THE CYCLING BIBLE

THE CYCLIST'S GUIDE TO TECHNICAL, PHYSICAL AND MENTAL TRAINING AND BIKE MAINTENANCE

CHRIS SIDWELLS

THE CYCLING BIBLE

THE CYCLIST'S GUIDE TO TECHNICAL, PHYSICAL AND MENTAL TRAINING AND BIKE MAINTENANCE

CHRIS SIDWELLS

Vertebrate Publishing, Sheffield
www.adventurebooks.com


PHOTO: JOOLZE DYMOND

THE CYCLING BIBLE

CHRIS SIDWELLS

First published in 2023 by Vertebrate Publishing.

Vertebrate Publishing
Omega Court, 352 Cemetery Road, Sheffield S11 8FT, United Kingdom.
www.adventurebooks.com

Front cover: Jack Noy and Dalila Lecky cycling in Galloway Forest, Scotland. Photo: Roo Fowler.
Back cover photo: Jamie Rutherford.
Photography by Chris Sidwells unless otherwise credited.
Images of workouts and bike maintenance in chapters 6, 7 and 11 © Andy Jones.

A CIP catalogue record for this book is available from the British Library.

ISBN: 978-1-83981-121-0 (Paperback)
ISBN: 978-1-83981-122-7 (Ebook)

10 9 8 7 6 5 4 3 2 1

Edited by Jess McElhattan, cover design, layout and production by Jane Beagley, Vertebrate Publishing.
Based on an original design by Jon Tore Modell.

Vertebrate Publishing is committed to printing on paper from sustainable sources.

MIX
Paper from responsible sources
FSC® C014138
www.fsc.org

Printed and bound in Europe by Latitude Press.

CONTENTS

Introduction 10

CHAPTER 1 **A MANIFESTO FOR CYCLING** 12
Cycling is good for your body 14
Cycling improves mood, brain function and mental health 19
Cycling helps you stay young 20
Cycling is the best form of exercise 22
Cycling is good for the planet 24

CHAPTER 2 **GETTING STARTED** 26
Buying a bike 28
Finding the bike for you 28
Women's Specific Design 29
Wheel size 30
Mountain bikes 30
Finding the right bike for your body 31
Frame sizes 32
Buying second-hand 33
Additional kit 35
Drinks bottles and cages 35
Spare inner tubes, tyre levers and pumps 36
Multitools 36
Under-the-saddle bags 36
Lights 37
Cycling helmets 37
How to fit a cycling helmet 38
Cycling shoes 39
GPS 40
The add-ons 40
What to wear 42
How to build up your cycling wardrobe 44
Cycling in cold weather 47
Extras to consider 49

CHAPTER 3 **THE WORLD OF CYCLING** 50
Cycling disciplines 53
Road cycling 53
Road racing 53
Road racing bikes 55
Starting road racing 57
Road touring 60
Track cycling 61
Commuting 64
Off-road cycling 66
Mountain biking 66
Cross-country 66
Trail riding 67
All-mountain 68
Downhill 68
Enduro 69
Freeriding 69
Cyclo-cross 70
Gravel and adventure cycling 71
Ebikes 73

CHAPTER 4 **BIKE FIT, RIDING POSITION AND SKILLS** 74
Fitting your bike to you 76
Bike fit 76
Pedal position 77
Saddle position 79
Saddle fore and aft position 79
Handlebar position 80
Riding position 80
Essential skills 81
Pedalling 81
Cornering 83
Gear shifts 85
Climbing hills 87

Getting out of the saddle 87
Descending 89
Cycling in wet conditions 89
Eye contact 90
Riding in traffic 90
Traffic skills 90
Going with the traffic flow 91
Traffic manoeuvres 91
Being highly visible 92
Cracks, holes and rough surfaces 92
Cycling in darkness 93
Country roads 94
Off-road etiquette 95
Route planning 95
Planning an off-road cycling route 96
Additional kit 97

