

3.4 How to Optimise Training & Prevent Injury

3.5 Effective Use of Warm Up & Cool Down

4.1-4.3 Use of Data

Name _____

Class _____



	Description from Specification	Pupil comments – How confident do you feel on this topic?
Calculating intensities to optimise training effectiveness	Definition of training threshold. Calculate the aerobic/anaerobic training zone: Calculate maximum heart rate (220 minus age), aerobic training zone (60–80% of maximal heart rate), anaerobic training zone (80–90% of maximal heart rate). For circuit training, altering the time/rest/content of the circuit will determine the fitness aim. How to calculate one repetition maximum (one rep max) as part of weight training and how to make use of one rep max, with reference to strength/power training (high weight/low reps – above 70% of one rep max, approximately three sets of 4–8 reps). Muscular endurance (low weight/high reps – below 70% of one rep max, approximately three sets of 12–15 reps)	
Considerations to prevent injury	The training type/intensity should match the training purpose (eg aerobic or anaerobic). Where applicable, the following factors should be taken into account in order to prevent injury: A warm up should be completed, over training should be avoided, eg appropriate weight, appropriate clothing and footwear should be worn, taping/bracing should be used as necessary, hydration should be maintained, stretches should not be overstretched or bounce, technique used should be correct, eg lifting technique, appropriate rest in between sessions to allow for recovery.	
Specific training techniques – high altitude training as a form of aerobic training	How high altitude training is carried out: Train at high altitude; there is less oxygen in the air and oxygen carrying capacity is reduced; the body compensates by making more red blood cells to carry oxygen. Students should be taught to evaluate the benefits and the limitations of altitude training for different sports performers. Students do not need to be taught how to calculate intensities for altitude training.	
Seasonal aspects	Names of the three training seasons: Pre-season/preparation; competition/peak/playing season; post-season/transition. An understanding of what each of the seasons entails (aims): Pre-season/preparation – general/aerobic fitness, specific fitness needs; competition/peak/playing season – maintain fitness levels, work on specific skills; post-season/transition – rest and light aerobic training to maintain a level of general fitness. An understanding of the benefits of each season to the performer.	

	Students should be taught to apply and justify the characteristics of the seasonal aspects to different sporting activities.	
Warming up and cooling down	<p>The constituent parts of warming up and cooling down. Warming up should include: Gradual pulse raising activity, stretching, skill based practices/familiarisation, mental preparation, increase amount of oxygen to the working muscles.</p> <p>Cooling down should include: Maintain elevated breathing and heart rate, eg walk, jog, gradual reduction in intensity, stretching. Students should be taught to understand and justify appropriate elements of a warm up and a cool down for different sporting activities.</p> <p>The benefits of warming up: Effect on body temperature, range of movement increased, gradual increase of effort to full pace, psychological preparation, practice of movement skills through the whole range of movement, injury prevention.</p> <p>The benefits of cooling down: Allowing the body to recover, the removal of lactic acid/CO₂/waste products, prevent (delayed onset of) muscle soreness/DOMS.</p>	
Quantitative v Qualitative Data	Quantitative data deals with numbers. Methods for collecting quantitative data = questionnaires/surveys. Qualitative data deals with descriptions. Methods for collecting qualitative data = interviews/observations.	
Presenting Data	How to present data in tables. How to plot basic bar charts/line graphs. How to label x and y axes on bar charts and line graphs.	
Analysis and evaluation of data	Interpretation of data presented in basic tables, bar charts, line graphs, pie charts.	

Training Thresholds:

These are based on Heart Rate and are set to make sure that people train at an effective but safe level.

The Method for working out your Training Thresholds:

Firstly work out your maximum heart rate with the formula: _____

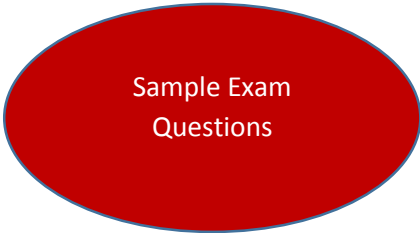
What is your maximum heart? _____

Your aerobic zone is what percentage of your maximum HR? _____

Therefore what is your aerobic target zone? _____

Your anaerobic zone is what percentage of your maximum HR? _____

Therefore what is your anaerobic target zone? _____



Emma is 20 and is training for a marathon. How would you work out Emma's aerobic training zone? **(3 marks)**



Tom is 16, has a resting heart rate of 64 bpm and has just completed a six-week personal exercise programme (PEP).

