% more likely to present with depressive symptoms. In COVID-19 self-quarantine, four times more people have presented with increased levels of depression and anxiety than previously<sup>3</sup>.

***“From nine million over-70s, there could be an increase of 392,948 new cases of diabetes attributed to lockdown measures”***

## IMMUNE FUNCTION

While social distancing has been the only effective intervention to limit the transmission of COVID-19, it has had damaging effects on the immune system, particularly in older adults. COVID-19 is a severe and aggressive respiratory condition that causes significant damage to the lungs. The infection causes a local immune response resulting in the release of macrophages and monocytes releasing cytokines initiating a response from T cells and B cells. In most cases, this immune response would neutralise the virus and resolve the infection. However, the COVID-19 virus causes an overproduction of pro-inflammatory molecules, resulting in an overproduction of cytokines and a cytokine storm, leading to multi-organ damage to respiratory tissue, cardiac, liver, vascular and kidneys<sup>4</sup>.

Sedentary lifestyles are also associated with immune dysfunction. Prolonged inactivity

causes an increase in tissue inflammation, impaired natural killer cell activity, reduced T cell proliferation and cytokine production. These responses lead to greater susceptibility to viral and bacterial infections.

Inactive older adults generally present with lower concentrations of anti-inflammatory bio markers and higher levels of low-grade chronic inflammation. Improvements in immune function in older adults requires continual muscle contractions that trigger anti-inflammatory responses through the release of myokines. In the current COVID-19 climate, inactivity has been responsible for >8% of hospitalised cases, while obesity has been responsible for >28%.


## METABOLIC HEALTH

Metabolic syndrome comprises abdominal obesity, insulin resistance, diabetes, hypertension and hyperlipidaemia. With the reduction in activity levels due to COVID-19, people at risk for metabolic syndrome are spending an inordinate amount of time in sedentary activities, particularly older groups. Sitting time >42 hours per week is associated with a 4-12% increased risk of metabolic syndrome, which is further exacerbated by poor eating habits. For example, major changes in carbohydrate metabolism occur with sedentary behaviour, with alterations in the muscle glucose transporter (GLUT 4), a critical site for these changes. When a muscle is inactive, there is a rapid decrease in GLUT 4 ability and a decrease in insulin-stimulated glucose uptake, resulting in increased circulating blood sugar levels. Low-intensity movements increase GLUT 4 concentrations and improve glucose tolerance in the absence of normal physical activity guidelines<sup>5</sup>.

In the UK, it has been estimated that, from nine million people over 70 years of age, there could be an increase of 392,948 new cases of diabetes attributed to lockdown measures, adding another 1.17 billion dollars to the UK healthcare system<sup>6</sup>.

## INFLAMMATION

Tragically, older adults are at the greatest risk of the COVID-19 infection. The inflammation of the COVID-19 virus reacts with the constant low-grade inflammation associated with ageing, often termed ‘inflammaging’, which is highly correlated with an increase in morbidity and an increased risk of death<sup>7</sup>.

Obesity is regarded as a significant risk factor in contracting and recovering from 





***“51% of COVID-19 cases were attributable to unhealthy lifestyle choices”***

COVID-19. Obesity initiates ‘metaflammation’, a low-grade inflammation caused by chronic metabolic conditions such as hypertension, diabetes, insulin insensitivity, glucose intolerance and increased blood lipids.

As the fat cell (adipocyte) increases in size to store more triglycerides, abnormalities in the endoplasmic reticulum (ER) and mitochondria occur. When food intake is increased, the ER builds proteins for the cell structures and everything remains in balance. As the adipocyte increases in size, the ER becomes overwhelmed and produces damaged proteins that build up in the cytosol, interfering with other functions of the cell. If the ER cannot restore order, the damaged proteins die, adding additional stress by releasing free fatty acids and inflammatory molecules, increasing fat and glucose levels throughout other cells, as well as insulin resistance resulting in hyperglycaemia and diabetes.

The enlarged adipocyte releases immune cells producing a pro-inflammatory response, leading to oxidative stress in the mitochondria and forcing it to become overworked and unable to process the excess fatty acids.

## THE IMPORTANCE OF PHYSICAL ACTIVITY

Physical activity is an important intervention in avoiding infection, fighting COVID-19 and in the recovery process. During physical activity and for approximately three hours after, important immune cells circulate throughout the body at a faster rate than normal. The most effective are neutrophils (situated in

bone marrow and lung), natural killer cells (located in spleen) and macrophages, which are part of the innate immune system (front line of defence).

Physical activity brings these cells out from the lymphoid tissue and into the blood compartments to roam throughout the body. After three hours of recovery, everything returns to nearby tissue. The immune system receives no long-term effects from a single bout of physical activity. The results are purely from the accumulation of the acute effects of one bout of physical activity building upon another bout, indicating the immune responses are frequency dependent.