CHAPTER 5 **PERFORMANCE SKILLS AND TECHNIQUE** 98

Technique 100
Perfect pedalling 100
Cadence 100
Drills 101
Precision braking 102
Precision cornering 103
Performance 106
Performance climbing 106
Performance gear-shift management 107
Precision descending 108
Riding in a group 109
Off-road performance skills 114
Choosing your line 114
The bunny-hop 115
Rocky descents 116
Climbing on loose surfaces 116
Cornering on loose surfaces 117
Riding through soft sand 118
Dismounting and carrying your bike 118
The importance of aerodynamics 120
Aerodynamic clothing 123

CHAPTER 6 **FITNESS: GENERAL PHYSICAL PREPAREDNESS** 124

Cycling fitness 126
Turbo trainers 126
Pain caves 127
Cycle computers, heart rate monitors and power meters 128
Strength and conditioning 129
A word for the over-forties 130
Diaphragm breathing 130
Repetitions and progression 131
***The Cycling Bible*'s strength and conditioning session** 132
Body care 144
Stretching work 145
Foam-roller work 148
Running for cyclists 150
Improving cycling fitness 150

CHAPTER 7 **FITNESS: SPECIFIC TRAINING FOR CYCLING** 152

Specific areas of cycling training 154
Meeting the specific physical demands of cycling 156
Aerobic and anaerobic adaptations 157
Performance capacities 158
Specific training sessions 164
Endurance training 164
Crossover effects 166
Anaerobic threshold training 166
VO2max training 169
Variations 171

Glycolytic capacity training 171
The Tabata Protocol 172
Crossover benefits 173
Peak power training 173
Rest – the sixth capacity 174

CHAPTER 8 **CREATING YOUR OWN TRAINING PLAN** 176
Setting yourself up for success 178
Tapering 178
Body maintenance 179
Training for cyclosportives 180
The foundations of cyclosportive training 181
How to structure your cyclosportive training 182
Ultra-endurance training 184
Training for road races 184
The chaingang 186
Training for time trials 187
Time-trial skills 188
Training for cross-country, mountain bike and gravel races 189
Training for cyclo-cross 190
Other disciplines 191
Example training tables 192

CHAPTER 9 **EFFECTIVE NUTRITION** 200
The basics 202
Hydration 202
Food groups 204
Carbohydrates 204
Fats 204
Protein 205
Eating before, during and after training 206
Performance eating 207
Pre-competition strategy 208
Eating and drinking during a race or cycling challenge 209
Eating and drinking after a race or challenge 210
Food supplements 212
Losing weight 214

CHAPTER 10 **TRAINING THE MIND** 216
The psychology of performance 218
The mind model 218
Dealing with pre-event nerves 221
Performance thinking 222
Performance reviewing and goal setting 224
Considering outcomes 225
Being in the zone 226
Staying in the moment 228
Visualisation 228
Mantras 229

CHAPTER 11 **BIKE CARE AND MAINTENANCE** 230
Basic bike checks 232
Checking your bike is safe 232
Brakes 233
Tyres 235
Wheel rims 235
Frame and forks 235
Cassettes, chains and chainsets 235
Maintenance 236
Bike cleaning 238
Mending a puncture 241
Adjusting derailleur gears 245
Adjusting brakes 249
Protecting your bike in winter 250

Glossary 252
Resources 255
Acknowledgments 256

CHAPTER 1

A MANIFESTO FOR CYCLING

CYCLING IS A force for good in our world as we face a growing human health problem, as well as dealing with an environmental crisis. The bicycle is the perfect fitness machine, and there is a strong link between increased fitness and good health. Travel by bicycle has very little environmental cost, reducing congestion, noise and damaging emissions, all of which are harmful to our environment.

Cycling is also fun: it's an escape from the day to day, as well as a vehicle for adventure, for healthy competition, for taking on challenges, for independence, gaining confidence, discovering places and experiencing the delight of movement under your own power. The bicycle, a simple machine from the nineteenth century, has a big and positive role to play in our future and in the future of our planet.

PHOTO: JOOLZE DYMOND

CYCLING IS GOOD FOR YOUR BODY

In my personal opinion, exercise can hugely improve your health, and cycling is the best form of exercise for the widest range of people. Two big claims, but there's plenty of evidence to back up both. The health benefits of exercise are so great, and cycling is accessible to such a wide range of people, that some doctors prescribe cycling alongside or even in place of medicine to some patients. Many of these doctors in the UK work with local authorities and other bodies, who create cycling programmes for all ages. These programmes are aimed at preventing or even reversing illness, promoting healthy living as well as the idea of cycling as a means of transport, which is cycling's gift to the planet. But more about cycling and our environment later – let's deal with the health benefits and the boost cycling gives to fitness, health and our quality of living first.

