



A road map to building physically healthy students in modern world



AWARE

Heart Fitness Advantage

TM

A textbook for PE Teachers
21st Century PE Teaching



Exercise Science



Pedagogy



Technology



Future Focus

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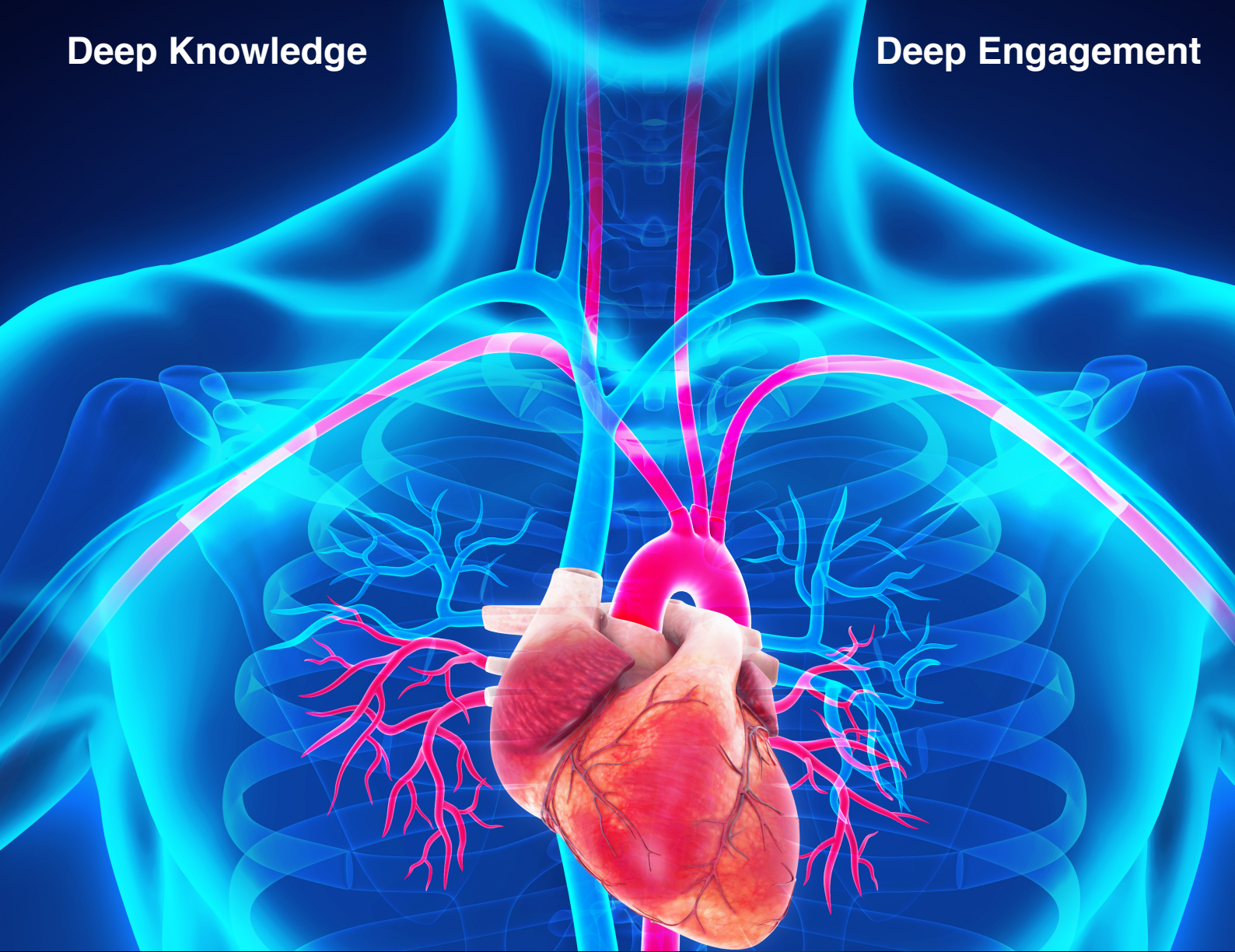
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Deep Knowledge

Deep Engagement



AWARE

Heart Fitness Advantage

Educative purpose

Health outcomes



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A PE Teachers personal story

Hello.

I have taught PE in Australian schools since 1985. At the time of writing it is 33 years. I love it more now than I ever have.

Why has this book been written?

Because there is so much to achieve and never has there been a time in history where we are more capable. We may be more capable, but as physical education teachers we seem to be achieving far below our capacity as a profession. In 2018 at least 80% of children by the 7th grade do not meet the minimum levels of physical activity in order to become physically healthy. (Active Healthy Kids Australia Report)

By the time they reach year 12 this has RISEN to 95% of children not meeting the minimum requirement. In most of western countries approximately 60% of adults do not complete enough physical activity per week in order to grow their health outcomes and be classified as physically healthy. (AIHW)

This means that my 9 year old son is far more likely to grow chronic disease as a result of not learning the critical importance of completing 'enough' physical activity towards his future health outcomes. This is despite him starting a dedicated set of physical education lessons in year 3 and finishing in year 12.

This book was written because this is not just the hand dealt my own son, it's what all children in schools are going to experience or have experienced - unless there is some change.

Why we do 'important work'?

In 1989 I was 22 years old working in a fitness centre after just having completed my Bachelor of Education in Physical Education. I was about to start my adult life in a career I knew I would stay in forever.

Life changing news which is destructive never comes at a good time.

It was 3.30pm on November 1st 1989. The receptionist at work said my mum was on the phone. I walked downstairs to the fitness testing room and picked up. She said three words "Love Dad's died". I fell to the floor. He was 47 years old and had not been sick. In the weeks ahead I discovered he dropped dead of a massive heart attack without warning. As a young man I was so looking forward to having him help me grow through life's decisions. Now that would never happen. You will see shortly how a PE teacher could have made all the difference.

It changed me forever.

Three months later I applied for and took a new job at The National Heart Foundation of Australia. For the next 7 years I went on a mission to discover how this could have happened to my hard as nails and unbreakable father. I did find out 27 years later in 2016 from The American Heart Association. They released a scientific statement backed by global medical research and over 50 medical Professors from 30 years of longitudinal research.

It will change what Physical Education Teachers do forever.

This research paper told us that the biggest cause of early morbidity (sickness) or early mortality (death) was something no Physical Educator had ever heard of. To this day I have asked every PE Teacher I know, what are the leading causes of early morbidity (sickness) or early mortality (death). Not a single one of them has ever got it correct. Here is the question I ask. From the list below, which of these is the most responsible (based on clinical evidence) for early morbidity (sickness) or early mortality (death)?

- Obesity
- High Blood Pressure
- High Cholesterol
- Smoking
- High Blood Sugar

The answer is not on the list. The global evidence says it is a low ACTIVE HEART FITNESS SCORE which is most responsible. (The medical term is a low Cardiorespiratory Fitness Score). We will go in depth on what a person's ACTIVE HEART FITNESS SCORE means in chapter one.

A PE Teacher could have changed the day my Dad died.

My 9 year old sons great grandfather went through the physical education system in the 1930s. From 1930 until today - almost 90 years, physical education has not been successful in turning students into physically healthy adults.

This textbook has one primary motivating factor, that is to share with PE Teachers that they have the capacity to help their students become AWARE. The platform we have built including education theory, combined with exercise science, 21st-century technology and a never before created digital health software for PE Teachers - is the culmination of my 33 years work as a physical education teacher.

Future Focused learning for PE

In the very first pilot of building AWARE Heart Fitness Advantage (our four part digital health platform) we were able to raise the number of physically healthy students per class from 4-5, to over 20 - 25 students. In this textbook will show you exactly how that was done and how can be duplicated into any school in the world.

We are just looking for you, the champion for PE Teacher. I believe my son deserves someone like you, I believe that his great grandfather and grandfather also deserved someone like you – you really do important work. Without any question in my mind, the team behind PE 21 consider every single PE Teacher are the only ones adept enough to bring about an improvement in our students physical health outcomes. We simply must be 'Future Focused'. This means that PE teaching MUST have an impact on the health of our students. However it cannot be with NOW technology or NEXT technology - it must be driven by FUTURE technology. AWARE Heart Fitness Advantage is exactly that.

Here is the current physical health status in countries like Australia, New Zealand, USA, Canada, England, South Africa and others where there is a common living standard.