Physical activity is the only stimulus that permits the transient surge of important immune cells as it releases the front line of defence and improves pathogen surveillance. If the pathogen gets through the slower acting immune cells, the T cells and B cells are then brought into action. As the blood is forced through the arteries during exercise, the walls are subjected to the mechanical force of the blood pushing against it, causing the release of leukocytes into the blood at the same time as catecholamines and glucocorticoids. This response enhances the ability of the immune system to fight any impending infection, eventually producing an anti-inflammatory response reducing low-grade inflammation<sup>8</sup>.

The responses caused by exercise are transitory with each bout. For long-term protection, physical activity must be regular, moderate, constant and continual.

To address the new health and fitness

paradigm created by the COVID-19 virus and its consequences, rather than concentrating on weight loss and aesthetics and the 18-34 years demographic, fitness professionals need to refocus their programmes on more public health issues, such as improving immune responses, decreasing metabolic syndrome, reducing systemic inflammation, reducing anxiety and depressive symptoms and engaging older adults. **fp**

## BIOGRAPHY ►

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# 10 IMPORTANT FACTS

## fitness professionals **need to know** about **SEDENTARY BEHAVIOUR**

In part three of our *Targeting the Sedentary Market* series, **Dr Paul Batman** discusses 10 facts you need to know to target sedentary behaviour.

**T**he importance of regular physical activity has never been more evident. The pandemic has forced people to become more sedentary than at any other time in the past 50 years. As more people understand the dramatic effects of sedentary lifestyles, there is an increased need to specifically target reducing sedentary behaviour, as well as prescribing a structured moderate-to-vigorous physical activity (MVPA) exercise programme.

To reduce daily sedentary behaviour, it is important to understand the unique characteristics that make it different from inactivity.

**1 Sedentary behaviour, as represented by sitting, is seriously hazardous to health and is a significant risk factor**

Prolonged sedentary behaviour during COVID-19 creates unfavourable responses that have not been previously identified. Over the past 40 years there has been a doubling in diabetes and metabolic syndrome in the sedentary population, mainly as a result of increased obesity levels and reduced muscle contractions.

Unique conditions such as tissue inflammation, mitochondrial distress, tensegrity deformations, deep vein thrombosis, reduced LPL activity and LPP1 gene changes are examples of conditions





specific to sedentary lifestyles that can only be overcome by daily multiple intermittent muscle contractions<sup>1</sup>.

## 2 Too much sitting is not the same as too little exercise

It is possible to meet the current national exercise guidelines and still be sedentary, while still being affected by its side effects. As sedentary behaviour and the absence of MVPA are distinctly different, they should be treated with different interventions. MVPA sessions making up 1/48th of the day only require muscle contractile activity for 30-60 minutes per day, which is not enough to overcome the sedentary side effects of the remaining hours in the day<sup>2</sup>.

## 3 Based on the concept of specificity, the responses associated with low-intensity activity less than three METs could be different from those gained by more MVPA

The specificity principle is especially related to recruiting the correct energy systems and muscle recruitment patterns. For over 150,000 years, our bodies have evolved through intermittent activities all day at an oxygen consumption of 2-6 METs (7-21ml/kg/min<sup>3</sup>), walking 8-20km at a low-to-moderate intensity or 12,000-18,000 steps, and interspersed with short periods of moderate-to-vigorous-intensity activities (6-9 METs).

It seems implausible that the thousands of muscle contractions per day that have been eliminated from our modern lives could be replaced by physical activity bouts of 30-60 minutes two to four times per week.

## 4 It is still possible to increase cardiometabolic risk factors even further given the low adherence rates of structured exercise

Structured exercise programmes follow the traditional medical model of dose response prescription, which has been effective in producing powerful results in reducing mortality rates but has historically produced high drop-out rates, low retention rates, low participation rates and low penetration rates.

A new approach that emphasises integrating physical activity back into our lives by creating an active lifestyle with an initial emphasis on reducing prolonged sitting and increasing walking could be the funnel into a structured fitness model required to improve long-term adherence rates<sup>3</sup>.

## 5 The rapid unique responses occurring from sedentarism are largely due to reduced muscle contractility throughout the day

A contracting muscle is a dynamic

# “Active brains are hard wired to move, while the sedentary brain creates a sedentary structure”

process producing important energetics and biochemistry, activating more than 100 genes to regulate some of the most complicated processes in the body. The metabolic rate and oxygen cost of the muscle activity at rest is low; however, when contracting, the metabolic rate escalates to epic proportions in an instant.

Given the dramatic increase in metabolic disease, the importance of physical activity in controlling and promoting glucose regulation and insulin sensitivity can't be underestimated<sup>4</sup>.