The old saying 'use it or lose it' really applies to the human body, and in this day and age, when many of us work while sitting at a desk, it has never been more applicable. Our sedentary lifestyles mean we must find ways to use our bodies as well as our brains. If we don't, we run the danger of losing both. We need to be physically active to stay healthy. There is evidence that exercise may contribute to protecting against dementia.

The starkest example of the risks we run by not using our bodies is a major factor in the leading cause of death globally: cardiovascular disease. Narrowing of the arteries, caused by a build-up of fatty material adhering to artery walls, is a contributory factor in cases of high blood pressure, heart attack and strokes – all conditions classed as cardiovascular disease. Narrowing of the arteries has been linked to high levels of low-density lipoprotein (LDL) – sometimes called 'bad' cholesterol – in the blood, which can happen if people don't exercise and/or have a poor diet.

There are drugs to combat high levels of this 'bad' cholesterol, while other drugs help lower blood pressure. Changes in diet can help too, but exercise can heighten all the positive effects of drugs and a good diet. Exercise lowers LDL levels in the blood and also lowers blood pressure. Many people find that exercise is extremely effective in preventing cardiovascular disease.

Above mimicking what drugs do, exercise has added cardiovascular and wider health benefits than simply lowering LDL and blood pressure. Exercise increases the concentration of high-density lipoprotein (HDL) in the blood. HDL is sometimes called 'good' cholesterol because it takes LDLs back to the liver, and it has been linked to cardiovascular health. And exercise does this without any changes in diet.

Exercise increases the size of the heart's chambers and thickens their walls, improving the stroke volume (the amount of blood pumped in one heartbeat). Exercise also increases capillary density, which means more oxygen can be delivered to organs and muscles, so they then function more efficiently. Delivering oxygen and nutrients is also important in wound repair, organ and muscle maintenance and regeneration, hormonal balance, eye health, and the health and efficiency of a host of other bodily functions.

These are a few examples of ways exercise boosts health, but there are many more – enough to fill a whole book. A wide-reaching health study carried out by Harvard T.H. Chan School of Public Health not only underlined that vigorous physical activity decreases the risk of coronary heart disease, but also discovered other physical benefits of exercise, and tried to quantify some of them.[i] For example, boosting 'good' cholesterol levels has been associated with a decreased likelihood of life-threatening cardiovascular disease.[ii] Studies have also identified other important markers of health improvement from vigorous exercise, including increases in vitamin D[iii] and HbA1c.[iv] Vitamin D has a role in protecting against cardiovascular disease and has an immune-system-boosting effect. HbA1c (glycated haemoglobin) is important in diabetes diagnosis and management, in that high levels of it are a marker for the disease. This is increasingly important due to type 2 diabetes becoming a bigger problem in the general population.

Regular physical activity can not only reduce your risk of developing type 2 diabetes, but also metabolic syndrome. Metabolic syndrome is a condition in which sufferers have some combination of too much fat around the waist, high blood pressure, low levels of HDL 'good' cholesterol, high triglycerides and/or high blood sugar. It's an unhealthy state that is easy to get into, especially if your job or lifestyle involves a lot of sitting, but metabolic syndrome predisposes people to a whole range of illnesses. Starting to exercise or increasing the amount you do has a massive effect on reducing metabolic syndrome.

It's generally accepted by medics and researchers all over the world that regular exercise significantly lowers the risk of developing a wide variety of cancers. For example, uterine cancer is reduced in active women and lung cancer is lower in active people, although active people being less likely to smoke may be a contributing factor to this.

The other big role exercise plays in fighting cancer is in controlling or losing weight. Exercise combined with healthy and balanced eating can contribute to many people maintaining a healthy weight or losing weight. And it certainly guards against obesity, which is a factor in developing some types of cancer.