- About 63% of adults do ZERO physical activity per week
- By the time a 12 year old reaches the 7th grade, 80% don't do enough activity for health
- By the time an 18 year old reaches the 12th grade, 95% don't do enough activity for health
- Approximately 30% of adults have high blood cholesterol

90% of adults have one risk factor for heart disease

Some children as young as 10 years old are developing signs of ageing of blood vessels

Physical inactivity (low levels of physical activity) is the fourth leading cause of death

One-third of chronic disease burden is due to physical inactivity

The future MUST be different to this one above. As a cohort, if we were to assess our ability to help create healthy outcomes, we could be marked very low.

Whose responsibility is it anyway?

I held a discussion with a Professor of Physical Education in Sydney during 2017. For professional courtesy I will not name them. Suffice to say he was one of a group of Professors responsible for our current Australian PE curriculum. The thrust of the conversation was his opinion is that PE Teachers are not responsible for public health and the curriculum was written to avoid the need for this.

I asked him a basic question, whose responsibility is it? He gave me the usual guff. Government, parents and health bodies like hospitals. So I gave him my follow up question. How is that working out for our children and the adult population?

He did not get it. If it is the responsibility of the group he claims, how would you rank their success?

Me - poorly.

My follow up position was this. Leadership does not wait to get permission. It is my son who is in the 3rd grade right now and is about to go through the 'health and physical education' system in Australia. Based on current and past trends, he is way more likely to be physically unhealthy as an adult than healthy. I contend that we teach a subject called 'health and physical education', yet this esteemed Professor holds the viewpoint that PE Teachers are not responsible to turn out students who build 'deep knowledge and deep engagement' in their own physical health for the future.

I cannot see inside your head and how you respond to his position, however you can see inside mine. I have never heard something so 'batty' in all my life. Let us teach a subject in schools across the globe called 'Health and Physical Education', but we shall not focus on building physically health students as a matter of course.

Final word

AWARE Heart Fitness Advantage is a platform for those PE Teachers and schools in the world who see that improving the physical health outcomes of their students and their community is their responsibility. The team behind PE 21 does not seek to 'twist' your arm to see our position. We are calling all PE Teachers to view our platform and understand that we have not created NOW Technology or NEXT technology - but rather we have created FUTURE Technology to benefit every student in every PE class, and do some heavy lifting for PE Teachers.

Diagram 1. 'Educative Purpose'

Aware Heart Fitness Advantage patented education platform.

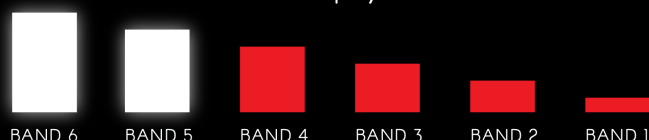
The AWARE education platform was developed by a PE Teacher in Australia with 30 years experience in the classroom with over 10,000 PE lessons taught. The data from AWARE is only 50% of the platform. The real work begins when we come into the PE Faculty and share our experience of how to develop 'Deep knowledge and Deep Engagement' with your students.

AWARE diagnostics are a tool, the PE Teacher remains the centre of creating the environment where students physical health can progress. This is what pedagogy is all about.

A detailed explanation of this diagram will occur in future chapters.

PE21
AWARE HEARTTM
FITNESS ADVANTAGE

Classification of physical health outcomes.



8 Minutes

8 Minutes

Intensity Block 1

2 Minutes Rest

Intensity Block 2

2 Minutes Rest

45

Active Heart Fitness Score

60

Resting Heart Fitness Score

30

Recovery Heart Fitness Score

42

Target Heart Fitness Score

19%

13%

23%

Term 1

Term 2

Term 3

Term 4

Progress Growth Score...

RAISING PHYSICAL HEALTH OUTCOMES OF EVERY STUDENT, WITH DEEP KNOWLEDGE AND DEEP ENGAGEMENT

Chapter one.

The Biggest Public Health Problem of the 21st Century and the role PE Teachers have to help shape a modern world.

“Change will not come if we wait for some other person or some other time. We are the ones we've been waiting for. We are the change that we seek”

President Barack Obama

If you go to a doctor for a health examination you would almost certainly have the following medical biometrics tested in order to determine your current personal health status.

Blood pressure

Waist circumference (to measure excess body fat)

Blood sugar levels

Blood cholesterol levels

Weight

You also be asked if you smoke

I have asked over 100 physical education teachers which of these has the largest influence or impact on a person overall physical health outcomes. Out of all the PE Teachers I have ever asked, zero have answered correctly.

Turns out this is a loaded question and the answer is not even included in the list above. As a health and physical education teacher, I like all of my colleagues spent four years at university when part of it focused around what physical health looks like and how to improve it. As our careers rolled on and we began teaching in schools, we were handed a PE syllabus which told us that we needed to teach the concepts above in order to meet what the Department of Education required. Some of us along the way took extra courses to advance our professional careers, however most of these were focused around sports, sports coaching, skill acquisition, game sense and physical literacy.

I've met very few physical education teachers who have continued their studies in the area of exercise physiology. Therein lies the reason I believe that zero Physical Education Teachers have ever been able to answer my question correctly.

At the core of what we teach is having a deep and modern understanding of exercise physiology. Professors in exercise physiology have been advancing our deep understanding of how the human body functions significantly over the past three decades. However not much of this research has made it into teaching practice.

If it's one thing that this textbook aims to do it is to show the bulk of PE Teachers how to apply modern exercise physiology and medicine to improve the physical health outcomes of their students.

So what is the answer to the question of the biggest public health problem of the 21st-century.

It was Professor Stephen Blair who spent 30 researching over 53,000 people who coined the phrase 'The biggest public health problem the 21st-century'. It is a bold statement considering other emerging medical issues in the modern world.

Like all PhD researchers Professor Blair makes the statement backed up by evidence. Unlike many public statements, his evidence is on based on a massive quantity of people and over a longitudinal period. He first published his paper with this title in 2009. Now remember this research paper is not a small study, it is 53,000 people who were examined in a double-blind study as to what impacted their physical health the most.

Here is the basic data from his 30 years of exercise physiology research. Note the percentages next to each category, this is the amount of impact each one has on early morbidity and early mortality. If you're like me, then this is completely surprising.

Obesity 3%

Smoking 9%

High Cholesterol 4%

Diabetes 4%

High blood pressure 15% (men)

Low ACTIVE HEART FITNESS SCORE 18%

- The term **ACTIVE HEART FITNESS SCORE** refers to a medical term called cardiorespiratory fitness score. A physical education teacher may have heard it called VO2 max. They all mean exactly the same thing. For education purposes we are calling it **ACTIVE HEART FITNESS SCORE** throughout our literature. It is a great descriptor which students can easily understand how it is applied to physical health. Medical terminology is often a barrier when it comes to educational outcomes.

For those of you who are being introduced for the first time to the term **ACTIVE HEART FITNESS SCORE**, here is essentially what it means - The capacity of a persons heart to take oxygen and breathe it in, then send it from the heart, transported along blood vessels to cells at the muscles, dump off the oxygen and pick up carbon dioxide and move this out of the body through the blood vessels heart and lungs.

If a student or adult does not participate in consistent and intense enough physical activity, they will have a low **ACTIVE HEART FITNESS SCORE**.

The opposite is true if there is regular and consistently intense enough physical activity.

So what is the impact of low ACTIVE HEART FITNESS SCORE?

The answer to this question is the answer to what is the cause of the biggest public health problem of the 21st century. When your score is low, the major blood vessel which branches out from your heart (called the aorta and is about the thickness of one of your fingers) becomes very stiff or inflexible. This will be a trigger for major health problems called 'chronic lifestyle disease'.

When you're active heart fitness score is low and causes the aorta to become very stiff, it means blood will leave your heart and travel to the ends of your toes and fingers and back to your heart very quickly. The name for this is your pulse wave velocity. The faster which blood travels to your extremities and returns to your heart the more dangerous it is and more likely for you to develop chronic disease.

This is the impact. Chronic diseases like high blood pressure are triggered when your **ACTIVE HEART FITNESS SCORE** is low. When it is high enough (we will talk about how high later) it is very difficult for your body to develop things like obesity, high blood cholesterol, diabetes, and cardiovascular disease.