## 6 Muscle fibres are not created equal when controlling for sedentarism

When a motor unit is activated, it stimulates all its muscle fibres, explaining how low-intensity activity can produce powerful changes in cellular signalling and energy production, causing a cascade of dramatic responses.

Type 1 fibres that are oxidative and fatigue resistant play an important role in low-to-moderate-intensity daily intermittent contractions. Together with lipoprotein lipase enzymes they play a crucial role in reducing tissue inflammation, fat removal from the blood and improving mitochondrial performance<sup>5</sup>.

## 7 Sedentary behaviour is about the psychological as well as the physical

Sedentary people tend to be less sensitive and unresponsive to moving signals from either the muscles or the brain. Active people are sensitive to moving neurochemicals and have a strong feedback loop from the muscles to the brain that encourages movement. Active brains are hard wired to move, while the sedentary brain creates a sedentary structure due to its interaction with its inactive environment<sup>5</sup>.

## 8 The root problem of sedentary behaviour can be traced back to the inability of the cell membrane to constantly change shape

Throughout life there is a constant need to overcome gravity. Molecules, cells, tissues,

organs and systems need to be exposed to constant intermittent tension and mechanical forces. When this stops, there is a breakdown in structure leading to problems with the cell, tissue growth and development. The new mismatch chronic diseases are due to reduced movement patterns, load distributions and reduced cell deformations. A changing environment forces the cells to continually adjust to maintain their shape, always working against gravity to create new loads on different parts<sup>5</sup>.

## 9 The most effective way of reducing sedentary time is to target it specifically, rather than prescribing an MVPA programme

For sedentary clients, prescribing traditional exercise is generally not a realistic long-term solution to reducing sedentary behaviour. In a review of 33 studies and 25,446 participants between 18-94 years, MVPA and sedentary behaviour interventions resulted in modest reductions in sedentary time. Interventions that focused solely on reducing sedentary time produced more clinically significant changes. For every 30 minutes of sedentary time substituted with light-intensity activity there is 2-4% improvement in triglyceride, insulin levels and B cell function<sup>6</sup>.

## 10 According to the WHO, more than 9,000 people die daily due to consequences of sedentary death syndrome, caused by a mismatching of a changing lifestyle and reduced daily physical activity levels

Cregan-Reid said, "If the timeline for the human species were condensed into a 9am-5pm working day, we would need to wait until 4.58pm for the first change to our hunter gatherer lifestyle (8,000-15,000 steps per day) in the form of the agricultural revolution and moving into small cities at 4.59, the emergence of the industrial revolution at 4.59:58 and the recent digital revolution at 4.59:59 (to less than 1,000-2,000 steps per day). Our sedentary lifestyle problems have occurred in the last two minutes and, more specifically, in less than a fraction of a second in our evolutionary timeline from hunter gatherer to couch potato."<sup>7</sup>

Our body is in shock from these rapid changes! **fp**



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# 12 KEY CONSEQUENCES OF PROLONGED SEDENTARY BEHAVIOUR

In part four of our *Targeting the Sedentary Market* series,  
**Dr Paul Batman** outlines 12 reasons we need to keep moving.

**T**o control the transmission of the COVID-19 virus, multiple lockdowns of entire population groups have been required. While successful in controlling the pandemic, it has contributed to public health issues in those unable or not motivated to undertake physical activity. While the general consequences of quarantining have been reported, there are unique complications caused by prolonged sedentary behaviour that are often overlooked.

## **1** Deep vein thrombosis

Deep vein thrombosis (DVT) is caused by blood clots in the veins during prolonged periods of sedentary behaviour. These blood clots can travel to other parts of the body and cause serious blockages, leading to heart attacks or strokes and other life-threatening conditions. Blood clots can travel to the lungs and, by obstructing the pulmonary artery, can cause a pulmonary embolism<sup>1</sup>.

## **2** Insulin sensitivity and metabolic syndrome

Over the past 40 years, there has been a dramatic increase in the number of people with type 2 diabetes, mainly due to sedentary behaviour and poor eating habits. Prior to 1960, there were fewer than two million people in the US with type 2 diabetes, swelling now to 26 million, while a further 80 million have pre-diabetes. The body's cellular mechanisms are not designed for sedentary behaviour. Without muscle contractions to relocate blood sugar, most will remain in the blood until insulin is released to move it into the muscle, organs and fat cells. If large muscles are contracting, there is an increase in the movement of blood sugar into the muscles, reducing the blood sugar spike without a large increase in insulin release<sup>2</sup>.