The figures below show his average working heart rate each week.

Week 1 – 180
Week 2 – 172
Week 3 – 160
Week 4 – 175
Week 5 – 145
Week 6 - 150

State the total number of weeks Tom's heart rate was within his aerobic target zone.

(1 mark)

- A** One
- B** Two
- C** Three
- D** Four

Answer: _____

State the total number of weeks Tom's heart rate was within his anaerobic target zone.

(1)

- A** One
- B** Two
- C** Three
- D** Four

Answer: _____



Circuit Training Thresholds:

When using Circuit Training, altering the time, rest or content of the session can adjust the threshold being used.

A performer has been using the following stations as part of a Circuit. They have been performing each activity for **45secs**, with **30secs rest** between exercises.

Press-Ups
Shuttle Runs
Box Jumps
Tricep Dips
Squats

Fill in the table below in order to show how you would make the session more aerobic/anaerobic.

	Adjust the Time	Adjust the Rest	Adjust the Content
Make the session more aerobic			
Make the session more anaerobic			

Weight Training Thresholds:

This is based on your one rep max for any given weight lifting activity.

- Strength/Power training should be performed at above 70% of your **one rep max**. This should allow 3 sets of 4-8 reps to be performed
- Muscular Endurance training should be performed at below 70% of your **one rep max**. This should allow 3 sets of 12-15 reps to be performed

Using weight training exercises of your choice, fill in the tables below to show how your strength and muscular endurance thresholds differ.

Weight Training Exercise =

	Weight Lifted (kg)	Number of sets/reps
One Rep Max		
80% of One Rep Max		
60 % of One Rep Max		

Weight Training Exercise =

	Weight Lifted (kg)	Number of sets/reps
One Rep Max		
80% of One Rep Max		
60 % of One Rep Max		

*Individuals should always ensure that they have been given a safety briefing before conducting weight training. A partner must also be used as a 'spotter' for safety.

Preventing Injuries:

The table below shows the factors that should be taken into consideration in order to prevent injury. Try to explain these factors in the table below.

Factor Preventing Injury	Explanation of how this can be used (make use of examples where necessary)	How it prevents injury
Completing a warm-up		
Avoiding overtraining		
Wearing appropriate clothing and footwear		
Taping/Bracing where necessary		
Hydration		
Stretching appropriately		
Using correct technique		

High Altitude Training:

Use the following words to complete the paragraph below.

Oxygen Race Altitude Red Muscles

This is a form of aerobic training. An athlete will move to high _____ for training as there is less _____ in the air. The body then compensates by creating more _____ blood cells to carry oxygen. When moving back to low altitude for a _____ or competition the athlete will find that they are able to get large quantities of oxygen to their working _____, giving them a better chance of winning the race.



Seasonal Aspects:

Almost all sports are split into three seasons across a year. Each season has different aims and therefore different training requirements.

Training Season	What this part of the season entails	Specific Examples of training sessions undertaken in a given sport
Pre-Season		
Playing Season		
Post-Season		

Warming Up/Cooling Down

A warm up has 3 stages to prepare you **physically** and **psychologically** for exercise and prevent injury. For each stage give an example of a warm up that could be undertaken in your sport and explain why this stage of a warm-up is important.

Stage 1 – Pulse-Raiser (Increase oxygen to the working muscles)

Stage 2 – Stretching (both dynamic and static)

Stage 3 – Specific Skills Practice

Stage 4 – Mental Preparation



A cool-down should include:

- Activity to maintain elevated breathing and heart rate
- Gradual Reduction in Intensity
- Stretching

A cool down is vitally important following exercise. Using the following words/phrases explain why...

Lactic Acid. Breathing rate. Light exercise. Oxygen debt. Anaerobic.

The benefits of warming-up	What could happen if a warm-up wasn't implemented properly? Why?
Body temperature increased	
Range of movement increased	
Gradual increase of effort to full pace	
Psychological Preparation	
Injury Prevention	

The benefits of cooling-down	What could happen if a cool-down wasn't implemented properly? Why?
Allows the body time to recover	
Removes lactic acid/CO2/Waste Products	
Prevents DOMS	

Sample Exam Questions:

A warm-up is carried out before physical activity to reduce the chance of injury. Explain one other reason for warming up.

Reason 1 (2)

Explain why an athlete should use a cool down following a 100m sprint.

(3)



Explain why a marathon runner would benefit from altitude training (4 marks)

Several items of protective clothing are being used by the performers in the image below.



