

GCE Physical Education – Exemplar Materials

Unit 4: The developing Sports Performer (6PE04)

Task 4.1 – Development Plan (Tennis)

This is a detailed and well written Development Plan from a student who has been able to incorporate the theoretical elements of sports science and training into a Plan designed and centred on increased muscular strength in order to enhance performances in tennis.

Planning and Research

The planning and research section is well detailed and contains some but limited direct referencing. The candidate has explored those elements of a higher marked development plan and in the main has applied the knowledge and understanding gained to themselves personally. The candidate has a fully detailed introduction exploring their present participation levels and their own profile of fitness components. The candidate has been able to include details on periodisation thereby structuring the plan, has used the principles of training, methods of training and details goal setting in order to apply targets to the outcomes.

By exploring energy systems and the use of this knowledge to shape recovery the candidate has extended the academic standing of the Plan. The task includes the reasoning behind warming up and cooling down although the task would have benefited from diagrammatic or photographic evidence of this. Including detail of the dietary consideration in order to fuel the training and the physiological developments that will occur the candidate has provided another level of planning that complements the expectations of a higher marked plan.

The Plan could however have been improved by detailing the specific type of strength that would have benefited the candidate as a tennis player. Would maximal strength training, dynamic strength endurance or elastic strength training need to be identified as the specific type of component to develop and consequently the more specific training to be selected? The candidate has also identified a large number of tests and not all of these have direct relevance to the aim of the Plan. The layout of the test results is also a little confusing at times and greater care needed to be taken in details of the results. Centres have been advised to guide their candidate's through their Plans and to only include the directly relevant materials – although the wider inclusion of a review of the use of ball feeding machines or compression clothing was applied to the candidate's own development. The detail included on diet and hydration is extensive but only relevant if the candidate modifies their own food intake and hydration strategies when completing the plan – this was missing from the performing section. The wider inclusion of reviews on stretching and dietary considerations provide further evidence of research but this needed to be referenced in more detail. The inclusion of typical dietary requirements /calories was valid but needed referencing and further explanation.

The major weakness of this Plan is there is no specific detail of the candidates training regime only a brief outline contained in the session reviews. The candidate needed to include those specific exercises selected and detail the Sets/Reps and recovery times undertaken in a separate tabled form. In addition in order to satisfy the principle of progressive overload the candidate needed to re-test and then recalculate the new working loads for his training and

ensure the detail for this was contained in the Plan. On occasions the training sets/reps vary from 3 x 8, 3 x 12 to 5 sets of 6 reps. No reasoning was offered for these changes. Additionally the weight training tests include a 'leg extension' and 'Lats Pull' down but no record of any training on these specific muscle groups is included. There is also some debate over the validity of the initial 1RM results but an assumption is made as the centre accepting authenticity. The Plan was to develop an increase in hitting power and the candidate undertook upper plyometric sessions but these needed to have more detail and explanation of loadings in relation to overload/progression. The candidate should have also included a review of the physiological adaptations expected as a result of completing the plan.

Performing and Recording

The candidate has used a simplified version of recording that details the work undertaken. The use of Borg's PRE is a subjective value to qualify the intensity of the training sessions completed. The recoding sheets have at times only limited detail and qualification. The candidate completed the Plan as outlined and has been able to include critical comment. There is, however, no record of the dietary intake and modifications or those of hydration as detailed in the planning section. Did the candidate modify his diet to underpin his training as identified ...'Therefore I should be eating more carbohydrates'?

Review and Evaluation

This section did not contain enough detail to gain full marks. The candidate identifies the clear progression made in the identified tests and as such make subjective comment on the impact this has had on their performance. The candidate has included the use of performance profiling to offer validation of the impact on performance through coach observation but these needed to be expanded/enlarged to make reading easier. In order to full understanding the developments made after the completion of the Plan the candidate needed to quantify the speed of ball hitting as mentioned in the planning stage "allowing more powerful ground strokes". Notational exercises could have also been employed to quantify % first serve successes. Changes in technique can often bring this adaptation regardless of any physiological improvements. A coach testimonial is included that support the progress made.

Planning and Research	16/20
Performing and Recording	15/20
Review and Evaluation	4/5
Total	35/45

Development Plan



Development Plan

Summary

Focus sport	Tennis	
Focus component of fitness and reason for choice	Muscular strength and power in order to become more powerful when playing. For example, with my serving and general groundstrokes	
Primary methods of training	Predominantly weights training	
Testing arrangements	<ul style="list-style-type: none"> • Prior to development plan – testing a wide variety of aspects of fitness • Mid-point testing – testing the focus component of fitness • Post development plan – testing the same wide variety of aspects of fitness 	
Anticipated impact on performance	An improvement in my upper body strength, allowing more powerful ground strokes and general play	
Arrangements for training programme –when, where, with whom?	Weights training preferably Monday, Wednesday and/or Thursday – at Framlingham gym. Tennis training on Tuesdays – at Framlingham College Tennis Club and tennis training on Fridays with Framlingham Tennis Club	
Sporting aspirations	2012	I would like to be playing at a high standard at university
	2016	Just post university, I would like to be competing at a high standard at club level, improving my county ranking and continuing to coach more, after gaining further qualifications
	2020	Again, I aspire to be competing at a high standard at club level and would like to be competing for the county. Also, continuing to gain more coaching experience and adding more qualifications
Miscellaneous	I will continue to train with a similar intensity and frequency as I have been during my development plan. Now that the winter league is over, it is important that I continue to train at a similar frequency in order to prepare me fully for the summer and tennis season	

Contents page:

Personal Profile

Introduction

Self-evaluation;

- Components of fitness
- Skill related aspects of fitness

Fitness testing results

Principles of training

Methods of training

Smarter Principle

Typical week of training

Energy Systems

Warm up and cool down

The Impact the Development plan will have on my performance and fitness levels

Borg Rating

Psychology

Diet

Hydration

Physical Activity Readiness Questionnaire (PAR-Q)

Literature review

Development Plan compared to that of an elite performer

Use of technology

Mid-point and final results

Personal Profile

Name:

Age: 17

Date of birth: January 1994

Height: 6ft

Weight: 73kg

Sports: Tennis, hockey, cricket

Clubs: Framlingham College tennis club and Framlingham tennis club, Harleston Magpies Hockey Club, Easton Cricket Club.

Focus Sport: Tennis

Format: Singles and doubles

Achievements: County Hockey at Under 13 level and Tennis at Under 11. At the age of 15 I played my first match for Easton men's 1st team.

Introduction

For my development plan, I am going to focus on tennis. For tennis, there are multiple health related fitness requirements consisting of; Cardio-vascular fitness, muscular endurance, muscular strength, flexibility and body composition. The skill related fitness requirements consist of agility, balance, co-ordination, speed, power and reaction time.

I would like to improve my muscular strength in tennis, in order to become more powerful when playing my strokes such as; my serves, both first and second and my general groundstrokes. I would like to improve my physical fitness in this area in order to remain strong and keep my strength levels high throughout the entire game, rather than tiring and allowing for my shots to become weaker as the match goes on. I will attend various training sessions throughout the winter season where there is a lack of matches and therefore should not disturb my performance in match play and rather, with the delay between matches in the winter, should allow me to see an increase in fitness levels especially towards the end of the season. Another factor that drew me towards the idea of improving my muscular strength is due to the fact that it is a definite weakness of my overall fitness compared to other aspects and therefore I believe this to be the best aspect of fitness to improve.

After a poor summer this year and having done little pre-season training in order to get a strong fitness level for the season, I would like my fitness levels to improve significantly for the season ahead. This will leave me with the best chance of performing well and receiving good results in the tournaments next summer and will allow me to improve my ranking and rating within the LTA and get my ranking closer to the top 10 in Suffolk. I intend to continue playing at a high level at university within the next few years and would therefore like my fitness levels to be as strong as possible in order to allow me into a strong side at university next year.