## **3** Telomeres

In the nucleus of each cell, genes are stacked into DNA molecules, tightly packed into thread-like structures called chromosomes that are surrounded by specific proteins that support its structure. At the ends of the chromosomes are sections of DNA called telomeres that protect the genetic data, make it possible for cells to divide and hold the secrets to ageing and chronic

diseases. With each cell division, the telomere shortens, eventually causing many age-related diseases. The shortening of the telomere reflects the number of times the cell has divided. When they get too short and the cell can no longer divide, the cell becomes inactive, 'old' or dies. This shortening process is accelerated by ageing, sedentary behaviour and cancer<sup>3</sup>.



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**An active lifestyle and reduction in sedentary behaviour can reduce the risk of cancer by more than 45%** ”



#### 4 Lipoprotein lipase (LPL)

Lipoprotein lipase (LPL) is an enzyme important in fat metabolism. LPL is found in the walls of the adipose (fat) cells and is responsible for converting triglycerides into free fatty acids and glycerol and clearing it from the blood into the skeletal muscle. Sedentary behaviour reduces LPL activity, reducing triglyceride uptake into the skeletal muscle, increasing dyslipidaemia, reducing HDL (good cholesterol) activity and contributing to an increased risk of metabolic syndrome. Multiple muscle contractions throughout the day are the most effective method of increasing LPL activity<sup>3</sup>.

#### 5 Stabiliser muscles

The stabiliser muscles are important in maintaining correct posture in both static and dynamic movements and in glucose and free fatty acid consumption. Sedentary behaviour renders them ineffective and weaker. Stabilisers require constant intermittent movement, often in an isometric manner, to maintain strength and flexibility. A loss in strength of the stabiliser muscles affects the force production of the mover muscles. The mover muscles can no longer pull hard on the bone, reducing its force and power.

#### 6 Cancer

Cancer is the second main cause of death, with smoking, sedentary behaviour and poor nutrition increasing its impact significantly. An active lifestyle and a reduction in sedentary behaviour can reduce the risk of cancer by more than 45% by

stimulating the immune system, decreasing body fat, changing participating hormone levels and improving the antioxidant enzyme's fighting capabilities. Sedentary behaviour promotes inflammation, increasing the risk of endometrial cancer, ovarian cancer and breast cancer without any significant change in BMI, indicating that physical activity might be the key variable in cancer risk reduction<sup>4</sup>.

#### 7 Bone density

Bones grow due to the stresses and strains placed on them. If loading on a specific bone increases, the bone will remodel itself over time to become stronger. Sedentary behaviour reduces bone mineral density due to the absence of any significant overloading mechanisms. Sedentary behaviour can also cause a rapid resorption of bone with a decrease in bone development and bone mineral density, contributing to osteoporosis.

#### 8 Brain function

The brain of sedentary people can form a sedentary structure, due to the interaction with their sedentary environment. Their sedentary brain is less responsive to the neurochemicals for movement. They have muscles that are trained to sit and not send feedback signals back to the brain to get them moving, making it difficult to motivate them to exercise. Active people are more sensitive to moving neurochemicals and have a strong feedback loop from the muscles to the brain that encourages movement.

#### 9 Confined places

The body is affected by the force of gravity at all levels of its organisation (i.e., cells, systems, organs – all are responsive to changes in gravity). By changing position, the body is always working against gravity, creating new loads on different body parts. When the same position is maintained for many hours, cells will react by creating unnatural overloads on the specific muscles. Sedentary behaviour reduces movement patterns, load distributions and cell deformations, resulting in cell membrane damage. Every movement loads the tissues of the body in different ways, increasing the daily reliance on gravity, increasing ground reaction forces by interacting with the environment and supporting bodyweight<sup>5</sup>.

#### 10 Sarcopenia

Sarcopenia is the involuntary loss in strength, function and muscle mass that comes with ageing or sedentary behaviour. As a result of ageing, muscle mass decreases by 3-8% per decade after the age of 30 years, with a substantial loss by age 60 years, resulting in joint problems and poor posture. This can lead to an increased risk of falling and disabling injuries. Sedentary behaviour causes an initial decrease in neural strength, followed by a loss in muscle mass, muscle power and mitochondrial dysfunction at any age.

#### 11 Mitochondrial distress

Mitochondria are very small organelles found within all cells of the body. Initially, it was thought that their role was to just produce energy for the remake of ATP, a molecule necessary for any type of contraction. Mitochondria play a vital role in maintaining health over the lifespan. Diseases of the mitochondria have a profound effect on daily life and longevity, as they regulate substrate utilisation, energy production and muscle size and function. Sedentary behaviour causes a reduction in mitochondrial number and size and enzyme activity. Sedentary behaviour combined with ageing results in an accelerated decrease in mitochondrial functioning, contributing to insulin resistance and type 2 diabetes, muscle breakdown, oxidative stress and reduced aerobic fitness<sup>6</sup>.