Obesity is defined as having a body mass index (BMI), a measure defined by the ratio of a person's weight to their height, of over 30. It should be noted, though, that where BMI is a useful instrument applied to populations, it's a blunt one when applied to very muscular individuals, who can have high BMIs but be very lean. Researchers have established a link between obesity and the risk of developing a number of cancers, including kidney, pancreatic, thyroid, gallbladder, uterine and esophageal cancers. Obesity may also be linked with developing other cancers too, but more research is required to be definite.

Another important health benefit is that people who exercise, even when they don't change eating habits at all and have no significant subcutaneous fat loss, still lose intra-abdominal fat. This is the fat that forms deep in the centre of the body, and it has been directly linked with a higher risk of several diseases, including cardiovascular disease.

CYCLING IMPROVES MOOD, BRAIN FUNCTION AND MENTAL HEALTH

Exercise improves blood flow to your brain. That means your brain gets all the oxygen and nutrients it needs, and it needs a lot of both to remain healthy and function optimally.

Firstly, exercise stimulates the creation of new nerve cells, called neurons, in our bodies. Neuron loss inside the brain, as well poor blood-vessel health, are causes of dementia, which can also be caused by Alzheimer's disease. So, in promoting new neuron growth and maintaining or even improving blood vessel health, exercise provides protection against the kind of dementia caused by neuron loss or poor blood-vessel health.

Secondly, exercise improves many people's mood. It helps us to reframe problems and gain perspective. Simply put, a good dose of exercise, particularly cycling in the countryside in my experience, just makes you feel better about yourself or about your life; it can help you feel better about your problems and provide perspective on any stresses or anxieties you have. Exercise also can give people a more positive outlook; it certainly can improve your mood. One of the reasons for this is that exercise boosts serotonin levels in the brain. Some sufferers of anxiety and depression have even said that exercise was sometimes just as effective as antidepressants.

Exercise is very powerful medicine, and in my opinion is likely to be prescribed more in the future as new medical students graduate because they are being taught about its benefits. Governments around the world are beginning to understand and appreciate the health benefits of exercise too. A healthy, active population is far more productive than one in which illness is rife, and as exercise can be free it's much more cost effective for governments to build infrastructure and support schemes that encourage exercise than build hospitals and other medical facilities.

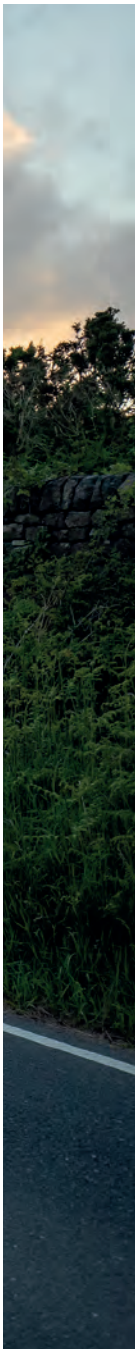

PHOTO: JAMIE RUTHERFORD

CYCLING HELPS YOU STAY YOUNG

A lot of what we know about the benefits of exercise comes from a study of identical twins by the Department of Twin Research and Genetic Epidemiology at King's College London.[v] Identical twins share almost all of their DNA, and in childhood they often share a common environment. This can reduce the nature versus nurture debate around comparative studies, although each twin's experience can obviously vary vastly.

In the study, more than 2,400 identical twins were asked to rate their exercise habits on a scale, and blood samples were taken. You can get a good indicator of general health and physical well-being from white blood cell health, and when researchers compared the blood samples they found that the most active twins in the study had the more robust white blood cells. Furthermore, the DNA strands of the white blood cells in each active twin showed a remarkable difference from their inactive twin's DNA.

Chromosomes have caps called telomeres at either end. Telomeres are a bit like the plastic found around the ends of shoelaces (aglets): they protect the DNA strand. Whenever a DNA strand copies itself, it doesn't copy all the way to the end of the strand but slices off a tiny section of each end. The slice occurs in the telomere, but the telomere doesn't contain any genetic information and therefore nothing is lost – until the telomere becomes too short to protect the DNA. At this point the DNA in it dies and the cell begins to degenerate. Effectively, it gets old.

So telomere length is a good measure of relative cell age, and in the twin study the most active of each pair had the longest telomeres.