Self-Evaluation

Components of fitness

Aspect of Performance	Own view of present performance	Coach's view of present performance (Trevor Wright)	Target performance
<u>Cardio-vascular</u> – “The ability of your body to continuously provide enough energy to sustain sub maximal levels of exercise.” (1)	My cardio vascular fitness is strong enough for tennis as I am always able to last the entire game however, after occasional very long rallies, I do tire and therefore believe my cardiovascular fitness could be improved.	There are no problems with Tom’s cardio vascular fitness. He can always withstand a 3 set match and is not ever let down by this aspect of fitness.	Working on this element of fitness will allow me to improve my game as I’m able to run for longer and possibly faster by increasing my aerobic threshold.
<u>Muscular strength</u> – “The ability of a muscle to exert a force to overcome a resistance.” (1)	My strength is strong enough to keep my in rallies presently but as I get older and am now having to play against men, I will have to improve my strength in order to remain in tougher rallies and in order to play more attackingly.	There are times when we see Tom’s performance levels drop on his service games if they are particularly long which may be due to a lack in muscular strength or endurance and therefore showing that this could well be an area for him to improve his game.	Improving this aspect of fitness will allow me to play a lot more aggressively as a player which is a definite aim of mine as I will be able to strike the ball harder and faster and should be able to stay in control of the rallies easier.
<u>Muscular endurance</u> – “The ability of a muscle to make repeated contractions over a period of time.” (1)	Overall, I believe my endurance is quite sound although towards the end of a longer three set match I often find myself fatiguing slightly but generally I don’t feel it makes me play any worse.	Again, as just stated, can tire towards the end of some high intensity service games but not generally on ground strokes during rallies where he is able to pursue with powerful shots throughout the majority of the match.	I’d like to improve my muscular endurance in order to remain strong and be able to last as long in the rallies in a long third set as I would in a first set.

Skill related aspects of performance

Aspect of Performance	Own view of present	Coach's view of present	Target performance
-----------------------	---------------------	-------------------------	--------------------

	performance	performance (Trevor Wright)	
<u>Agility</u> – “The ability to change the position of the body quickly and with control.” (1)	I am agile enough and able to move and change quickly enough to reach the ball in time.	There is no problem with tom’s agility, possibly due to the fact that he has always continued to warm up using a set of agility exercises.	Continuing to warm up using a set of cones and different agility tests will allow me to keep my agility strong and allow me to remain agile during matchplay and training sessions.
<u>Coordination</u> – “The ability of the body to link movements together, either with other movements or in relation to an external object such as an opponent or a ball.” (1)	My coordination is very strong. Since a young age my tennis coach has always looked to improve this aspect, especially during warm ups and therefore am now easily able to use two body parts at once for example, hitting the ball while using my legs to jump off the ground during the serve.	Like above, Tom’s coordination is very strong. He has always played a large amount of sports, helping with co ordination since a young age and has also often warmed up using co ordination drills.	Again, continuing to warm up using coordination exercises will allow me to coordinate well and continuing to play in a range of different sports will allow my coordination to remain strong.
<u>Power</u> – “is the ability to exert a maximal force in as short a time as possible” (1)	I believe my power is a slight weakness to my overall game. There are times in matches when I have wanted to be more powerful, either on my serve or in general groundstrokes, making me more attacking as a player and able to take control of a point easier.	Tom can occasionally under hit groundstrokes when playing tougher opponents and now that he is having to compete with stronger men, he will need to improve this type of fitness in order to stay in the rallies.	I need to be able to have the confidence to be able to attack balls well and finish off points easier. I also want to be generally more attacking when hitting my groundstrokes and I believe an increase in power will allow me to play like this.
<u>Speed</u> – “The time taken to move a body, part or whole, through a movement over a pre-determined distance.” (1)	My speed is generally strong. As well as having a fast reaction time, I am generally fast around the court from, for example, striking a deep ball to then having to retrieve a drop shot.	Tom’s speed is good and allows him to get around the court easily with time to spare to prepare himself and his footwork before striking the ball. So, I don’t see any problems with this type of fitness at the moment.	My speed within a distance of only the width/depth of a court is normally very strong and doesn’t let me down; however I am generally not a fast runner if having to run over a longer distance than this, Therefore maybe it is my agility and

			reaction time which allows me to remain fast around the court.
<u>Ground strokes</u> – “Any type of shot (Forehand and Backhand) across the net where the ball bounces.” (2)	Generally sound in most situations and am able to change direction on the ball with ease, either choosing to hit down the line or cross court.	Tom’s general groundstroking has always been a strong aspect of his game. He can control the ball nicely on both sides; his backhand and forehand side, and is able to pick up a good amount of angle, particularly on his forehand side.	There is no problem with the control I have in my ground strokes but once again, an increase in the power in which I strike the ball could be improved and will help heavily when looking to attack in matchplay, especially against stronger players with a strong defence.
<u>Serving</u> – “to begin a point by hitting the ball into the opponents half of the court”. (3)	My serving is a strong aspect of my game as I am able to use all of three types of serve in order to add variation. However, there is a slight lack in power.	Tom is able to use all three types of serve but predominantly chooses to use the slice serve on both his first and second serve which gives him good variance on the serve but also a strong degree of reliability.	An increase in power would allow me to serve stronger but still use my variation in order to make my serve even stronger and even harder to return.
<u>Movement around the court</u>	Generally I am quick around the court; I am agile and my reaction time in anticipation to opponent’s shots is normally quick. Although these components are strong, my speed in getting to the ball over a longer distance can sometimes be quite slow.	Tom’s movement around the court is strong and as previously said, he is agile and quick and therefore can retreat back to the centre and ready position quickly.	With strengths in both agility and reaction time, my movement around the court does not need heavily improving. My speed could be developed in some ways but I don’t believe this will have a great impact in my game and there are other areas which are in more need of improving.