#### 12 Inflammation

Older adults, obese and overweight, unhealthy and sedentary groups present with a low level of chronic tissue inflammation, contributing to cardiovascular disease, colorectal cancer, type 2 diabetes, chronic obstructive disease and different types of dementia. Under normal conditions, inflammation is important to fight the spread of diseases or infection. Those 'at risk' of low-grade chronic inflammation include the unfit and sedentary, whose immune system is in an overactive state, resulting in a high-energy demand, a decrease in insulin sensitivity, increased atherosclerosis and tumor growth, and increased oxidative stress.

#### The bottom line

The root of all sedentary problems lies in the lack of daily muscle contractile activity. Intermittent muscle contractions in any domain have the greatest effect on variations in metabolic rate than any other intervention. The changes in the metabolic rate of muscle activity are so dramatic it can increase 50-100 times from rest to muscle activation.

To conclude, Dr Marc Hamilton, a pioneer researcher in inactivity physiology, said, "Public health campaigns should eventually provide people with a rich sense of 'metabolic awareness' about the concept that the body constantly senses and responds to movement vs inactivity, in tandem with behavioural strategies promoting the ability to take full advantage of every opportunity to move more." **fp**



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# 10 RULES OF ENGAGEMENT

## to **change behaviour** in the

# SEDENTARY POPULATION

In part five of our *Targeting the Sedentary Market* series, **Dr Paul Batman** looks at 10 ways you can influence the behaviour of the sedentary population.

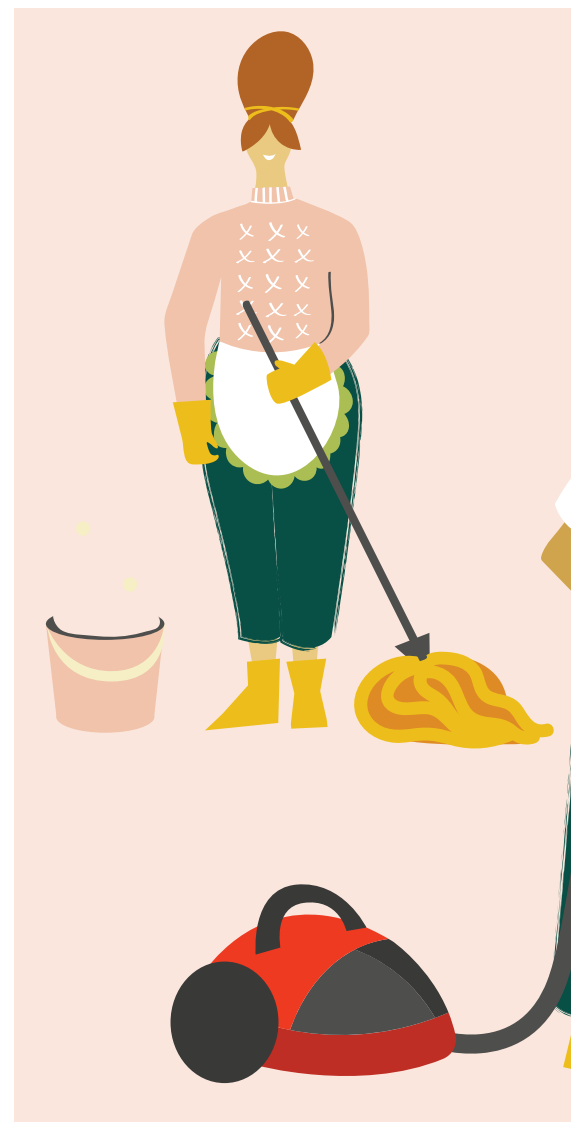
**M**otivating sedentary groups to include physical activity as part of their daily lives requires more than an exercise prescription of 150 minutes of moderate-to-vigorous activity per week. Sedentary groups need to follow a path built on small wins and modifying old habits with new, achievable habits that are built into all parts of their daily lives.

**1 Educate and equate**  
For sedentary groups to realise they can change their lifestyle by reducing their sedentary time over the course of the day, they need to understand the consequences of inactivity. They also need to make lifestyle changes by creating active homes, active work, active transport and active leisure and compare them against more formal fitness activities. For example, running on a treadmill at the gym at 6km per hour for 30 minutes is equal to 6 METs x 30 minutes = 180 MET minutes. Sedentary groups could expend the same amount of energy if they swept the patio for 15 minutes (4 METs x 15 minutes = 60 METs) + walked while shopping at a supermarket for 30 minutes (3.5 METs x 30 minutes = 105 MET minutes) + mowed the lawn for 30 minutes (4.5 METs x 30 minutes = 125 MET minutes). By combining all the active home activities

(sweeping, shopping and mowing) the total workload is 290 MET minutes, compared to the 180 MET minutes of running on the treadmill.