PE21

Raising Heart Fitness Scores of school Children

AWARE

"Know thy Impact"

John Hattie
Laureate Professor

Deputy Dean Of MGSE, Director of the Melbourne Education
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Chair, Board of the Australian Institute for Teaching and School Leadership
Associate Director of the ARC-SRI: Science of Learning Research Centre



Heart Fitness Score

The worlds only approved education program to raise
Heart Fitness Scores of school students

www.pe21.com.au

A digital health platform built with pedagogy

When you're ACTIVE HEART FITNESS SCORE is high enough for you to be classified as physically healthy, then the aorta is very flexible. At this point is very difficult for your cardiovascular system to develop chronic disease, especially high blood pressure. If you notice the second most influential factor causing the early morbidity and mortality is is high blood pressure. So by tackling your active heart fitness score first , you actually impact the other major contributor towards early morbidity and early mortality. a more flexible aorta makes it almost impossible for your body to grow into a state of high blood pressure. If the aorta is flexible, so too are the rest of your blood vessels.

This link at our website <https://www.pe21.com.au/heart-fitness-score> has a video which explains the concept of Pulse wave velocity.

A 2016 scientific statement from the American Heart Association about ACTIVE HEART FITNESS SCORES.

The work of Professor Blair in his groundbreaking publication called the biggest public health problem the 21st century was so significant that seven years later the powerful and influential American Heart Association made a decision in December 2016 to change direction on what medical doctors should be measuring when it comes to a persons physical health. They took the work of Professor Blair and extended its reach into the daily habits of medical doctors.

This scientific statement is the basis of AWARE Heart Fitness Advantage. It can change PE Teaching forever and help produce physically healthy students around the world.

To view the actual research we are going to discuss here and it's application in real world of PE Teachers search this in Google.

"Scientific statement from the American Heart Association cardiorespiratory fitness"

The first result is the link you need to click on.

Here is one of the key statements made in this document.

"CRF is a potentially stronger predictor of mortality than established risk factors such as smoking, hypertension, high cholesterol, obesity and type 2 diabetes mellitus...."

The abbreviation see CRF stands for cardiorespiratory fitness. This term is interchangeable with our term, one that we think is more appropriate for schools and the AWARE platform - it is call **ACTIVE HEART FITNESS SCORE**.

Look at the statement from the American Heart Association. Health educators in schools around the world have all been teaching health curriculum focused around exactly what is in their list, smoking, hypertension, high cholesterol, type 2 diabetes and obesity. Now with this published scientific statement, there is a mountain of evidence that shows all of these diseases, with the exception of smoking are driven by low **ACTIVE HEART FITNESS SCORES**.

For example:

High Blood Pressure is the second most influential factor in causing poor public health. One of Australia's best known cardiologists, Dr Ross Walker once told me once he sees a patient over the age of 50 he is more interested in their blood pressure than anything else.

If I was to ask 100 PE Teachers, how does high blood pressure cause your health to be damaged - most of them do not understand the mechanism. For the 30 years I have been teaching in schools, The only thing I've ever seen in a syllabus is to teach the meaning of high blood pressure and it's classifications. So if I was to ask a PE teacher what 120/80 meant, they will be able to tell me that this is considered to be a healthy range. If a person's reading was 140/100 or higher they will be able to tell me that this would be considered dangerous.

They just wouldn't be able to tell me why it would be considered dangerous.

So let's do two things, discover why having high blood pressure is considered to be medically dangerous how does having a high **ACTIVE HEART FITNESS SCORES** impact person's blood pressure. This does not just include adults, but also includes school children.

What is the mechanism inside the human body which makes high blood pressure dangerous?

Let's reference webmd.com

"Arteries

It all starts with your arteries. Normally, the vessels that carry blood from your heart to the rest of your body have a smooth inner lining. They're strong and flexible enough.

to push blood through your body.

High blood pressure changes that. The extra force of the blood can damage the cells on the inside walls of your arteries.

If the pressure doesn't let up, it can cause tears in the lining so it's not smooth anymore. That's where fatty bits, called plaque, get caught and build up. Blood can't move as well around these clogs, which can even block arteries. These deposits can also make the walls stiff so it's harder to move the blood"

Look at the reference points that we have put in bold from the above quote. The language in this text which are significant include:

Flexible

Pressure

Tears

Stiff

To describe this in more every day language, it's simply saying that high blood pressure puts a strain on the blood vessel network through the inside of your body. When a person is young, their network is very flexible. As you age (even through your 20s) The artery network can become more stiff and inflexible. If this happens, tiny cuts from the pressure of the blood on the inside of the artery wall begin to happen and fat deposits can commence from a young age. These deposits will often have a plaque form over them. It is at this point, usually somewhere in your 40s 50s or 60s that a person can have what seems to be in unexplained heart attack, stroke, kidney failure, eye disease or other complications.

Because all of this happens without pain and can begin as young as your teenage years, what seems an unexpected heart attack from nowhere was actually growing inside your body years and years before you get to experience the outcome.

This is the most challenging and difficult component of health education to overcome.

If you do not create deep engagement and deep knowledge in students between the 3rd and 12th grade, over the entire nine year period with a system like the AWARE platform, there is very little chance that a young person will grow into an adult who wants to do something about their physical health outcomes as they age.

Take Australia for example.

6% of teenagers have high blood pressure. By the time they are 25 years old this rises to 10%. By the time they are 35 years old this rises to 16%. By the time they are 45 years old this rises to 25%. At 55 years of age the number of people with high blood pressure is 35% of the entire population.

Despite what we have been teaching in schools through our health education syllabus, the data above clearly shows evidence that we are not having an impact. The actual goal of health education should be to turn physically healthy students into physically healthy adults.

Now that we know the mechanism of high blood pressure and how it causes a poor physical health status, as PE Teachers, we need to understand the true nature of the link between physical activity and how it drives down a person's blood pressure.

How much physical activity, what type of physical activity, but more importantly what level of intensity is enough to cause a structural change and impact blood vessel function.

It is this concept which is at the core of the AWARE platform.

What is the mechanism where consistent physical activity helps to drive down blood pressure?

Let's examine a very little known biological principle that occurs every time someone participates in physical activity. I say it's a very little known fact because in the 33 years I have been a PE teacher it has never been taught in any syllabus.

Nitric oxide release.

In our previous discussion about blood pressure we saw that it was very dangerous and it was generated by blood vessels that become very stiff and inflexible. This is particularly so with the major blood vessel that leaves the heart called the aorta.

“physical activity significantly improves functioning of the cardiovascular system through an increase in Nitric Oxide bioavailability”.

This quote is from a 2014 medical research publication from these scientists Alexei V. Nosarev, Lyudmila V. Smagliy, [...], and Leonid V. Kapilevich.

In everyday language this review of a wide range of research says that every time a person takes part in physical activity releases a chemical called nitric oxide. It is this chemical which actually causes your blood vessel network to maintain its flexibility. The higher a person's **ACTIVE HEART FITNESS SCORE**, the more nitric oxide has been released into the blood vessels over time.

This is the actual mechanism that causes the blood vessel to remain flexible even as we age. The great news is if your blood vessels have become stiff and inflexible, regular physical activity and a high enough intensity will contribute to reversing the problem.

The absolute key takeaway is that it is almost impossible to develop high blood pressure if your **ACTIVE HEART FITNESS SCORE** is high enough - because the amount of nitric oxide in your blood vessel network over time forces your blood vessels to become or remain flexible. Remember the very definition of high blood pressure is stiff arteries.

In our future chapters we will look at how high does your **ACTIVE HEART FITNESS SCORE** need to be in order to be classified as physically healthy. This will be based on age and gender. Then we will examine how you drive the score up by just using regular PE lessons.



Lets evaluate how a few other chronic diseases are influenced by your **ACTIVE HEART FITNESS SCORE**.

1.Weight / waist circumference

Obesity and overweight get all of the media's attention. Primarily this is driven by the multi billion dollar industry around weight loss products.

Yet look at the actual research provided by Professor Blair in his publication the biggest public health problem of the 21st-century and the title for this chapter.

Obesity contributes 3% impact towards early morbidity and mortality is, which means early sickness or early death. Now that isn't to say that being overweight or obese is not a health problem we should ignore, it absolutely does lead to other chronic diseases.

However as an educator you're about to see concentrating on this has not reduced its prevalence and should not be our first focus when it comes to improving physical health outcomes.