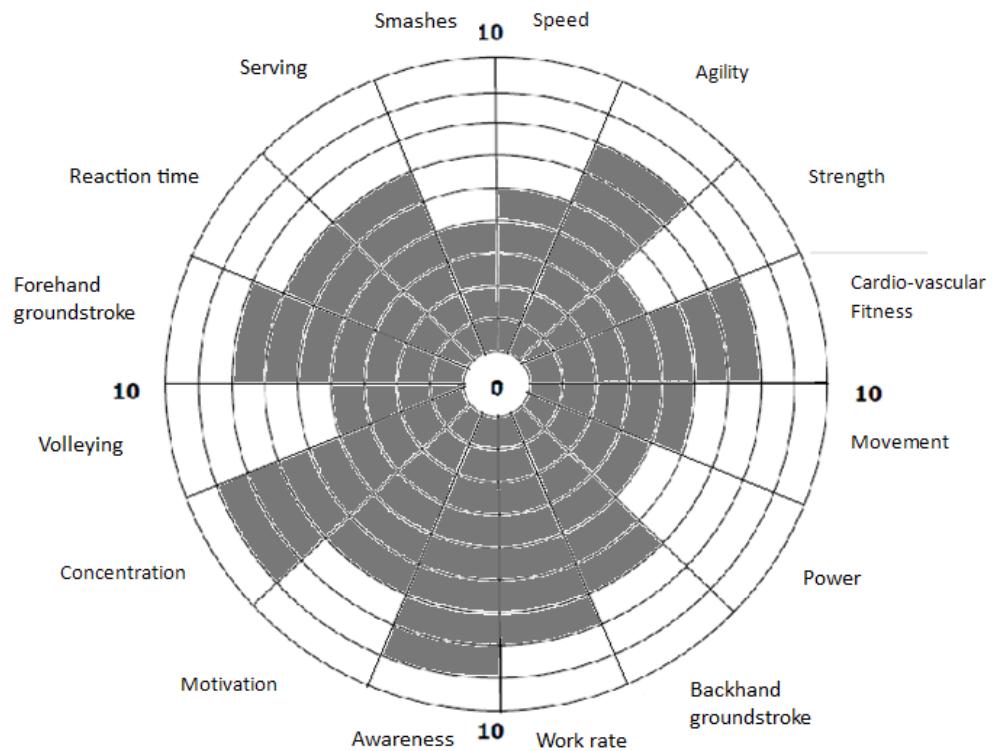
1) Edexcel AS PE Textbook – Mike Hill

2) <http://www.britishtennis.com/newtotennis/glossary/> - tennis terms

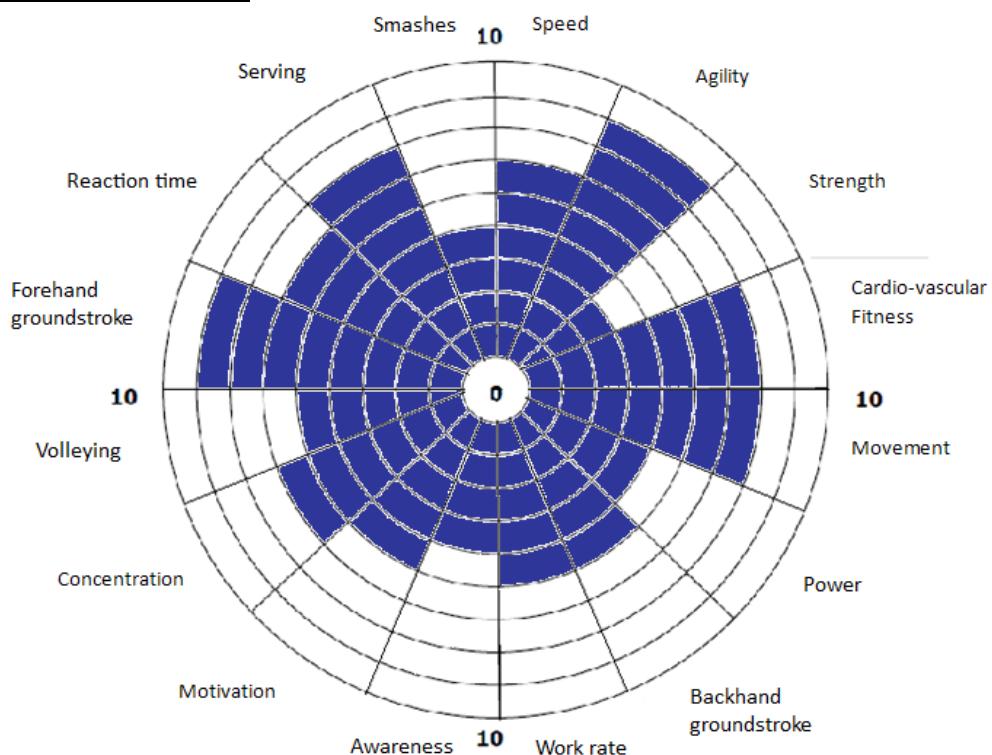
3) <http://www.sheetudeep.com/tennisglossary.html>

Evaluation using the wagon wheels

My self-evaluation



My coach's evaluation



Pre development fitness test results

Before starting the development plan I undertook some fitness tests on every aspect of fitness in order to show out the main aspects of fitness which most need improving. Therefore, after retrieving these results I should have evidence from myself, my coach and my testing as to which aspects most need improving in order to improve my game.

The fitness tests we did tested many but not every aspect of health related fitness; cardio vascular fitness, muscular endurance, flexibility, balance, power, agility and speed. We did these tests throughout two lessons in a sports hall. These results will not be completely reliable and accurate as the majority were pushed into a single lesson, concentrating on the speed and cardio vascular fitness in the 2nd of the single lessons, and therefore there was some testing on similar body parts and aspects of fitness within the same lesson.

These tests can also be used in the evaluation when comparing them to the tests I will undertake half way through my development plan and those I will do at the end of my development plan, hopefully showing signs of improvements but possibly signs of drops in fitness areas also.

Type of testing	Aspect of fitness tested	Description of testing used	Results	Aspect to improve?
Illinois Agility Run	Agility	The athlete runs around cones on a marked-out course of 10m x 5m. The athlete begins in a prone position behind the base line. When they start, the time is recorded. The course should be covered as quickly as possible and in order to get the most accurate result, should be taken three times, getting the average. (3)	14.86 seconds	No
Standing Broad Jump	Power	This involves jumping as far as possible from a two-footed starting position. The distance is measured with a metre ruler and is measured from the starting line to the back of the foot. (3)	2.08 metres	Yes
Standing Sergeant jump (Vertical Jump)	Power	The athlete stands sideways against a wall. Their maximal vertical reach is measured before performing a stationary two-footed jump, reaching as far as possible. Their maximum reach height is subtracted from their maximum jump height, giving a value indicating their leg power. (3)	52 cm	Yes

Press-ups in 60 seconds	Isotonic muscular endurance	Simply how many press-ups the performer can undertake within one minute. (3)	28	No
Wall sit	Isometric muscular endurance	The athlete squats against a wall, ensuring the knees form a 90 degree angle, the feet are flat against the floor and the back and head are straight against the wall. The athlete times how long they can remain in this position, continuing to keep in this form mentioned and recording the time. (3)	1 minute 36 seconds	No
Sit and Reach	Flexibility	This test provides a good indication of the flexibility of the hamstring muscles and the lower back. The athlete sits down on the floor with their legs out straight and feet against a box. Without bending the knees, bending forwards with arms outstretched, the athlete reaches as far as possible, measuring how far passed the toes is reached, using a metre ruler. (3)	12 cm	No
Shoulder Raise	Flexibility	Here a performer lies flat with a straight back and your face facing the floor. The athlete holds a metre ruler horizontally and lifts the ruler vertically as high as possible above your shoulders. Using another metre ruler, someone else measures how high off the ground you lift the ruler. (3)	31 cm	No
Standing Stork	Static balance	Stand on both feet with hands in front of the chest. One leg is raised and held on the inside of the opposite leg's knee. With the leg holding you up, the foot is raised so that the heel is raised above the ground, making balancing far more difficult. Take the time between when the heel is lifted off the ground and when the heel touches the ground. (1)	18 seconds	No
30 Metre Sprint	Speed	A 30 metre flat area is marked out with enough room for the athlete to accelerate up to full speed before reaching the start line. The time to travel the 30 metres is the speed travelled. (3)	4.62 seconds	No

Cooper's 12 minute Run	Cardiovascular fitness	An endurance test used to predict VO ₂ max. An athlete runs around a 400 metre track for 12 minutes at a constant pace throughout. A prediction of the VO ₂ max is calculated using this formula; 0.0225 x metres covered – 11.3 (3)	2800 metres	No
1 repetition max (1RM)	Maximal strength	The athlete performs one repetition with the greatest possible resistance. By definition, this will be the greatest resistance that they can perform in one complete repetition without struggling or losing form. (1)	(shown below for a range of exercises)	Yes
Seated Medicine Ball Throw	Power	This test measures upper body (arm) strength and explosive power. By keeping the back in contact with the wall the strength of the arms only are tested. (1)		Yes

Testing my 1RM (1 repetition max) – Fixed weights (machines)

Exercise	Primary Muscle(s) tested	Result	95% of 1RM	90% of 1RM	85% of 1RM
Pec Fly	Pectorals	113kg	107kg	102kg	96kg
Leg press	Quadriceps, hamstrings	66kg	62kg	59kg	56kg
Lat Pull	Latissimus Dorsi	73kg	69kg	65kg	62kg
Seated Row	Latissimus Dorsi, Biceps, Triceps	79kg	75kg	71kg	67kg
Chest Press	Pectorals	66kg	62kg	59kg	56kg
Leg Extension	Quadriceps	93kg	88kg	83kg	79kg

Testing 1RM – Free weights

Exercise	Primary Muscle(s) tested	Result	95% of 1RM	90% of 1RM	85% of 1RM
Bicep Curl	Biceps	18kg	17kg	16kg	15kg
Triceps	Triceps	26kg	24kg	23kg	22kg

extension					
Dumbbell bench press	Pectorals	24kg	23kg	22kg	20kg

Further details on testing the aspects of fitness I wish to improve on:

Standing Sergeant Jump:

Procedure: the athlete stands side on to a wall and reaches up with the hand closest to the wall. Keeping the feet flat on the ground, the point of the fingertips is marked or recorded. This is called the standing reach height. The athlete then stands away from the wall, and leaps vertically as high as possible using both arms and legs to assist in projecting the body upwards. The best of three attempts is then recorded.