**2 Appeal to the emotional brain**  
Sedentary people need to be convinced that they are capable of making significant changes that are within their capabilities. It is important to appeal to their emotional brain, as this is the part that gets things done. They need to see success stories where others have made positive changes and feel the connection. Simply giving directions and a plan engages their rational brain, which is great for direction and clarity but is not effective for long-term motivation and sustainability. It is always best to find the emotional hook and build upon it. Sedentary groups need to experience the positive feeling of exercise during or immediately after and not just be given directions and instruction. Extra knowledge does not always change behaviour. External motivation by the fitness instructor or personal trainer rarely motivates them into long-term change.<sup>1</sup>

While SMART goals are important, they appeal more to the rational brain and don't generate the same level of emotion in the emotional brain of sedentary groups. Most fitness programmes appeal to the rational brain with the need to follow directions and





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To foster long-term participation in physical activity, it is best to initially encourage sedentary people to build ‘movement habits’ ”

maintain the programme. The rational brain contemplates and analyses the task and is almost always guided by problems rather than solutions, often over thinking the situation, causing additional confusion. In sedentary groups, this can lead to poor adherence to the fitness programme and, ultimately, drop-out. Smokers understand the devastating effects of smoking and know they should quit cigarettes, yet they still keep smoking.

### 3 Willpower/self-control is limited

Sedentary people have an easily exhausted supply of self-control/ willpower. They tend to revert to previous behaviour when the change is too great or too quick. The larger the change required, the less self-control, making long-term change challenging. Just like

experiencing fatigue in the gym after too many repetitions, the emotional brain starts to fatigue and lose interest, while the rational brain cannot bring it back to task. The bigger the change required to undertake a fitness programme, the greater the exhaustion of their self-control and willpower. It is not that sedentary people are lazy, they just wear themselves out by making too many decisions about the fitness programme and its sustainability.

To maintain their self-control and willpower, sedentary people respond better with clear instructions and clarity, as it provides direction and reduces ambiguity that can create confusion and exhaustion. The more a behaviour becomes automatic, the less the willpower required to maintain it. The more decisions that sedentary groups are faced with during the day, the less willpower they have sustaining physical activity and fitness programmes. ■■■▶



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## The more a behaviour becomes automatic, the less the willpower required to maintain it”

From an evolutionary perspective, it is an ancient, powerful instinct to avoid unnecessarily wasting energy. Hunter gatherers never exercised and only moved and expended energy throughout the day for meaningful tasks. Not knowing when their next meal was coming, it was an important survival instinct to conserve energy and expend it only when necessary to hunt, gather, prepare meals, etc. Formal exercise requires sedentary groups to overcome the natural urge to remain inactive and conserve energy.<sup>2</sup>

4

### Avoid decision paralysis

Sedentary people can suffer from decision paralysis, where too many options can have them revert to the default plan or status quo. If it is too difficult, they can go back to their Plan B. The options requiring more decisions, even if they are great alternatives, can freeze change. It is more effective to start at a point, give clear instructions with limited choice, and then create an action plan to be followed and monitored. It is not effective to be told how to act when its success comes from being internally motivated. The more fitness choices the rational brain is given, the more exhausted it becomes. Ambiguity is the enemy of sedentary groups and should be countered by a physical activity programme that is anchored to existing behaviours. This allows a new behaviour to be added to an already existing habit, taking away any confusion or doubt.

5

### Focus on small changes

To ensure long-term progression, sedentary groups respond more effectively by making small changes that can be achieved easily, even though the goals can be seen as almost trivial to highly motivated groups. It requires lowering the bar until the goals can be achieved and then repeating the same process over and again. The best method is to concentrate on one small behaviour, achieve this and then add another small change until the final goal is reached. This method creates enough enthusiasm to keep them on task and progress through to the next small challenge, creating a spiral of change. If there are no obvious changes or visible benefits, the sedentary person will soon choose to quit.

To be effective, small wins must be within immediate reach and be meaningful. Success must come immediately or after the event. When sedentary groups set small goals they immediately achieve and they start to realise that they can succeed beyond what they have achieved previously. Small wins reduce the importance and magnitude of the task, and

reduce its difficulty and improve skill levels. It now does not seem such a big task.

6

### Create an identity

Sedentary people need to belong to something; it is one of their strongest desires. They need to create an identity or group. Asking them to go to a fitness centre and work out with a group of strangers using unfamiliar equipment and different training regimes sets them up for failure. As the majority of sedentary people will not fit into this scenario, they lose their identity, causing their emotional brain to resist and the activity to become too daunting. It is better to start sedentary groups on small, achievable, familiar tasks in an accustomed environment with people they know.