Figure 3

Identify **two** item of protective clothing visible and explain how this helps to reduce the risk of injury.

(2)

Item of clothing 1

Item of clothing 2

Use of Data

This topic has been on-going throughout the course, but we will look at it in closer detail here.

As discussed previously...

Quantitative Data is _____.

Qualitative Data is _____.

Methods for collecting Quantitative Data	Methods for collecting Qualitative Data
Surveys	Interviews
Questionnaires	Observations

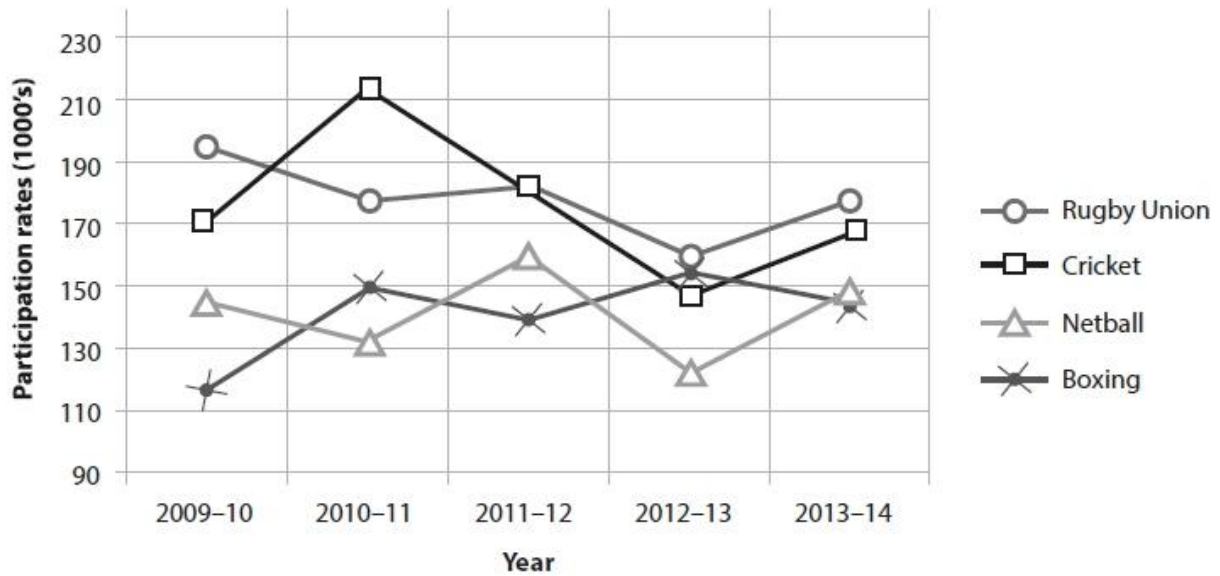
1. Create a short survey in order to find out about the enjoyment levels of GCSE PE in your class.

As this data is quantitative, you should be able to use it to create a table, bar chart or line graph which can then be analysed in order to gain results.

2. Interview the person next to you in order to find out about their enjoyment of GCSE PE.

How does this data differ in the ways it is presented and can be used?

The line graph below shows the results of a survey into participation rates of certain sports.



(Source: adapted from Sport England Active People Survey 8)

Figure 1

1. Label the X and Y axes on the graph.
2. Which sport had the highest participation rate in 2014?

3. Which sports have shown an increase in participation rates between 2009-2014?

4. Which sports have shown a decrease in participation rates between 2009-2014?

The table below shows the Resting Heart Rate (BPM) of a 26 year old female over time.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
RHR	75	71	70	68	70	64

- Use a separate sheet of paper to create a line graph with these values
- Label the X & Y axes on your graph
- Answer the following questions:

1. Looking at your graph, what is the overall trend being shown?

2. What has happened to the cardiorespiratory system of the individual between week 1 and week 6?

3. What type of training might the individual have been undertaking over the 6 week period? Why?



Key Terms:

Training Threshold – A safe and effective level to train at

Maximum Heart Rate – $220 - \text{Age}$

Aerobic Training Threshold – 60-80% of MHR

Anaerobic Training Threshold – 80-90% of MHR

One Rep Max – Maximum weight that can be lifted for one repetition on a given machine

Altitude Training – Used by endurance athletes to create more red blood cells

Warm-Up – Undertaken before an activity/match in order to prepare physically and psychologically

Cool Down – Undertaken after an activity/match in order to aid recovery

Quantitative Data – Information about quantities that can be compared and measured

Qualitative Data – Information about qualities which is difficult to measure