Scoring: The jump height is usually recorded as a distance score. This table below provides a ranking scale for adult athletes based on my observations, and will give a general idea of what is a good score. (1)

rating	males (inches)	males (cm)	females (inches)	females (cm)
excellent	> 28	> 70	> 24	> 60
very good	24 - 28	61-70	20 - 24	51-60
above average	20 - 24	51-60	16 - 20	41-50
average	16 - 20	41-50	12 - 16	31-40
below average	12 - 16	31-40	8 - 12	21-30
poor	8 - 12	21-30	4 - 8	11-20
very poor	< 8	< 21	< 4	< 11

Advantages: this test is simple and quick to perform.

Disadvantages: technique plays a part in maximizing your score, as the subject must time the jump so that the wall is marked at the peak of the jump and the score can be difficult to mark if the jump is completed very quickly.

Standing Broad Jump:

Procedure: The athlete stands behind a line marked on the ground with feet slightly apart. A two foot take-off and landing is used, with swinging of the arms and bending of the knees to provide forward drive. The subject attempts to jump as far as possible, landing on both feet without falling backwards. Three attempts are undertaken the best score is used.

Scoring: The measurement is taken from take-off line to the nearest point of contact on the landing (back of the heels). Record the longest distance jumped, the best of three attempts. The table below gives a rating scale for the standing long jump test for adults, based on personal experiences. (1)

	males		females	
rating	(cm)	(feet, inches)	(cm)	(feet, inches)
excellent	> 250	> 8' 2.5"	> 200	> 6' 6.5'
very good	241-250	7' 11" — 8' 2.5"	191-200	6' 3" — 6' 6.5'
above average	231-240	7' 7" — 7' 10.5"	181-190	5' 11.5" — 6' 2.5"
average	221-230	7' 3" — 7' 6.5"	171-180	5' 7.5" — 5' 11"
below average	211-220	6' 11" — 7' 2.5"	161-170	5' 3.5" — 5' 7"
poor	191-210	6' 3" — 6' 10.5"	141-160	4' 7.5" — 5' 2.5"
very poor	< 191	6' 3"	< 141	< 4' 7.5"

Advantages: This test is simple and quick to perform, requiring minimal equipment.

Disadvantages: There is some skill component in this test.

Seated Medicine Ball Throw:

Procedure: The athlete sits on the floor with his legs fully extended, feet 24 inches (~60 cm) apart and the back against a wall. The ball is held with the hands on the side and slightly behind the center and back against the centre of the chest. The forearms are positioned parallel to the ground. The athlete throws the medicine ball vigorously as far straight forward as he can while maintaining the back against the wall. The distance thrown is recorded.

Scoring: The distance from the wall to where the ball lands is recorded. The measurement is recorded to the nearest centimetre (other protocols have used the nearest 0.5 foot or 10 cm). The best result of three throws is used.

Advantages: This test is easy and quick to perform for an individual.

Disadvantages: Several people are needed to conduct this test smoothly: one to mark results, another to check technique and another to collect and return the balls. If testing a large group, it can be time consuming to put all the subjects through this test.

One Repetition Maximum Test: (2)

Purpose: To measure maximum strength of various muscle and muscle groups.

Procedure: One repetition maximum tests (1-RM) is a popular method of measuring isotonic muscle strength. It is a measure of the maximal weight a subject can lift with one repetition. It is important

to reach the maximum weight without prior fatiguing the muscles. After a warm up, choose a weight that is achievable. Then after a rest of at least several minutes, increase the weight and try again. The athlete chooses subsequent weights until they can only repeat one full and correct lift of that weight.

Scoring: The maximum weight lifted is recorded. The sequence of lifts should also be recorded as these can be used in subsequent tests to help in determining the lifts to attempt. To standardize the score it may be useful to calculate a score proportional to the person's bodyweight.

Advantages: The required equipment is readily available in most gyms

Disadvantages: Performing a maximum weight lift is only for advanced weight trainers. It is important to have good technique before attempting this test.

- 1) <http://www.brianmac.co.uk/eval.htm>
- 2) <http://www.teachpe.com/fitness/testing.php>
- 3) Edexcel AS PE Textbook – Mike Hill

Principles of training

In order to get the most out of training, athletes can follow some principles of training. The planned training program must be systematic and take into account demands of the activity and the needs, preferences and abilities of the performer. There are a number of principles that performers and coaches must follow if they are to fulfil their potential and an acronym of SPORTFIT is used by many to remember all of the principles.

- Specificity – “The type of training you undertake should be relevant and specific to you and your sport.” (1)

Therefore, you should be training the energy system and components of physical and skill related fitness that are most relevant for you. In order to improve, you must train specifically to develop the right muscles (if your sport requires a lot of running, work mainly on your legs), aspect of fitness (for example, muscular strength or cardio vascular fitness?) and skills (for example, specific skills such as kicking).

- Progression – “Gradually increasing the amount of exercise you do.” (1)

When a performer first starts exercising, their levels of fitness may be poor. If a coach increases the frequency and length of training too quickly, the body may not have sufficient time to adapt and this could result in injury. Slow and steady progression is the best way. For example, if you were training for a 10 km run, you may choose to start by going for two 30 minute runs a week and could then increase the time you run by 3 minutes each week.

- Overload – “you must continually increase training loads as your body adapts over time.” (2)

In order to improve fitness, we have to put our bodies under additional stress. Doing this causes long term adaptations to take place, enabling our bodies to work more efficiently to cope with this higher level of performance. Overload can be progressed by; increasing the resistance (for example, adding 5kg to the dumbbell), increasing the number of repetitions with a particular weight, increasing the number of sets within the exercise and increasing the intensity which can be linked with the FITT principle.

- Reversibility – “any adaptation that takes place as a result of training will be reversed when you stop training. If you take a break or don’t train often enough you will lose fitness.” (1)

If training is stopped then improvements that have been made when training may be lost. If training is stopped for as little as a week, the performer may not be able to resume training at the same point it was left at and therefore fitness levels will have worsened.

- Tedium – you should consistently change aspects of your workouts. (2)

When planning a training session, it is important to vary the training in order to prevent performers from getting bored. If every session is the same the performer can lose enthusiasm and motivation for training which could result in a decrease in intensity and work rate. The performer should try and include a variety of different training methods or vary the type of activity.

- Moderation – “the balance between not training enough and training too much, or over training.” (1)

Getting the balance right is very hard to achieve. Not training enough means that the performer will not improve fitness as they will not experience the principle of training, overload. However, overtraining can lead to a lack of rest and recovery time, leaving players feeling too tired to train effectively and in the worst case can result in injury. This is caused through over stressing joints and tissues or from poor technique resulting from exhaustion.

- Individual needs – “fitness training programs should be adjusted for personal differences, such as abilities, skills, gender, experience, motivation, past injuries, and physical condition.” (2)

Every athlete will have their own individual needs and the focus of training should be on these. For example, if you are a rugby player, what is your position and role in the team? The training should also reflect other factors such as gender, experience and levels of performance.

FITT Principles: Frequency, Intensity, Time, Type (FITT) describes how often you train.

Frequency is how often one trains. As exercise plus recovery provides the potential for improvements to take place then the more often and frequent you train, the more you can improve. This is true up to a certain extent for example, if you train before your body has time to recover from a previous session, you can start regressing.

Intensity is the main variable that is likely to determine the outcome of my training the most. Many people believe there is only one training intensity which is working at maximal but different training intensities will determine different training adaptations. For example, weight training requires almost maximal intensity in order to see progression however, with continuous training with an aim to improve cardio vascular fitness it is impossible to work at maximal intensity.

Time is the length of the exercise period. This is closely related to the intensity as the greater the intensity the shorter the duration and vice versa.

Type is the method of training specific to the sportsman. For example if you are a rugby player, although there will be some benefits of improving cardio vascular endurance by continuous training, it is more sport specific for you to undertake interval training or fartlek due to the changes in tempo of the game.

1) Edexcel AS PE Textbook – Mike Hill

2) <http://www.articlesbase.com/fitness-articles/8-key-training-principles-for-fitness-and-sports-training-805728.html>

Linking these principles of fitness to my own training:

Specificity – My training program must be specific to me and my sport. Therefore, the training should be specific to improving my muscular endurance for a tennis player.