In a study of hotel maids, almost 67% did not recognise that their job was a form of exercise. More than 30% said they did not get any exercise at all. The reason being that their work did not fit into the cultural definition of exercise and so they felt they were unfit and inactive. One group was told they were very active and fit, as their daily chores were sufficient to meet and exceed the national recommendations for physical activity. This group now having been given a new identity worked harder and more intensely during their work shifts, regarded themselves as ‘exercisers’ and lost 3kg in the following four weeks.<sup>3</sup>

7

### Move within familiar environments

Sedentary people are very sensitive to their environment. Sometimes, it is more effective to move within a familiar environment, as the problem with adherence to a new behaviour can be more situational rather than a people problem. Rather than prescribe exercise in an entirely new environment, it is more effective to initially encourage movement in familiar surroundings. This allows sedentary people to change behaviour in a familiar setting, which then gives them confidence to perform automated tasks in a new environment. Making small changes in this environment is about making the right behaviours a little easier and wrong behaviours a little harder.

To foster long-term participation in physical activity it is best to initially encourage sedentary people to build ‘movement habits’ by substituting inactive periods of their day with more active alternatives. Simply by breaking up periods of prolonged sitting with ‘sit two, stand two, stroll, repeat’ alternatives throughout the day creates a wave of responses that can lead to major changes in bodyweight and health parameters.

8

### Don’t start at the bottom

Rather than prescribe activities for sedentary people outside their comfort zone, initially focus on physical activities they are already doing and then build movement behaviours around these behaviours. If they feel they are on their way to becoming fitter and not starting from the bottom, they are more motivated to maintain the longer journey. Sedentary groups need to feel they are closer to the finish line than they might have thought.

9

### Changes are contagious

Behavioural change can be contagious. If people around the sedentary person see that they can succeed without too many changes to their daily activities, they are also more likely to follow. The influence of loved ones, friends, the circle of trust can exert important peer pressure and provide support, spreading the word to a more extensive network. Friends and family can be a crucial influence on sedentary groups by exerting visible peer pressure and support by pulling them in their direction.

10

### The spill-over effect

Often changes in one movement behaviour can have a spill-over effect into another part of the sedentary life. Changing one behaviour can make changes to other behaviours much easier. Once the sedentary person embraces physical activity, they can start to look for other healthy changes that are within their scope (e.g., improved diet or joining a fitness centre).

### THE BOTTOM LINE

While spreading the word about fitness has been marginally successful, with some countries attracting up to 20% of their population, collectively still only 2.4% of the world’s population attends fitness centres. While this number will undoubtedly increase over the years, its infrastructure, current methods and fitness offerings will still have difficulty in attracting the sedentary groups where the greatest number of people exist.

To attract larger numbers and improve penetration rates in the sedentary population, physical activity programmes must be accessible, sustainable, achievable, affordable, convenient, unintimidating, self-selected and enjoyable. **fp**



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# PIVOTING FITNESS TO A HEALTHCARE OPTION

In the final part of our *Targeting the Sedentary Market* series, **Dr Paul Batman** discusses placing fitness under the umbrella of healthcare.

**P**rior to COVID-19, the fitness industry was thriving with an increase in gyms opening and memberships at their highest levels at 10,000,000, a 25% increase from the previous year. However, COVID-19 has revealed a soft underbelly, exposing continual high levels of sedentary behaviour and physical inactivity on a population basis. Inactivity is still the fourth largest killer, with over 9,000 people globally dying daily of sedentary-related chronic diseases.

Since 1995, there has been a rapid rise in sedentary behaviour, with the UK experiencing a 20% decline in physical activity levels over this period. This has been partly attributed to the increased use of home and office personal computers and the increased reliance on the internet for many of our normal daily needs.

The COVID-19 quarantining and multiple lockdowns to control the transmission of the infection has led to higher levels of sedentary behaviour, with increases in metabolic syndrome, levels of low-grade chronic inflammation, oxidative stress, malfunctioning mitochondria and a reduction in immune system functioning, leading to increases in chronic non-communicable diseases.<sup>1</sup>

The leisure time commercial fitness model promoted for the past 20 years is not attracting wider groups within our population, particularly the most vulnerable, and has had little impact on reducing sedentary behaviour on a global basis.