Waist circumference is taking a tape measure and finding out how many centimetres your body measures around the waist. If it's too high this is an indication that you are at risk from chronic diseases. Simply put the larger your waist circumference the more you are going to be classified as overweight or a obese.

Men you need to be less than 102 cm, ideally 94 cm or less.

Women you need to be less than 88 cm, ideally 80 cm or less.

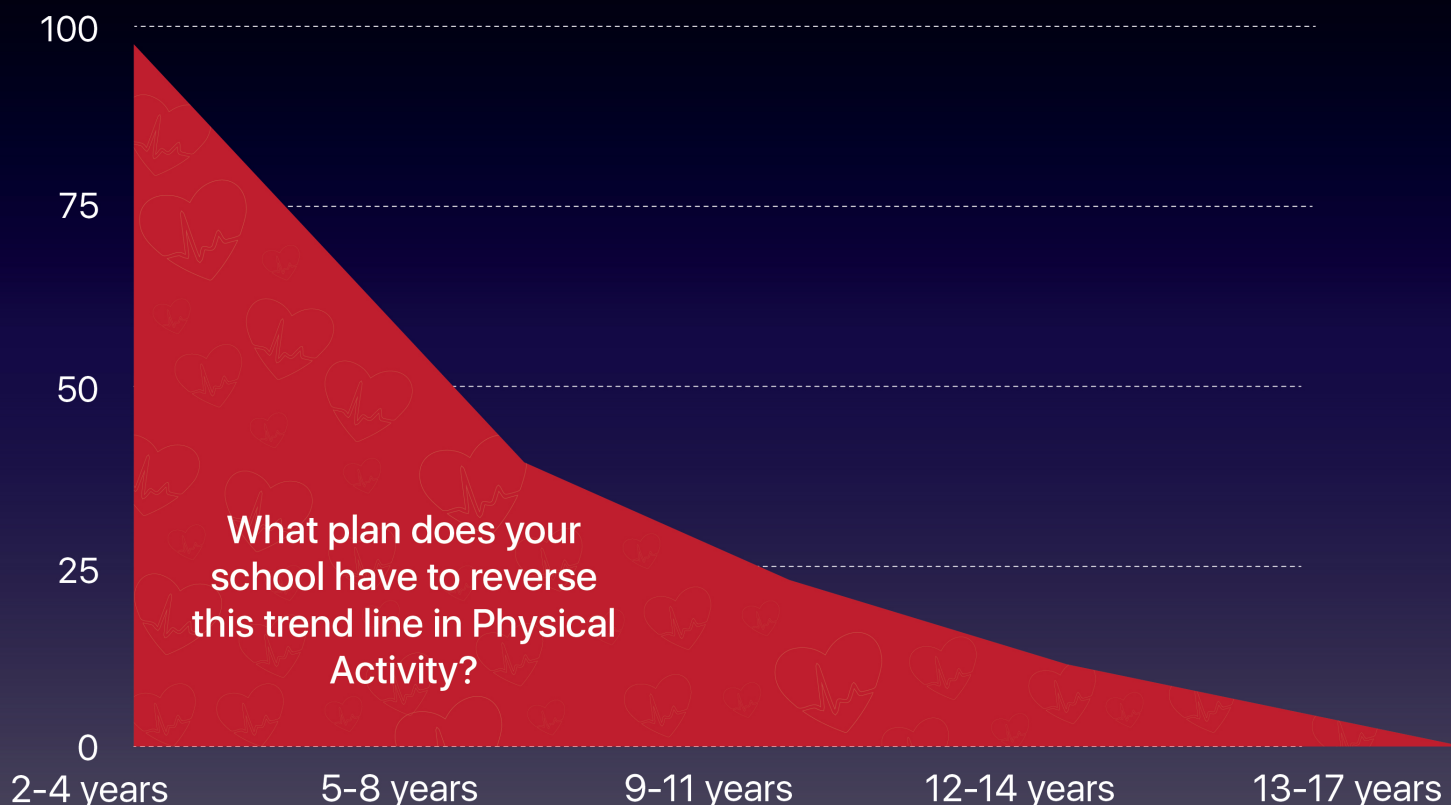
I once had this conversation with a male PE Teacher in his early 50s who exercised frequently, yet has a waist measurement over 115 cm. He tried to make the claim that the guidelines were too small. He is simply in denial.

The impact of your ACTIVE HEART FITNESS SCORE on obesity

Your **ACTIVE HEART FITNESS SCORE** is called your VO2 Max by exercise physiologists.

When you see it written, or unit of measurement is millilitres per kilogram per minute. (ml/kg/min)

The name is derived from V - volume, O2 - oxygen, max - maximum. Maximal oxygen consumption reflects the cardiorespiratory fitness of an individual and is an important determinant of their health capacity during prolonged physical activity. Traditionally speaking this medical term has been applied to athletic performance and is what PE teachers commonly associated with high level athletes. The AWARE platform does not do this and focuses the term around health outcomes.



The basis of the AWARE Heart Fitness Advantage platform is this graph. In Australia the trend towards less physical activity is alarming. By the time a student reaches year 7 - 80 percent do not meet the minimum amount of physical activity per week in order to be healthy.

Until PE 21 invented AWARE, each school does not have the capacity to quantify just how much physical activity is being completed. Once a school discovers where their students are placed, AWARE provides PE Teachers with the Pedagogy to improve the physical health outcomes of every single student.

“KNOW THY IMPACT”

PE Teachers and students can learn the impact of every PE lesson on every student - discover if each PE lesson makes a difference to health outcomes of every student.

The critical component of **ACTIVE HEART FITNESS SCORES** in relation to obesity or being overweight in general is taking note of the unit of measurement and specifically the component of kilograms.

The aim with your **ACTIVE HEART FITNESS SCORE** is to drive it up, normally a PE teacher would think of doing this solely through PE lessons at 80% maximum heart rate.

This objective is absolutely necessary by using our class sets of heart rate monitors built specifically for PE lessons.

However if a PE teacher in their health education lessons creates deep engagement and deep knowledge on how to reduce (if needed) or maintain your weight to a point where your waist circumference is below the recommended guidelines, this will automatically drive up your **ACTIVE HEART FITNESS SCORE**.

For example A 15 year old male student who has waist measurement of 105 cm and weighs 96 kg learns about healthy eating patterns - and then goes about activating those healthy eating patterns and reduces their waist measurement to 94 cm and weight to 82 kg, their **ACTIVE HEART FITNESS SCORE** will automatically improve without an increase in physical activity.

In simple terms that students body can complete physical activity without having to carry so much weight around, this puts less strain on the lungs, heart and blood vessel is in simple terms that students body can complete physical activity without having to carry so much weight around, this puts less strain on the lungs, heart and blood vessels.

The Takeaway

A student or an adult should be more interested in driving their **ACTIVE HEART FITNESS SCORE** than focusing on their obesity or overweight level. Remember back earlier in this chapter when we outlined the impact that a low **ACTIVE HEART FITNESS SCORE** has on your physical health compare to obesity.

ACTIVE HEART FITNESS SCORE has an 18% influence.

Obesity has a 3% influence.

The aim of an overweight or obese student or adult should be to concentrate on their eating patterns to reduce weight and waist circumference so there are less kilograms to carry around when being physically active. This is how lowering it improves your **ACTIVE HEART FITNESS SCORE**, which then will improve your physical health outcome.

2. Diabetes/High Blood Sugar

A very well known child endocrinologist named Dr Robert Lustig based in San Francisco recently made a statement about the chronic disease diabetes. He said we should rename it “processed food disease”. Simply put, high blood sugar leading to diabetes is one of the most prolific chronic diseases in our modern world.

What is Diabetes? (In a description that is easy to understand and explain)

The Australian Diabetes Association describes it this way on their website.

“Diabetes type 2 is diagnosed when the pancreas does not produce enough insulin (reduced insulin production) and/or the insulin does not work effectively and/or the cells of the body do not respond to insulin effectively (known as insulin resistance)

- Represents 85–90 per cent of all cases of diabetes
- Usually develops in adults over the age of 45 years but is ***increasingly occurring in younger age groups including children, adolescents and young adults***

Type 2 diabetes develops over a long period of time (years). During this period of time insulin resistance starts, this is where the insulin is increasingly ineffective at managing the blood glucose levels.”