Progression – For improving muscular strength and power, there should be clear signs of progressing in fitness for example, an increase in the amount of reps I can undertake with a particular weight or in contrast an increase in the amount of weight but keeping to the same number of reps.

Overload – A muscle will only strengthen if it operates beyond its customary intensity (overload). This can be progressed by increasing the resistance when weight training, such as increasing the weight of a dumbbell. It can also be progressed by increasing the number of repetitions with the same resistance or increasing the number of sets of the exercise. However, increasing the number of repetitions will lead me to improve another aspect of fitness, muscular endurance, rather than muscular strength so I will avoid this and rather increase the resistance to show progression and overload.

Reversibility – In order to not undertake reversibility, I will need to continue training at a similar intensity and frequency throughout the entire development plan as reversibility can take place as quickly as having no training for one week. Reversibility can also take place due to an injury and a lack of exercise because of this, which can be helped if I change my program slightly in order to improve areas of fitness which haven't been affected by the injury, if at all possible.

Tedium – It is important that I vary my training program and do not continue to do the same exercises every session. This could make the training boring and as a result, could make me lose motivation. Therefore, I could vary my training, not by changing my methods of training as that could make my training less specific and could lose the principle of specificity and individual needs, but I could change the training within my program already. For example, I could change the exercises I use in weight training and change the ways in which I warm up and cool down.

Moderation – It's important that I get the balance right between training too hard and not training enough. If I train too hard then I have a greater chance of injuring myself but If I do not train with a high enough intensity, I will not benefit from overload and the training will not be very effective in improving my fitness.

FITT

Frequency – this describes how often I have to train. As my training will consist mainly of weight training, I will train three or possibly four times a week, allowing for 48 hours rest between each session which should be enough time to allow for recovery of my muscles although the recovery time does vary depending on the intensity of the previous session.

Intensity – As weight training is predominantly the main method of training I will be doing, in order to improve my absolute strength I should be working at 90+ % of my 1RM and in order to improve my power I should be training at 80 – 90% of my 1RM. In basic terms, the intensity of the sessions needs to be high enough in order for the principle of overload to take place however I am going to

be far more specific about this, working out my 1RM and using this to work out of what resistance I should be working to.

Time – Overall the entire sessions should be lasting around one hour, including both the warm up and cool down.

Type – My type of training should be specific to the sport I am wishing to develop, tennis. In tennis, almost every aspect of fitness is needed and can be developed to improve my overall performance but improving my muscular strength and power has been chosen as one of my weaknesses and an essential aspect of fitness to improve.

It has been said that the three most critical factors for strength and power training are progressive overload, intensity and recovery.

Progressive overload means that I must force my muscles to work harder every time I exercise. In order to increase strength, as previously stated, it is important that I progressively overload by increasing the resistance rather than repetitions as if otherwise, the exercises will increase my muscular endurance rather than my strength and power.

The intensity of the workout is also very important in improving fitness. For example, if I am typically undertaking 3 sets of 8 repetitions of bicep curls at 16 kg, if I am able to do so, I should be increasing the intensity, performing 3 sets of 8 repetitions at 18 kg. In theory, my body will add muscle if the stress upon the body is increased and if my body has to work at a higher level than it is used to. The most effective way of overloading is performing 2 to 3 sets of each exercise, continuing until it is extremely challenging and almost impossible to perform another repetition without losing the technique.

Once the target muscle group has been overloaded, I must recover fully and over compensate. This means I must rest long enough to allow full recovery of the targeted muscle group, the nervous system, to refill the glycogen stores and to allow for enough time for the muscles to make any improvements. Generally it takes 2 days to recover from a strength training workout but depending on the intensity, it can be longer.

Methods of training

One method of training used to improve muscular strength and power is weight training.

Weight training involves exercising with a variable resistance. It is predominantly an anaerobic activity although by varying the duration and intensity of the sessions the training can be changed for other benefits such as muscular endurance. However, as I am working on muscular strength, the activity will be anaerobic exercise.

Fixed weights refer to machines which predominantly focus on exercising and causing stress upon a particular muscle group, improving the fitness in a defined area. However, free weights are the bars and bells that are traditionally linked with weight training.

	Advantages	Disadvantages
Fixed weights	Provide stability for the body. Provides a correct direction of movement Does not require a spotter Easy to use/no real technique needed Provides a variable resistance and body size position	The changes in resistance may be too large Although adjustable, the machine may not fit the individual perfectly A different machine is required for each exercise They don't develop the stabilising muscles as the machines take the weight
Free weights	There are many different exercises that can be used with one set of dumbbells Other stabilising muscles are used in each exercise as well as the targeted area	Require the athlete to learn technique. Have a greater risk of injury. For safety reasons, require at least one training partner as a spotter.

In order to improve absolute strength, it is said that the athlete should be working with at 90% + of my 1RM which I have already worked out and only repetitions between 1 and 5. Whereas, with power training, it is important to work at 80% – 90% of my 1RM but with a larger amount of repetitions of 6 to 10.

% Load	Repetitions	% Load	Repetitions	% Load	Repetitions
60	17	75	10	90	5
65	14	80	8	95	3
70	12	85	6	100	1

(1)

The amount of weight to be used should be based on a percentage of the maximum amount of weight that can be lifted one time, while keeping the correct technique, generally referred to as one repetition maximum (1RM). The maximum number of repetitions performed before fatigue prohibits the completion of an additional repetition is a function of the weight used, referred to as repetition maximum (RM), and reflects the intensity of the exercise. A weight load that produces fatigue on the third repetition is termed a three repetition maximum (3RM) and corresponds to approximately 95% of the weight that could be lifted for 1RM.

The number of repetitions performed to fatigue is an important consideration in designing a strength training program. The greatest strength gains appear to result from working with 4-6RM. Increasing this to 12-20RM favours the increase in muscle endurance and mass.

One set of 4-6RM performed 3 days a week is a typical strength training program. The optimal number of sets of an exercise to develop muscle strength remains controversial.

The aim of the recovery period between sets is to replenish the stores of Adenosine Triphosphate (ATP) and Creatine Phosphate (CP) in the muscles. An inadequate recovery means more reliance on the Lactic Acid energy system in the next set.

Several factors influence the recovery period, including:

- Type of strength you are developing
- The load used in the exercise
- Number of muscle groups used in the exercise
- Your condition
- Your weight

A recovery of three to five minutes or longer will allow almost the complete restoration of ATP/CP.

Like, with the majority of muscular strength training, the amount of rest needed between each session is vague and there is no reliable source indicated exactly how much time is needed. The time needed can be linked to the intensity of the previous session, with a greater intensity, the more time is needed to recover. With the intensities I am working at I believe that after most sessions, as long as I leave roughly 48 hours before I next train using this method of training, I should not worry of injury.

I believe simple sets should be used when I train. For example, I should focus on 3 sets of either 4 or 8 repetitions of a certain resistance, depending on the amount of repetitions.

- 1) <http://www.brianmac.co.uk/index.htm>

SMARTER Principle

Performers need a structure to their goal-setting to guide and shape their performance pathway. This is achieved through the SMARTER principle where SMARTER is an acronym that provides the performer with a pathway of which goals are set. (1)

- **Specific** – goals need to be clear such as, ‘playing well in sport’ is far too vague whereas, ‘improving a certain technique’ is not.
- **Measurable** – Goals need to be assessed through formal processes as when successful, this can help the performer build confidence and improve motivation.
- **Agreed** – Goals should be discussed and agreed with others for example, a coach may set more realistic targets and team players must all agree on an objective such as a tactical plan.
- **Realistic** – Goals must be genuine and not beyond the scope of the performer. Setting unrealistic goals can be demotivating but yet goals must be set highly in order for performance to improve so there is a fine line.
- **Time-bound** – Goals should reflect the short term as well as long term objectives of the performer and should be progressive in their difficulty.
- **Exciting** – Goals need to provide the performer with some sort of stimulus. If goals are not exciting enough, performers may feel demotivated and as a consequence, under achieved and not make their targets.
- **Recorded** – by recording their goals and creating a pathway for development, performers can see their agreed structure, time plan, and processes for evaluation and measurement. This will motivate the performer further.