Over the past 12 months in the UK, 8.8 million people reportedly did no exercise at all, particularly in the over-55 years. Additionally, 73% of people failed to meet the basic NHS physical activity guidelines, even though regular exercise was widely reported to decrease the risk of dying from the COVID-19 infection. Over 33% of UK residents reported their physical health was worse than

the same time 12 months ago and 24% said they planned to do nothing after lockdown restrictions were finished. By 2030, it has been predicted that total physical activity levels in the UK will be 35% lower than in the 1960s.<sup>2</sup>

The rapid transmission of COVID-19 has had a devastating effect on older adults, many with hypertension, diabetes and respiratory disorders, with over 50% of all hospital cases due to poor lifestyle choices. During COVID-19, the over-65 age group has been the most vulnerable, made worse by multiple risk factors as well as being among the most sedentary in the population. Over 40% of the healthcare budget is devoted to

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**Over 33% of UK residents reported their physical health was worse than the same time 12 months ago**”  
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over-65 years, with those who are sedentary between the ages of 45-65 years most likely to end up living in aged care facilities. The over-65 years group is rapidly increasing, with over 78,000,000 in the US alone, with 4,000,000 new additions every year, which translates into 11,000 per day.<sup>3</sup>

Over the years, numerous government bodies have created campaigns encouraging people to exercise in their leisure time to compensate for the reduction in everyday physical activity that has been engineered out of modern lives, many of which have made little impact in reducing sedentary behaviour.

To make significant changes in sedentary

time, physical activity must be made accessible, affordable and sustainable by embedding it within the lifestyle of all, irrespective of health, age or chronic condition, by creating opportunities to move in the home, at work, during transport and during leisure time.

The fitness industry needs to lead this initiative by pivoting to a physical activity healthcare option by initially focusing on reducing sedentary behaviour throughout the day by substituting inactive periods with more active alternatives. Once a culture of movement has been adapted and sustained, these groups can be converted to traditional fitness programmes.

## **Considerations for pivoting fitness to healthcare**

It is better to do some physical activity, irrespective of the intensity or mode of exercise. Light-intensity activities can produce appreciable health benefits by activating the Lipo protein lipase (LPL) enzyme important in transporting triglycerides in the blood to muscle and adipose tissue, as well as the continual activation of the Glut 4 transporter necessary for the removal of blood sugar into the muscle and liver.<sup>4</sup>

All domains of physical activity are legitimate modes of exercise, including active travel, home activities, gardening, leisure sport and activities of daily life, with each having energy expenditures equal to many traditional fitness activities between 5-9 METs. When it is not possible to perform normal fitness activities, gardening, housekeeping, home maintenance, etc. are excellent substitutes that cause powerful health benefits and increase energy expenditure without long recoveries.

Sedentary behaviour is an independent risk factor in the presence of moderate-to-vigorous exercise. Breaking up prolonged bouts of sedentary time every hour with sit to



stand to stroll transitions for up to five minutes and reducing sitting to less than eight hours per day causes increases in blood pressure, stroke volume and cardiac output, as well as mitochondrial respiration, LPL enzyme activation and improvements in blood sugar uptake.

There is no minimum duration for physical activity participation (the 10 minutes rule was previously prescribed). By giving credit to all movement time, exercise becomes a more sustainable behaviour. Significant health benefits can be gained by accumulating minutes of movement throughout the day.

The new WHO guidelines recommend 150-300 minutes of moderate physical activity (4 METs) and 75-150 minutes of vigorous physical activity (7 METs), which is double the previous recommendations. To target some chronic conditions, time in excess of 300 minutes of moderate physical activity (4 METs) can further improve health outcomes.<sup>5</sup>

High-intensity exercise requires more recovery time and should be performed no more than two to four times per week. If more intense sessions per week are prescribed, a longer recovery period is required between workouts. In sedentary populations,

high-intensity exercise should be performed no more than twice per week due to their low fitness threshold and the longer recovery required to receive the overcompensation from the workout.

Multiple bouts of muscle contractions throughout the day provide a strong health stimulus and this is generally more sustainable. Muscle contractions recruit motor units and can engage many thousands of muscle fibres in a single contraction that activate mitochondria, decrease blood sugar levels, remove fat from the blood, increase blood flow to active areas, release anti-inflammatory molecules and strengthen the functioning of the innate immune system.

Two sessions per week of strength training for all population groups will enhance health outcomes. During ageing and sedentary periods, muscles are subject to sarcopenia, which impacts on all aspects of life. Pulling, pushing, lifting, carrying, squatting, stepping and lunging with loads create powerful stimuli to increase muscle mass and strength.

Physical activity programmes should be inclusive of all sub population groups, including older adults, those with disabilities and chronic conditions and adolescents.

Initially focusing on reducing sedentary behaviour with lifestyle physical activity at low-to-moderate intensity creates sustainable behaviour that improves long-term fitness that can be converted to a more traditional fitness model.

The focus should be on internal motivational strategies to sustain new behavioural changes in sedentary groups. Sedentary groups are motivated when physical activity experiences appeal to their emotional brain by giving them a choice of activities, ensuring they are competent in performing the movements, the movement having some purpose, and immediately enjoying the physical activity in the moment. **fp**



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