It appears that we are simply not getting enough physical activity and eating way too much sugar from processed foods (hence Dr Lustig wanting to call it ‘processed food disease’). Diabetes is destructive to your health. It destroys blood vessels, reduces life expectancy. In Australia there are currently about 3000 amputations per year as a result of diabetes.

Raising your ACTIVE Heart Fitness Score will help reduce your risk of diabetes. Whilst it is common knowledge that frequent physical activity is a preventative measure, we still have a disconnect. In developed countries there are approximately 63% of adults who do zero physical activity per week. Does this mean these people want diabetes? I doubt it.

It does suggest that there is a yawning gap between what we teach as PE Teachers and applying the lessons in our lives. A PE Teacher I have worked with for 20 years is adamant that it is not our responsibility to help students be healthy. He claims that teaching students 'the lifelong love of physical activity' through building game skills and playing games in PE lessons is the best approach.

Here is the problem I put to him and to any PE teacher reading this.

1. How can you validate that you have taught them 'the lifelong love of physical activity?'
2. If this is the educative purpose - is it working?

For question one it's clear, there is no way to validate your impact. It is an intangible, which allows PE Teachers the luxury of not having to provide evidence for the success of their learning when it comes to practical PE lessons. I can hear PE Teachers around the globe shouting at me right now - "how dare you attack the integrity of our work". Well the bottom line is that 63% of adults do zero physical activity per week. I would say that the evidence is in - PE Teachers are not successfully helping their students acquire the lifelong love of physical activity. (You will see in just a moment how raising your ACTIVE Heart Fitness Score lowers your risk of developing diabetes).

Of course the same PE Teacher who made the claim they are teaching the 'lifelong love of physical activity' also claims there are too many factors that PE Teachers can't control outside of school, making them less likely to be interested in physical activity.

Its an excuse.

It is a simple abdication of responsibility. It is possible to raise the ACTIVE Heart Fitness Scores of students in school - leading to a lowering of risk of chronic diseases, including diabetes. It needs the desire and application of the AWARE platform.

It is a simple abdication of responsibility. It is possible to raise the ACTIVE Heart Fitness Scores of students in school - leading to a lowering of risk of chronic diseases, including diabetes. It needs the desire and application of the AWARE platform. We have proven it works.

How does raising your ACTIVE Heart Fitness Score impact diabetes?

Physical activity has so many benefits, but the biggest one is that it makes it easier to control your blood glucose (blood sugar) level. People with type 2 diabetes have too much glucose in their blood, either because their body doesn't produce enough insulin to process it, or because their body doesn't use insulin properly (insulin resistant).

In either case, physical activity can reduce the glucose in your blood. Muscles can use glucose *without* insulin when you're exercising. In other words, it doesn't matter if you're insulin resistant or if you don't have enough insulin: when you exercise, your muscles get the glucose they need, and in turn, your blood glucose level goes down.

If students develop a deep knowledge of why their ACTIVE HEART FITNESS SCORE should stay in BAND 5 or 6, then there is a strongly reduced risk of developing type 2 diabetes as they age.

3. High Cholesterol

There is a direct relationship between elevated cholesterol levels and coronary heart disease. A reduction in total cholesterol is considered the gold standard in preventative cardiovascular medicine. Physical activity has been shown to have positive impacts to reduce cholesterol levels.

Regular physical activity has been shown to increase HDL cholesterol (called GOOD cholesterol) while maintaining, and offsetting increases in, LDL cholesterol and triglycerides (these are BAD forms of cholesterol). There appears to be a linear dose response relationship between activity levels and HDL cholesterol levels.

More intense activity, however, is required to elicit reductions in LDL cholesterol and triglyceride levels. Aerobic exercise at high intensities appears to be effective in improving the lipid profile, and the effects surpass those of physical activity by initiating clearance of plasma LDL cholesterol and triglycerides.

This means that when a student grows into adulthood, where many of them are going to develop raised cholesterol - a system where they have learned about INTENSITY BLOCKS will fit into a working lifestyle and help them to drive down high cholesterol.

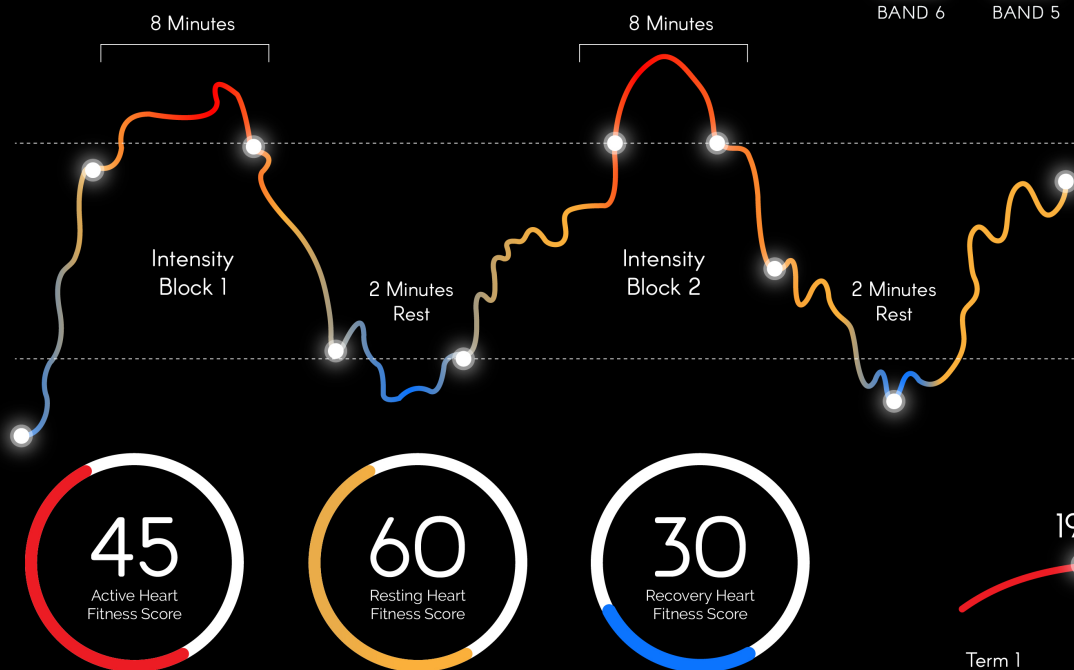
Simply, the more INTENSITY BLOCKS they complete the higher their ACTIVE HEART FITNESS SCORE will be. We will discuss this in detail in our next chapter.

Chapter two.

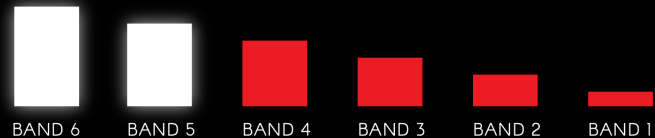


What is the AWARE Heart Fitness Advantage platform. How can a PE Teacher use it with their current syllabus and raise physical health outcomes in every single student.

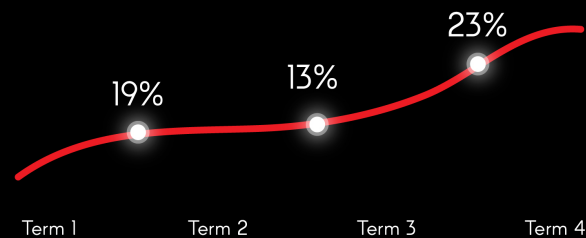
PE21
AWARE HEART
FITNESS ADVANTAGE™



Classification of physical health outcomes.



Target Heart
Fitness Score



RAISING PHYSICAL HEALTH OUTCOMES OF EVERY STUDENT, WITH DEEP KNOWLEDGE AND DEEP ENGAGEMENT

Progress Growth Score...