Researchers defined 'activity' as at least 30 minutes of exercise a day. This may not seem like a lot of exercise, but researchers found that regardless of factors including the subjects' body mass, gender, socioeconomic status or if they smoked, those who exercised for more than 30 minutes per day had telomeres as long and robust as inactive people 10 years younger.

Previously, it was thought that physical decline in old age was inevitable and fewer people exercised intensively past their fifties. There were rarely groups in large enough numbers to test that theory of ageing, so it became self-perpetuating. In more recent times, people over 50 – even up to those over 80 – increasingly exercise frequently or participate in sports or physical challenges that they may well not have contemplated 30 to 40 years ago. This change in trends provides a very different picture of ageing.

Professor Hirofumi Tanaka of the University of Texas at Austin has studied active members of older age groups, and concludes that 'A great deal of the physical effects we once thought were caused by ageing are actually the result of inactivity.'[vi] Muscle fibres diminish as people age. This was once attributed to a natural decline in motor unit numbers (the nerves that tell the muscles to contract and relax); more motor units mean a muscle can contract faster and more fully. However, a Canadian study found that runners aged 65 and over had lots of motor units in their legs – approximately as many as 25-year-olds.[vii] So we know now that exercise keeps motor units firing, which preserves muscle fibres, even in older people.

Exercise also has a social aspect. Often those who exercise are likely to mix with people of different ages, and this is especially true in cycling. The vast majority of cycling clubs and similar groups welcome members of all ages, so older and younger cyclists meet under the banner of a common bond, doing something they both enjoy and understand in the same way. It's a two-sided benefit too, because it can help younger people have more contact with older age groups and vice versa – this might in turn increase understanding of each other. In the hustle and bustle of day-to-day life, generations can ignore each other. In my experience, this doesn't happen in cycling, a sport and pastime with a real sense of community. Cyclists share similar experiences and that forms a bond.

And, finally, increased fitness and better health can mean an improved immune system, increasing our chances of fighting off many infectious illnesses we come into contact with – certainly the minor ones. Being fitter, stronger and healthier also increases our chances of coping if we are hit by a more serious illness: a person's chances of surviving Covid-19 are greatly reduced if they are obese or suffering from high blood pressure and related problems. The fit and strong tend to do better during and after operations too, generally tolerate cancer treatment better, and heal broken bones quicker. Their road to full recovery is quicker too.

CYCLING IS THE BEST FORM OF EXERCISE

Cycling is accessible to a huge range of people. When you cycle, the bike carries your weight, which reduces the loads placed on your joints, and cycling is a smooth movement that in itself creates few impact forces. To put this in context, running, which is great exercise and promotes many of the health benefits already outlined in this chapter, creates quite high impact forces every time each foot hits the floor. Cycling has less injury potential from impact forces than running and other physical activities involving impacts.

This reduced tendency to cause injury is one of the reasons why cycling is ideal exercise for people of all ages. It's something that older people with joint problems as well as children with their developing bodies and growing bones can do in relative safety. It also means cycling is a great option for people who want to lose excess weight. Calories are burned by the effort being put into pedalling, but the bike carries the cyclist's weight, so cycling puts less load on their joints. This means people can potentially exercise for longer and in doing so burn more calories. Some people might also find a 30-minute bout of cycling far more enjoyable than the same time running or doing aerobics, and so are more likely to repeat it.

Cycling is also a very convenient exercise method: once you have a bike you have much more freedom to exercise at times and in places that suit you. The techniques and skills of cycling are quite easy to master (this book will help!) and there is such a wide range of cycling you can do, from competitions to exploration and adventure.

Every time you cycle you will be getting fitter, stronger and increasing your life opportunities. Cycling at a steady pace increases fitness and benefits your health by stimulating and therefore improving the cardiovascular system, but cycling is also a very good workout for building and preserving muscle. Hills, setting off from a standing start, accelerating after slowing down or riding around a corner all require a short stretch of forceful pedalling. To push harder on the pedals the nervous system fires up more muscle fibres, which maintains those all-important nerve/muscle fibre links, and in doing so preserves and builds muscle tissue. Preserving muscle fibres is especially important as we grow older, because it gives us mobility and independence, which allows us to go on living in the ways we want to. If nothing else, your newly toned leg muscles may even improve your self-esteem and confidence.