For my own development plan

- **Specific** – I will have the main aim to improve my overall physical aspect of fitness in both muscular strength and power.
- **Measurable** – For my predominant method of training, weights, It can be easy to measure improvements and goals for which I want to achieve for example, If I wish to aim to achieve a certain resistance or weight when performing the bicep curls exercise.
- **Agreed** – I will discuss my training program with my coach for example, whether or not the training is specific enough to what I want to improve and whether or not I am training frequently enough.

- Realistic – The goals I set must be achievable in order for me to feel more motivated in training when they are reached. Otherwise, psychologically, the intensity in which I train could decrease.
- Time bound – I should progress the goals I give myself and this can be easily achieved when weight training as I am able to set higher resistances with the same repetitions as I increase my strength each week.
- Exciting – My goals should excite me and increase my motivation in achieving these goals as a consequence.
- Recorded – I will record every training session I undertake, noting down where, when, what type of training and what I attempted and achieved in each training session.

In order to remain motivated to train, I will stick to goals and keep a record of detailed training sessions. The recordings will allow me to see how I have progressed, in what areas and hopefully this increase in strength and when seeing these improvements, it should motivate me further to continue to exercise. It is often very difficult to recognise any physiological body changes and therefore, I believe that if I record training sessions and am able to identify areas of improvement, this should show a large enough improvement for me to feel motivated enough to continue at a strong enough intensity and frequency.

- 1) Edexcel A2 PE – Mike Hill

Periodisation

“Periodisation is an organised approach to training that involves progressive cycling of various aspects of the training programme over a specific period of time.” It is the splitting of training into periods in order to focus better on specific objectives. The aim of periodization is to introduce new movements as you progress through the macrocycle to specify your training right up until you start the season.

- **Macrocycle** – The entire period is known as the macrocycle. Here, the athlete sets themselves clear and specific objectives. A macrocycle refers to an annual plan that works towards peaking for the goal competition of the year. There are three phases in the macrocycle: preparation, competitive, and transition.

The entire preparation phase should be around 2/3 to 3/4 of the macrocycle. The preparation phase is further broken up into general and specific preparation of which general preparation takes over half. An example of general preparation would be building an aerobic base for an endurance athlete such as running on a treadmill and learning any rules or regulations that would be required such as proper swimming stroke as not to be disqualified. An example of specific preparation would be to work on the proper form to be more efficient and to work more on the final format of the sport, which is to move from the treadmill to the pavement.

The competitive phase can be several competitions, but they lead up to the main competition with specific tests. Testing might include any of the following: performance level, new shoes or gear, a new race tactic might be employed, pre-race meals, ways to reduce anxiety before a race, or the length needed for the taper. When the pre-competitions are of a higher priority there is a definite taper stage while lower priority might simply be integrated in as training. The competitive phase ends with the taper and the competition.

The transition phase is important for psychological reasons, a year of training means a vacation is in order.

- **Mesocycle** – In order to achieve the objectives in the macrocycle, the macrocycle is split into blocks called mesocycles. Each mesocycle has objectives that when achieved, contribute to the overall objective of the macrocycle. A mesocycle represents a phase of training with duration of between 2 to 6 weeks or microcycles, but this can depend on the sporting discipline. During the preparatory phase, a mesocycle commonly consists of 4 to 6 micro-cycles, while during the competitive phase it will usually consist of 2 to 4 micro-cycles depending on the competition’s calendar.

- Microcycle – The mesocycles are split into smaller cycles called microcycles. These are all individual training sessions with each training session having its own objectives, leading towards the overall objective of that mesocycle of which it's held.

Periodisation will shape my Development Plan clearly, defining a structure to which I train.

For my own development plan, it is clear that my main objective is improving my overall strength and power. Therefore, the main objective of my macrocycle is improving my strength and power. The macrocycle for me should be roughly 9 months as my tennis competitions generally start in July and August, although there are matches in May and June also.

My macrocycle will be split up into mesocycle's, each defining further objectives and where I wish to improve. For my development plan, this will be roughly 8 weeks, with the main aim again, of improving my strength.

My mesocycle's will then be split up into smaller microcycle's, leading to even more defined objectives, for example, specific groups of muscles I want to improve on in that session such as the pectorals or quadriceps and at what intensity, leading to a difference in what element of fitness I improve, but still contributing to the objective of the mesocycle. The mesocycles normally last roughly 7 to 10 days.

- 1) Edexcel A2 PE textbook
- 2) <http://www.brianmac.co.uk/plan.htm>

A typical week of training

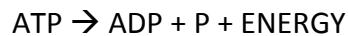
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Morning	Session in PE lesson	_____	_____	_____	_____	Tennis coaching	Weights training
Afternoon	_____	_____	School Rugby training	School Rugby training	School Hockey training	_____	_____
Evening	Weights training	Tennis training	_____	Tennis Match	Weights training	_____	_____

Generally, I believe my typical training week is strong and positive due to the fact that I am able to fit in at least 3 sessions of weight training at the gym, each week. However, the training sessions are not always ideal due to the lack of time to recover and rest before having to continue with weights training the day after, for example, if I am to train on Sunday mornings, with having to train again on Monday evenings, I do not often feel fully recovered and therefore have to make sure I am targeting different muscle groups in each areas as best as I can. However, I often either have work or a winter league tennis match on either/or Wednesday and Thursday's but if I have neither on, I generally prefer to train on either of those night's rather than the Sunday morning session so that I have large enough recovery times between each session.

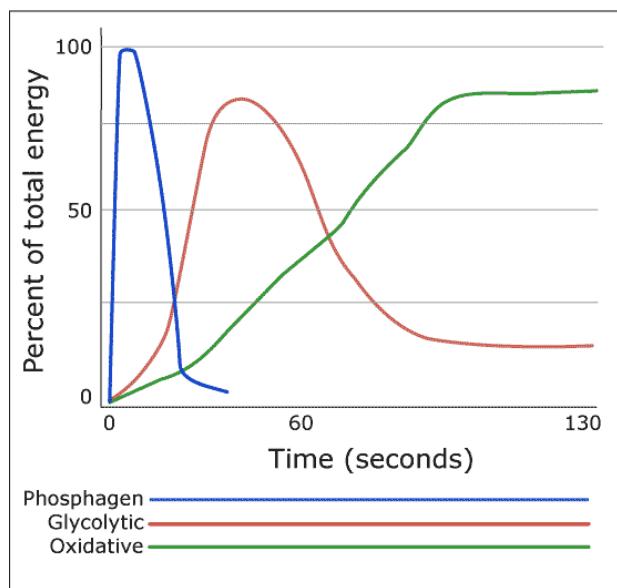
The energy systems

The body needs to convert energy-providing food groups into a chemical compound called adenosine triphosphate (ATP), which fuels muscular contraction. Carbohydrate, fat and protein are the only sources of food energy.

Adenosine triphosphate contains 3 bonds. It can be broken down into adenosine diphosphate, which contains 2. The breaking of one of the bonds releases energy for muscular action.

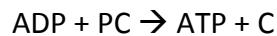


When energy has been stored in the body, there are three different mechanisms we can use to convert it back from its stored state into a useable form of ATP. The intensity and duration of the exercise will determine which system is the dominant energy provider.



ATP – PC (Alactic) System

The ATP-PC system is anaerobic. ADP is added to phosphocreatine. The PC is broken down by the catalyst called creatine kinase which enables the phosphate to recombine with ADP to form ATP and creatine. The energy provided in the form of ATP is used to work at maximal intensity but for a small duration of time, between 8 to 12 seconds. The main reason for fatigue in this system is the loss of Phosphocreatine.



Lactic Acid (anaerobic glycolysis) system

This system is again, anaerobic, exercising without oxygen. Glucose is the predominant source of energy and is broken down by an enzyme called glycolysis which, in this chemical reaction, creates pyruvic acid and 2 ATP's which is used for movement during the exercise. Because of the absence of oxygen, H⁺ ions are produced. These are used to convert the pyruvic acid into lactic acid which causes fatigue and the intensity will have to be lowered. The duration is roughly 2 minutes, depending on the athlete and has an intensity of about 95%. The main reason for fatigue and having to stop for this system is the build-up of lactic acid which stimulates the nerve endings and causes a pain sensation.