Laureate Professor John Hattie wrote to us in 2017 and said

“This will make a huge difference”

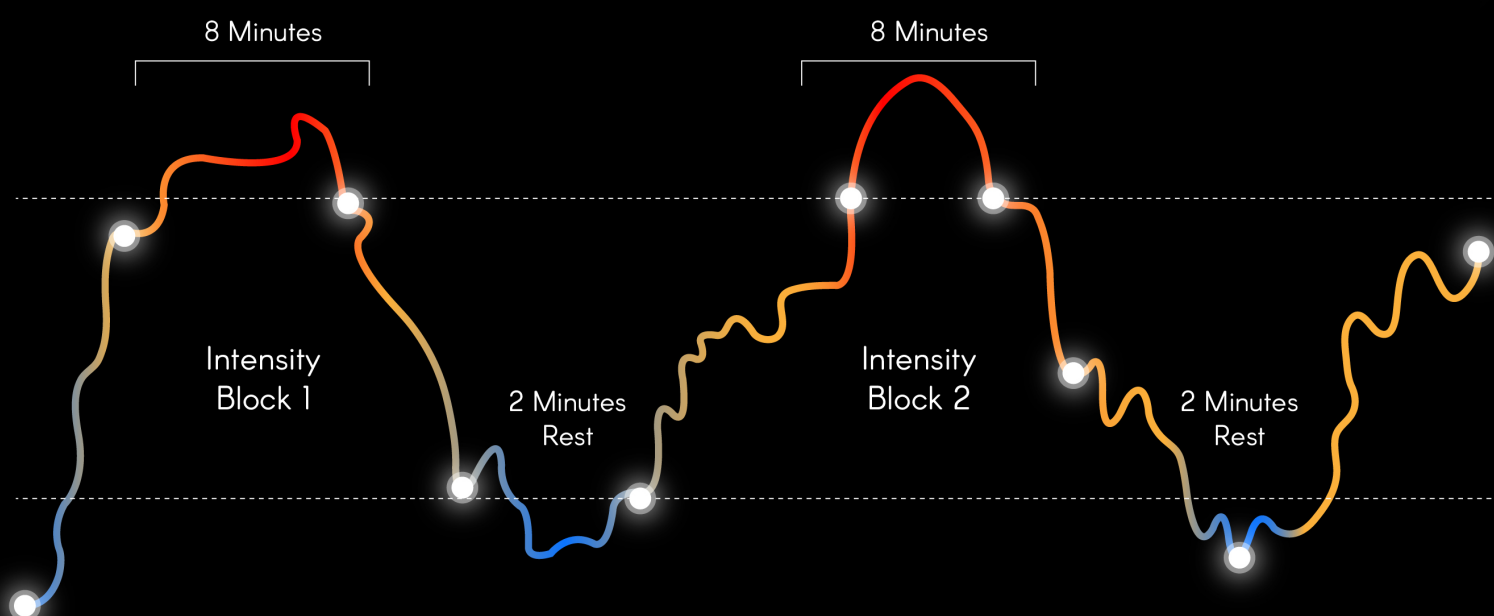
The AWARE Heart Fitness Advantage platform is not just a software technology. Rather it is a combination of 21st Century digital technology, heart rate monitors built specifically for PE Classes and PE Teachers, exercise science, and a dedicated approach to pedagogy - all underpinned by a future focus learning model.

Let's examine the simplicity of AWARE Heart Fitness Advantage.

Whilst it might seem simple, the sequence of steps we have patented into the AWARE platform have never been used anywhere, let alone in physical education classes with PE Teachers.

One thing we can tell any educator is this:

“The implementation of AWARE Heart Fitness Advantage steps will produce physically healthy students, who can grow “Deep Knowledge” and “Deep Engagement” when it comes to their personal health outcomes.



Step 1. Intensity BLOCKS (Educative Purpose)

A PE Teacher who is interested in using heart rate technology in their school is almost certainly going to have some educative purpose, however the learning we have all completed at university will only allow us to apply it to “common” knowledge of exercise science.

Intensity BLOCKS in physical education classes is not a “common” concept. We know, because we invented the term.

What is an Intensity BLOCK?

It is an 8 minute section in a PE Lesson where students do some type of modified game or game in small teams or any type of physical movement - where they get their heart rate up to at least 80% of their maximum for the 8 minutes. Then there is a two minute complete rest period.

There is nothing more important than the number of Intensity BLOCKS a student completes in a PE lesson, if you are to grow the physical health outcomes of your cohort. It is time efficient and not so difficult that students will want to give up the physical effort. (Also note this approach in a lesson does not make skill acquisition mutually exclusive. More on that later)

The educative purpose for an **Intensity BLOCK** is the where you start with developing AWARE students.

Deep Knowledge message to your students.

“The number of Intensity BLOCKS per week needs to be about 10. This will grow a biometric score called your ACTIVE HEART FITNESS SCORE. If this score grows, you will reach a status of being classified as physically healthy.”

To simplify this in a PE lesson you only need to get this knowledge through to your students - have you maintained 80% of your maximum heart rate for the 8 minutes during an **Intensity BLOCK**.

Here is a simple heart rate table.

9 - 11 year old children

Heart rate should maintain at or above 167 beats.

12 year old children

Heart rate should maintain at or above 166 beats

13 year old children

Heart rate should maintain at or above 165 beats

14 year old children

Heart rate should maintain at or above 164 beats

15 year old children

Heart rate should maintain at or above 163 beats

16 year old children

Heart rate should maintain at or above 162 beats

18 year old children

Heart rate should maintain at or above 160 beats

These numbers are not “absolute”, they are approximates. The human body is not a mathematical machine, you might vary slightly above or below, the overall aim is to build enough enough Intensity BLOCKS in a week - that causes growth, not a dedicated heart rate number.

How many Intensity BLOCKS do students need per week in order to grow their ACTIVE HEART FITNESS SCORE?

Our experience and the exercise science say a student needs about 10 per week. Again, it is not an absolute number. However 10 per week will drive every student towards BAND 5 and 6 during a school year.

On average we have been able to achieve 3-4 BLOCKS in a 51 minute lesson at our pilot school. If you have a longer lesson, then 5 Blocks are possible. This means it took us 1 PE lesson per week and 1 sport lesson per week to achieve 10 BLOCKS.

What you do in a PE lesson is no where near as important as achieving 3-5 Intensity BLOCKS in that lesson. This means you can use the same syllabus as you do now for practical lessons, just change the emphasis so every student achieves the desired number of Intensity BLOCKS.

More on exactly what an **AWARE PE Lesson** looks like in the next chapter.

Step 2. HEART Fitness Scores (Educative Purpose)



Growing a student's physical health outcomes revolves around understanding the impact physical activity has on three different Heart Fitness Scores. The three heart fitness scores are called:

1. ACTIVE Heart Fitness Score
2. RESTING Heart Fitness Score
3. RECOVERY Heart Fitness Score

In December 2016 the American Heart Association released the scientific statement which became groundbreaking. If you read chapter one called The Biggest Public Health Problem of the 21st Century, then you'll have discovered new global medical research which states a person's ACTIVE Heart Fitness Score is critical to short and long term physical health. The American Heart Association recommends that doctors should be measuring this as often as blood pressure, cholesterol and other known health markers.

What the scientific statement does not recommend is 'who is responsible for teaching anyone how to understand and improve their ACTIVE Heart Fitness Scores.'

Here is a reminder from chapter one on the definition of ACTIVE Heart Fitness Score.

- The term **ACTIVE HEART FITNESS SCORE** refers to a medical term called cardiorespiratory fitness score. A physical education teacher may have heard it called VO2 max. They all mean exactly the same thing. For education purposes we are calling it **ACTIVE HEART FITNESS SCORE** throughout our literature. It is a great descriptor which students can easily understand how it is applied to physical health. Medical terminology is often a barrier when it comes to educational outcomes.

For those of you who are being introduced for the first time to the term **ACTIVE HEART FITNESS SCORE**, here is essentially what it means - The capacity of a person's heart to take oxygen and breathe it in, send it from the heart, transport it along blood vessels to cells at the muscles, dump off the oxygen at the muscles and pick up carbon dioxide and move this out of the body through the blood vessels heart and lungs.

- If a student or adult does not participate in consistent and intense enough physical activity, and they will have a low **ACTIVE HEART FITNESS SCORE**. The opposite is true if there is regular and consistently intense physical activity.
- Your **ACTIVE Heart Fitness Score** is a number generally speaking out of 100. (Not strictly true in medical science, however this is a good way to communicate it to students) An elite athlete may have an ACTIVE Heart Fitness Score of 65-85. The highest ever recorded is about 95!
- It is vital to note that when discussing physical health outcomes, you will never look to achieve the level of an athlete.
- Any student who achieves an active heart Fitness score of over 42 well on their way to be classified physically healthy. The score does not need reach into the mid fifties or above order to be qualified as physically healthy.