In addition, cycling outdoors puts us in touch with nature, providing time and space to think and opportunities to explore, which promotes self-sufficiency and stimulates the body to produce mood-enhancing chemicals. There's a joy to cycling outdoors that takes us back to our youth, when for many cycling was a vehicle for adventure, a way to explore our environment and to discover and observe nature.

The adventure aspect of cycling is another reason why it's such a great way to exercise. You can visit places on a bike, cycle to a local beauty spot or even take on adventure rides or multi-day tours in exciting places. From sitting on a bike, you see the countryside around you in a different way to walkers and motorists, especially once you get used to sharing roads with other users and you have honed your cycling skills.

The adventure aspect is also why cycling is great exercise for kids. Through cycling they experience nature, the environment, the fundamentals of mechanics and even history, and through exposure to these things kids may become interested in them. Cycling is also a great and very convenient way for families to exercise together.

ONE CONSIDERATION

The fact that a bicycle carries its rider's weight makes it an attractive way to exercise, but it is also its only drawback as a means of exercise. Don't worry though, the drawback is easily remedied. First, though, what is it?

Reduced bone density can occur in people who do little else but ride bikes, even in young people. And the more you ride the worse your bone density can become. Some young, super-fit Tour de France riders have been found to have very low bone densities. Luckily, the sport is aware of this now, and riders do supplementary exercises to prevent bone density loss.

The supplementary exercises you should do aren't complicated: any exercise that is load-bearing will work. Strength exercises as simple as air squats without weights, press-ups or, even better, some light weightlifting or jogging will maintain bone density. All cyclists should do supplementary exercise, and if you want to be a competitive cyclist or challenge yourself you should definitely do some strength and conditioning work. Chapter 6 (p124) covers strength and conditioning in depth.

CYCLING IS GOOD FOR THE PLANET

In March 2020, across the world shed doors creaked open and people peered past the dust into the gloom. Childhood memories of rolling to the shop for sweets or going on mini-adventures with friends motivated thousands to squeeze past musty camping equipment and drag long-neglected bicycles into the light. Others bought new or second-hand bicycles, as with reduced public transport they needed a new way to commute. Some people, when they were placed on furlough, found they finally had the opportunity to exercise more and fulfil the promise they'd long made to themselves and their families. They didn't know it at the time, but these people were embarking on a collective journey that could change the planet.

In the midst of a terrible time, with many countries locked down in response to the devastating effects of the Covid-19 pandemic, we turned to the bicycle for relief from boredom, stress and, in some cases, grief; we rode to work, to exercise, to mentally escape or to simply entertain bored children. At a time of turmoil, the humble bicycle proved its worth to the world and gave us a glimpse of what might be.

As a consequence of a massive increase in bicycle use and a mirrored drop in numbers of motor vehicles on the road, for a few short weeks we saw what our world could be: air pollution levels in towns and cities fell dramatically, as did noise pollution. Some people in London even reported hearing birdsong in the city for the first time in their lives. A study by University of Reading scientists found that during lockdown carbon dioxide (CO_2) emissions in European cities reduced by up to 75 per cent, with a 59 per cent reduction in London.[viii]

People liked cycling, and in response they changed their habits, dropping motor vehicles and public transport in favour of cycling to work and back. Governments, seizing this new willingness to cycle, launched or accelerated plans to change road infrastructure to encourage more active transport.

Man-made greenhouse gasses play a significant part in global warming, which has contributed to creating a climate crisis. Motor vehicle emissions contribute to greenhouse gasses, especially during shorter journeys. Also, vehicle emissions add to air pollution, which threatens our environment as well as our health. The World Health Organization says that current levels of air pollution are responsible for a staggering 7 million preventative deaths around the world each year. More cycle journeys and fewer journeys by motor transport will drastically reduce air pollution, and so could contribute to saving lives.

Cycling has so much to offer, both in terms of improving personal health and improving the health of our environment. The evidence of accelerated climate change is vast and undeniable, as is the evidence that populations as a whole in the more developed parts of the world are less physically fit than they were, which is fuelling a growing health crisis. We are at a crossroads in human history; our health and that of our planet is under threat. Cycling can play a big part in ameliorating those twin threats, and can help to create a sustainable future and a healthy population.