Aerobic System

This is the most complicated but efficient system of the three. Glucose is firstly used to create pyruvic acid using glycolysis as an enzyme, causing the two products of H⁺ ions and 2 ATP's. There is then a link reaction of acetyl CO –A which then leads on to the Kreb's cycle. Here, O₂ is given in and the products consist of 2 more ATP's, CO₂ and H₂O. The H⁺ ions formed from the Kreb's cycle and glycolysis are used in the mitochondria where 34 ATP's are given off as well as H₂O. This system is therefore the most efficient as it gives of 38 ATP. However, once the majority of the glucose has been used up, the system resorts to fat as its source of energy and has to continue at a very low intensity of 60% or less. The main reason for fatigue in this energy system is due to the athlete hitting the wall and running out of glucose to carry on.

The energy system most directly linked to my own training programme is the ATP – PC system. This system allows me to work at a maximal intensity but for short periods of time. Therefore, I will be able to work sets of a certain amount of repetitions for roughly 10 seconds each set. It has been said that the recovery time, in order to replenish half of the phosphogen stores is roughly 30 seconds, it takes 1 minute to replenish 75% of the phosphogen stores but it takes roughly 3 minutes to replenish 100% of the phosphogen stores. Therefore, in my development plan, I will aim to leave at least 1 minute between each set in order to give time for the majority of my phosphogen stores to replenish but while continuing to exercise with a high intensity.

1) <http://www.brianmac.co.uk/index.htm>

2) Edexcel A2 PE – Mike Hill

Warming up and cooling down

A warm up is a specific pre-event ritual which causes stress upon the body, causing response that will prepare the athlete for activity (either training or competition).

The aims of a warm up;

1. Prepare the body physically for performance; increasing the seed of contraction and relaxation of warmed muscles, dynamic exercises can reduce muscle stiffness, increasing the blood flow through active tissues as local vascular beds dilate, increasing metabolism and muscle temperatures and allows the heart rate get to a workable rate for beginning exercise.
2. Prepare the body mentally for performance; improving concentration, commitment, confidence and control as well as decision making.
3. Improving performance. Warming up is not intended to cause any major adaptations to the body but rather, by performing certain activities you will be able to perform better and stronger at your optimum level. This is the main reason for warming up as if the warm up does not improve performance there is no real need to undertake the activity.
4. Reduce the risk of injury. It has been suggested that by gradually introducing the body to a changing environment, that it is less likely to experience an injury. However, this topic is still very much in question and there is little credible data to prove or disprove this final objective.

What should be included in my warm up:

- Step 1: Gross motor skills and pulse raiser activity

Here, stress is introduced to the body in a gradual and controlled manner and should be aimed at raising the temperature of the body's core and of specific muscles which will be used in the main part of the training session. This includes exercises like cycling, jogging, rowing and swimming.

- Step 2: Injury prevention

There is a great deal of debate about whether or not stretching both prior to and post exercise is of any good to the performer and whether or not some forms of stretching can increase the risk of injury. There is also a lot of debate as to which types of stretching should take place in the warm up and the cool down.

Although it has always traditionally been thought that stretching in the warm up will help to reduce the risk of injury, there is also evidence that suggests the opposite. For example, Kieran O'Sullivan, an exercise expert at the University of Limerick, Ireland, has studied various types of stretching and their impact on athletes and states that "When you stretch before exercising, your body may think it's at risk of being overstretched. It compensates by contracting and becoming more tense. That means you aren't able to move as fast or as freely, making you more likely to get hurt." He also says that "stretching helps with flexibility, but people should only do it when they aren't about to exercise, like after a workout, or at the end of the day."

Lots of people also believe that stretching to improve joint mobility and muscle elasticity is most effective when the muscle is at its optimum level, for example, after exercising and during the cool down stage, rather than the warm up.

Many believe that dynamic stretching should still be used during warm ups as it consists of active sports related stretching used to improve the elasticity of the muscles that the athlete is about to work.

- Stage 3: Skill practice

This part of the warm up should involve a skill related component where the neuro-muscular muscle mechanisms related to the activity are worked. For example, these could be elements of play used in matchplay for example, catching a high ball in rugby or starts in sprinting.

- Stage 4: Sport specific

This final phase of the warm up includes practising specific skills and exertion similarly to how they will be experienced in a game situation. This stage consists of game situations but at matchplay intensity. For example, the simplest way would be having both attackers and defenders and simply starting with the attackers with the ball, with the aim to score.

The intensity of the warm up should be that which will lead to the required responses (to be mentally and physically prepared for performance, to improve performance and to reduce the chance of injury). The duration of the warm up is obviously until all of the objectives of the warm up have been met and completed so therefore, as long as it takes.

In my development plan:

For tennis training, I will start the warm up with a pulse raising activity such as jogging around the courts for roughly 2 minutes. Although there is plenty of debate about whether

or not stretching should be used prior to training, I believe that there is a reason to stretch in a warm up as long as the heart rate is kept up. Therefore, after the pulse raising activity, I carry out a series of dynamic stretches such as; high knees, heel flicks, skipping, sidesteps and crossovers. I then follow on to the skill practise element of the warm up. Generally I rally with another player from the service line and then the baseline, then one of us volleys at the net, followed by the other player volleying. In each warm up, we set ourselves a target to reach before we move on to the next component of the warm up. For example, our target is normally close to a rally of 50, both at the service line and at the base line. This allows us to concentrate on a set target and improves our motivation so that we can move the warm up on quickly. However, when one of us is volleying, we generally set the target lower down at about a rally of 30 as the exercise is of a much higher intensity than that when we're both ground stroking. Finally, we move on to other exercises which are more like match intensity. We start by serving for roughly 2 or 3 minutes, making sure we serve on both sides of the court, both first and second serve. Then we make the drill into much more of a game like situation for example, by adding a returner into the court but having a restriction on the server by having to only be able to serve second serves, making the drill a lot more difficult.

<http://www.msnbc.msn.com/id/36553174/ns/health-fitness/t/want-better-workout-dont-stretch/#.TsFb-z0g-Ig>

Cooling down:

After exercise it is important to undertake a process, similar to that of what is completed prior to training. The cool down consists of a process of light and continuous exercising which keeps the heart rate elevated.

The main aim of the cool down is to speed up recovery and has been proven to do so dramatically. The main idea is to keep metabolic activity high and capillaries dilated so that oxygen can be flushed through the muscle tissue, removing and oxidising any lactic acid that remains and hence, aid the prevention of muscle cramping, spasms, stiffness and soreness. This can also prevent pooling in the veins, which can be the cause of dizziness if exercise is stopped abruptly.

This process generally takes around 10 to 15 minutes but can take as long as it needs in order to gradually get back to near resting heart rate and in order to decrease the overall metabolism previously elevated during exercise. However, this process can take as long as up to an hour which is not seen as being excessive. The heart rate is a strong indicator of the duration required and therefore, the intensity can be varied as a result.

The final part of the cool down should consist of various stretching exercises of the targeted muscle groups used during the exercises. It's argued that the best time to stretch is during the cool down due to the fact that the muscles are still warm and therefore, there is a lower risk of injury. Stretching is meant to relax muscles, restore them to their resting length and increase flexibility while reducing muscle soreness at the same time.

In my development plan, generally my cool down will consist of a gentle row at a low intensity, allowing me to retain a high heart rate but decrease the stress levels on my targeted muscles, my biceps in particular. The element of continuous exercise, keeping a constant and elevated heart rate will roughly take me 10 minutes and will be followed by a series of static stretching; stretching every muscle used in the main activity, plus extras.

<http://www.fittvo.com/3254/why-cool-down/>

The Impact the Development plan will have on my performance and fitness levels

I believe my development plan will have a number of effects on my fitness levels. To begin with, because of the amount of training I am undertaking and at a high intensity, I should see an increase in my muscular strength and power. This should be able to be seen by a progression in either the amount of repetitions I am able to achieve at the same resistance or, because I am targeting to improve muscular strength and power and therefore am having to work at between roughly 4 and 10 repetitions, I should be able to see an increase in the resistance I exercise, but still achieving the same number of repetitions.