The other two Heart Fitness Scores (RESTING and RECOVERY) are totally influenced by your ACTIVE Score.

Your **RESTING Heart Fitness Score** is the lowest number your heart beats at rest. For example a students RESTING Heart Fitness Score should be taken at the beginning of each PE lesson once you have put the ZONE HEART RATE MONITOR on each student.

In order for each student to have an accurate RESTING Heart Fitness Score they **MUST BE DIRECTED TO SIT FOR TWO MINUTES AT THE START OF EACH PE LESSON**. The AWARE software platform will average every five PE Lessons and calculate each students RESTING Heart Fitness Score. A student may have a RESTING Heart Fitness Score of 75 beats at the start of the school year. Through regular completion of Intensity BLOCKS in PE Lessons (and any outside of school) this number will decrease, say to 60 beats per minute.

As a students ACTIVE Heart Fitness Scores grows, they will see a corresponding decrease in their RESTING Heart Fitness Score. This is the aim, to lower your RESTING Heart Fitness Score, which then means your physical health is improving.

After a game in PE stops at the end of 8 minutes, a students heartbeat might fall from 165 beats to 155 beats 2 minutes after stopping. Their RECOVERY Heart Fitness Score is 10. The regular completion of Intensity BLOCKS in your PE lessons will improve every students RECOVERY Heart Fitness Score. By term two of three of a school year a students RECOVERY Heart Fitness Score might be 40. This would mean their heart is beating at 125 beats 2 minutes after stopping their physical activity.

The reason that your RECOVERY Heart Fitness Score is so critical is because it signifies the capacity of your body to deal with activity and return to normal this activity is completed. This is the very definition of a good cardiovascular system.

Classification of physical health outcomes.



BAND 6



BAND 5



BAND 4



BAND 3



BAND 2



BAND 1

Step 3. BAND Ranking - Classification of physical health (Educative Purpose)

Data of any kind in the education system is only of value once converted to educative purpose. In other words what do you do with the data that you collect. This applies to all curriculum subjects, but perhaps none as personally important as data that is collected and helps to classify physical health outcomes in every single student.

One of the most powerful features of the AWARE platform is that it is specifically built with the purpose of improving physical health outcomes for every student in every single lesson. It is the first time ever a physical education teacher the capability to know specifically if the PE lesson that they have just finished has made an impact towards future health outcomes for their class.

The BAND Ranking system is quite simple to understand. There are 6 BANDS in the AWARE platform.

BAND 6 in any heart Fitness score means that you are classified as being very physically healthy. At this level it is very difficult develop chronic disease. **BAND 1** means that you have done very little physical activity towards being classified as physically healthy. At this level is very easy to develop chronic disease.

Our research shows that approximately 65% of students between the 7th and 12th grade are in **BAND 1,2,3**, for their **ACTIVE HEART FITNESS SCORE**. Correspondingly we have found 4 to 5 students per class of 30 achieve **BAND 5** or **BAND 6**. In order to be classified as physically healthy a person must achieve at least **BAND 5**.

After one year of using the **AWARE** platform, there are at least 20 to 25 per class of 30 to reach **BAND 5** and above on their **HEART Fitness Scores**. All schools see a significant growth after installing the **AWARE** platform.

Below are the three tables used classify your student into a specific **BAND**.

Table 1.**BAND RANKING FOR ACTIVE HEART FITNESS SCORES**

ACTIVE HEART FITNESS SCORES. MALES

Age	BAND 1	BAND 2	BAND 3	BAND 4	BAND 5	BAND 6
12	32.0	33.9	35.2	37.5	42.3	48.1
13	30.7	34.7	36.1	38.4	43.4	49.4
14	33.4	35.5	37.0	39.4	44.5	50.7
15	34.2	36.4	37.9	40.4	45.7	52.0
16	34.6	36.8	38.4	40.9	46.3	52.6
17	34.6	36.8	38.4	41.0	46.4	52.8
18	34.6	36.8	38.4	41.0	46.5	52.8

Table 1.BAND RANKING FOR **ACTIVE** HEART FITNESS SCORES**ACTIVE HEART FITNESS SCORES. FEMALES**

Age	BAND 1	BAND 2	BAND 3	BAND 4	BAND 5	BAND 6
12	30.0	31.6	32.8	34.7	39.0	44.3
13	29.6	31.2	32.4	34.4	38.6	43.8
14	29.1	30.8	32.1	34.1	38.3	43.4
15	28.8	30.5	31.8	33.8	38.0	43.0
16	28.5	30.3	31.5	33.5	37.8	42.9
17	28.4	30.1	31.4	33.4	37.7	42.9
18	21.1	29.8	31.0	33.0	37.4	42.9

Your Heart Fitness Score needs to reach between 39 - 52 (or above) depending on your age or gender to be classified in BAND 5 or 6 and as physically healthy.

Here are all the BANDS and what they mean.

BAND 6.

This is **highly protective for your health**. It means you have the highest Heart Fitness Score on the ranking system. In order to achieve this you will need to complete at least **10 INTENSITY BLOCKS per week of physical activity with a total of 80 minutes**. You need to use your heart rate monitor and reach at least **at 80%** of your Maximum Heart Rate. In order to know the heart rate number a student needs to achieve in each INTENSITY BLOCK refer to our section on INTENSITY BLOCKS in this chapter.

BAND 5.

This is **protective for your health**. It means you have the second highest Heart Fitness Score on the ranking system. In order to achieve this you will need to complete at least **8-10 INTENSITY BLOCKS per week of physical activity with a total of 64 - 80 minutes**. You need to use your heart rate monitor and reach at least **at 80%** of your Maximum Heart Rate. In order to know the heart rate number a student needs to achieve in each INTENSITY BLOCK refer to our section on INTENSITY BLOCKS in this chapter.

BAND 4.

This is **helping protect your health**. It means you have the 3rd highest Heart Fitness Score on the ranking system. In order to achieve this you will need to complete at least **6-8 INTENSITY BLOCKS per week of physical activity with a total of 64 minutes**. You need to use your heart rate monitor and reach at least **at 80%** of your Maximum Heart Rate. In order to know the heart rate number a student needs to achieve in each INTENSITY BLOCK refer to our section on INTENSITY BLOCKS in this chapter.

BAND 3.

This is **reaching adequate levels for your health**. It means you have the 4th highest Heart Fitness Score on the ranking system. In order to achieve this you will need to complete at least **4-6 INTENSITY BLOCKS per week of physical activity with a total of 48 minutes**. You need to use your heart rate monitor and reach at least **at 80%** of your Maximum Heart Rate. In order to know the heart rate number a student needs to achieve in each INTENSITY BLOCK refer to our section on INTENSITY BLOCKS in this chapter.

BAND 2.

This is **not helping you reach adequate levels to cause health**. It means you have the 5th highest Heart Fitness Score on the ranking system. In order to achieve this you will need to complete at least **2-4 INTENSITY BLOCKS per week of physical activity with a total of 24 minutes**. You need to use your heart rate monitor and reach at least **at 80%** of your Maximum Heart Rate. In order to know the heart rate number a student needs to achieve in each INTENSITY BLOCK refer to our section on INTENSITY BLOCKS in this chapter. It is very difficult to grow your ACTIVE HEART FITNESS SCORE at this level.

BAND 1.

This is **putting your health at risk**. It means you have the 6th highest Heart Fitness Score on the ranking system. This means you are attempting no physical activity per week that approaches 80% of your maximum heart rate. You cannot grow your ACTIVE HEART FITNESS SCORE at this point.

What about RESTING AND RECOVERY HEART FITNESS SCORE tables?

Classifying these for students does not have the volume of clinical research that ACTIVE HEART FITNESS SCORES do. PE 21 will be adding to the research in the coming years.

When working with students, here is how you should teach RESTING and RECOVERY HEART FITNESS SCORES.

RESTING HEART FITNESS SCORE

In the AWARE platform, this is auto calculated each PE Lesson.



AT THE BEGINNING OF A PE LESSON STUDENTS NEED TO SIT DOWN AND MOVE AS LITTLE AS POSSIBLE. THE AWARE PLATFORM WILL TAKE THE LOWEST NUMBER IN THIS 2 MINUTE PERIOD. EVERY 5 LESSONS AN AVERAGE WILL BE CALCULATED.

IMPORTANT

The use of a heart rate monitor in any physical activity lesson does not diagnose any medical condition. The use of heart rate data is for educational purposes only. PE Teachers are not medical doctors and should not use this data with students for any other purpose than education about the benefits of physical activity.

The aim is to reduce this score. Students resting heart rates will typically vary between 60 - 85 beats per minute. As a students ACTIVE HEART FITNESS SCORE grows, there will be a corresponding drop in RESTING HEART FITNESS SCORES.

The critical teaching point is this. The lower your RESTING HEART FITNESS SCORE becomes, the lower your risk of developing chronic disease. It means your physical health status is becoming more protective. It is not a guarantee that a person will always remain physically healthy. The medical research does have clear evidence that a lower score provides very significant benefits.

RECOVERY HEART FITNESS SCORE



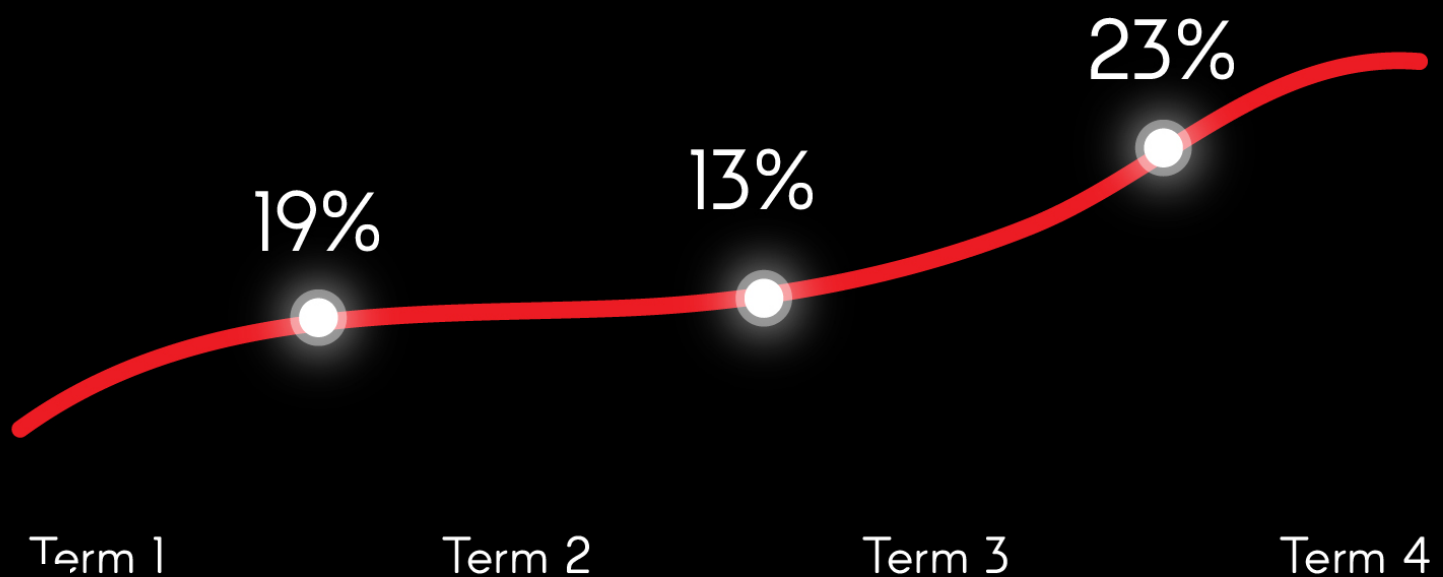
In the AWARE platform, this is auto calculated during a PE Lesson.

It is an average produced when a student finishes at least 3 INTENSITY BLOCKS in a PE Lesson.

When a student stops their mini sided game, and their heart rate reaches 80% of their maximum - their heart rate will begin to drop. The faster this drops, the better their physical health is. There is a range that a students RECOVERY HEART FITNESS SCORE will fall into.

Excellent.	45 Beat drop in heart rate after 2 minutes rest
Good.	35 Beat drop in heart rate after 2 minutes rest
Average.	25 Beat drop in heart rate after 2 minutes rest
Below Average.	15 Beat drop in heart rate after 2 minutes rest

Step 4. Progressive GROWTH SCORES - What really matters in assessment. (Educative Purpose)



Progress Growth Score...

Here is exactly what we mean when we talk about progressive growth scores as related to the AWARE platform. They are the critical component of assessment. As a practising group of PE Teachers, we do not suggest that you assess only on Heart Fitness scores. That does not make sense. However when it comes to assessing physical health outcomes we would totally recommend you look at a student's progressive growth scores.

Example.

After the first 4 weeks of using the AWARE platform in your PE lessons, let's say a 12 year old student has the following scores.

ACTIVE HEART FITNESS SCORE - 28

RESTING HEART FITNESS SCORE - 75

RECOVERY HEART FITNESS SCORE - 15

Over the next 10 weeks by completing INTENSITY BLOCKS in your PE lessons, let's say your student has these new scores.

ACTIVE HEART FITNESS SCORE - 32

RESTING HEART FITNESS SCORE - 70

RECOVERY HEART FITNESS SCORE - 25

Here are the progressive GROWTH scores for each category.

ACTIVE HEART FITNESS PROGRESSIVE GROWTH SCORE = 14%

RESTING HEART FITNESS PROGRESSIVE GROWTH SCORE = 7%



Conclusion about Progressive Growth Scores.

It is common practice for generations in Australia where students receive a school report on their progress halfway through the year, then again at the end of the year. When we hand out reports it is normal for students to quickly flip through each subject in high school and see what their marks and grades are. Then begins the discussion amongst their peers, “what did you get for...”

These reports have changed little since the 1950's. The marking system is typically a grade from A down to E. The grade is the focus of each student and parent.

PE 21 thought long and hard about this process. After consultation with Laureate Professor John Hattie, we concluded that for AWARE the ‘traditional’ reporting process made no sense. Two reports per year on your ACTIVE HEART FITNESS SCORES did not allow students to do what we call “COURSE CORRECT”. If they were off track and not progressing in growing their physical health outcomes, we did not want them to wait till the end of the year to see what improvements were needed.

With an automated data collection tool we could report to them on a lesson by lesson basis without the PE Teacher having to make an assessment task. This is a revolution in feedback. It is what Hattie calls ‘just in time feedback’.

A GROWTH SCORE is even better when compared to a grade. A positive growth score is a very likely outcome for all students in the AWARE platform. If a student is yet to reach BAND 5 or BAND 6 (most of them have not) then they will see a growth score that is in the positive.

It is not our recommendation for a PE Faculty to report only on the AWARE platform. There are other requirements from your syllabus. However we do recommend that there be a section called ‘Physical Health Outcomes’ be displayed in a school report.

We have seen student who regularly score a C or D in the grading system, score a 30% plus growth score. The student who regularly gets an ‘A’ on their report, might only have a growth score of 20%. All of a sudden, in this category the under performing student experiences a positive assessment about their physical health. It is very very encouraging.

Eventually our aim is to get all students to reach BAND 5 and BAND 6, this will see the growth score not be as high. However the true aim is to raise all students into the top two BANDS in order to be classified as physically healthy.

Chapter three.

What does an AWARE Heart Fitness Advantage PE lesson look like in practice? How to keep your current practical content and overlay the AWARE platform.

“AWARE is not another education platform for PE Teachers to squeeze into their already overly busy syllabus”

Over many years of PE Teaching (since 1988!) we have seen many education ideas presented to us, and have been asked to cram in some new and very important idea that falls under our teaching faculty.

AWARE Heart Fitness Advantage has been constructed by current PE Teachers. At the forefront of our mind was the idea that we do not need to have another PE program which must be shoved into a section of our syllabus.

You will be delighted to discover that it is not a ‘new program’, it simply overlays onto whatever your current practical curriculum is.

Here is an example of a what a typical PE program and units of practical work could look like.

1. Invasion games
2. Court games
3. Fitness unit
4. Striking games
5. Modified games
6. Sport Unit
7. Adventure games



Conversation between PE faculty members.....

Q) Head Teacher:

What is the purpose of teaching practical lessons in PE?

A) Teacher one:

The lifelong love of physical activity.

A) Teacher two:

The development of skills for the enjoyment of activity.

A) Teacher three:

To get students moving and help meet minimum standards.

A) Teacher four:

Build game sense towards improving understanding.