With the development plan, I should also be able to see a very gradual increase in size of muscles in my upper body. Improving on muscular strength should result in gradual muscular hypertrophy on the targeted muscles and hence, eventually leading to an increase in the size of the muscle.

The main aim of the development plan is to increase my strength and power so that I can use this improvement in fitness during matchplay and when performing and therefore, as said in the introduction, I should be able to become stronger when I play in matches; being able to hit the ball harder in groundstrokes and in particular, when serving.

However, there are possible side effects to my development plan. At the end of my DP I will undertake another set of fitness tests, covering all aspects of fitness which will reveal any changes in my physical fitness. I believe that there may be one or two aspects of fitness which have declined within the time I have been working on my DP. For example, there may be a possible decrease in my level of cardio vascular fitness. However, there may be an increase in close related aspects of fitness such as muscular strength which there will probably be an increase in my level of fitness.

BORG Rating

There are a variety of methods for determining exercise intensity levels. Common methods include the 'talk test', the target heart rate range and the Borg Rating of Perceived Exertion (RPE).

The Borg Scale is a simple method of rating perceived exertion (RPE) and can be used by coaches to gauge an athlete's level of intensity in training and competition.

There are a number of RPE scales but the most common are the 15 point scale (6-20), and the 11 point scale (0-10). I will be using the 15 point scale, from 6 to 20, for determining my exercise intensity levels in my development plan. (1)

This is the scale used for the 15 point scale (2)

6 - No exertion at all

7 - Extremely light

8

9 - Very light - (easy walking slowly at a comfortable pace)

10

11 - Light

12

13 - Somewhat hard (It is quite an effort; you feel tired but can continue)

14

15 - Hard (heavy)

16

17 - Hard (very strenuous, and you are very fatigued)

18

19 - Extremely hard (You can not continue for long at this pace)

20 - Maximal exertion

Research has shown that the Borg Scale of Perceived Exertion is a good way to tell how hard you are working, as it correlates with your actual heart rate, lactate levels, % VO₂ Max and breathing rate during physical activity. The relationship between a person's perceived exertion rating times 10 and their actual heart rate during physical activity are such that a person's exertion rating may provide a fairly good estimate of the actual heart rate during activity. For example, if a person's rating of perceived exertion (RPE) is 12, then $12 \times 10 = 120$ and hence, the heart rate should be approximately 120 beats per minute.

How to Use the Scales to Gauge Your Workout (3)

- A good warm up pace is around 10 to 11.
- Practitioners generally agree that perceived exertion ratings between 12 to 14 on the Borg Scale suggests that physical activity is being performed at a moderate level of intensity.

- Workouts done in the 15 to 18 range are your target for fat burning and cardio conditioning. If you cannot maintain this level of workout, consider interval training between moderate and more intense bouts of exercise. More evidence is showing that harder workouts actually contribute more to fat calories being burned than moderate to light exercise. They are finding that there is less of a "fat burning zone," and more of a target effort that should be put forth towards an exercise bout to burn an optimal number of calories.
- Exercising at 19 or 20 on the scale cannot be maintained for very long because this is VO2 max and heart rate max. Even the best athletes can only reach this level in their workout for a limited period. Exercising up to and around this point will help you broaden your scale, and help you increase your VO2 max.

1 - <http://sportsmedicine.about.com/cs/strengthening/a/030904.htm>

2 - <http://tweakfit.com/rate-exertion-burn-fat>

3 - <http://tweakfit.com/rate-exertion-burn-fat>

Psychological aspects

Psychology is definitely a very large aspect of tennis. There is also evidence that states that players are born with great psychological 'toughness' however, there is a lot of debate over whether or not psychological strength can be improved with training and whether or not it is worth undertaking psychological training as much as it's worth undertaking physiological training.

I personally believe that a great example and evidence of how psychology can be improved is with Roger Federer. Federer used to be a very emotional player on court as a junior, much like many youngsters in local competitions, even at county level. However, Federer has now learned to control his emotions. Currently, Federer is known for being one of the most composed, mentally tough players out there.

Many top tennis players talk about the value of mental toughness including Serena Williams. "I was really mentally tough out there. I wouldn't give into anything. The first set, I wanted to come out strong and tough, and I did. It's not that I was actually hitting really hard out there; I was just really mentally focused because I didn't want to go down. I worked hard, too. I wanted to have an opportunity myself," said Serena Williams. (1)

Dr. Alan Goldberg, has taught tennis professionally for 22 years and has worked as a sport psychology consultant for a number of high school and college teams as well as with several players on the pro tour. (2)

"Ask any tennis pro out there how important the mental part of the game is and they'll tell you it's at least 90%! Tennis players who consistently win do so because they are in sports psychology terms, mentally tough. That is, they have the ability to: Effectively handle the pressure of competition; Bounce back from missed shots, double faults and lost tie-breakers; Focus on what's important and block out the opponent's attempts at gamesmanship, the crowd, lousy court conditions and tough weather; Avoid getting psyched out or intimidated; Maintain self-confidence and a positive attitude even when your back's to the wall; Etc."

I feel that one way of improving my 'mental strength' and my coach, Trevor Wright, has always believed the same, is by playing in pressured situations in training that replicate the mood in competition. In matches, there is such a wide variety of ways a player can be in a pressured situation. For example, just by missing a second serve, some players with weak second serves may feel pressured to just get their second serve in play, and there's also the matter of getting the second serve in strong enough to not allow the opposition to have such a great advantage over the point. Therefore, because there are so many ways in which there can be a pressured situation in tennis, it can be easier for coaches to undertake mental strength training and interlink it with physiological training. My coach has always

believed that just playing and participating in as many matches throughout the year as possible, in order to get the crucial 'match play experience' is extremely important.

Buchanan defines motivation as; "Motivation is a decision-making process, through which the individual chooses the desired outcomes and sets in motion the behaviour appropriate to them". (3)

It can also be difficult to motivate yourself enough when undertaking such an extensive exercise program as this development plan. One way on motivating myself enough to train intensely during this programme is by noting down my results every time I exercise. Due to the fact that my predominant method of training is weights training, it is very easy to understand areas of improvement and this has heavily helped me to improve my motivation. One way of noticing an improvement in fitness during weights training is the increase in the amount of repetitions or resistance I am able to lift during a certain exercise. It was the third week of the Development plan that I noticed an increase in the resistance I was able to lift which resulted in a great motivation for me. I felt comfortable with the increase, being able to lift an increase in resistance but a greater quantity of repetitions. From the third week on there has been a constant improvement in different muscles groups as a result of increases in the amount of resistance I am able to lift in different exercises.

- 1) <http://www.sportpsychologytennis.com/?p=2611>
- 2) http://www.competitivedge.com/sports_article_tennis.htm
- 3) http://tutor2u.net/business/people/motivation_theory_introduction.asp

Diet and Hydration

The term diet refers to what you eat and drink and what you consume. All of the foods that we consume can be divided into seven categories, or groups;

	Food Group	Main bodily function	Good source of food group
Energy provider	Carbohydrates	High intensity fuel source Aids utilisation of fats as an energy source	Fruit, pasta, wheat, cereals
Energy provider	Fats	Low intensity energy source	Fish, animal and dairy products
Energy provider	Proteins	Essential for growth and repair of muscle and other body tissues Can act as 'last resort' energy source	Meats, soya, dairy products
Non-energy provider	Vitamins	Water and fat soluble vitamins play important roles in many chemical processes in the body Required to facilitate physiological functions	Fruits, vegetables, grains
Non-energy provider	Minerals	Aid vitamin absorption Essential in many bodily functions	Vegetables, fruits, fish, nuts
Non-energy provider	Fibre	Essential for healthy bowel function and the health of the digestive system	Plant foods, fruit, vegetables, beans and oats
Non-energy provider	Water	Major component of the body Involved in almost every bodily function Primarily seen in its role of	Fruits and water as a drink

		thermoregulation and transport	
--	--	--------------------------------	--

As well as undertaking a strong muscle strengthening workout, mainly for me in terms of weights training, it is also very important for me to eat well, changing my diet with the amount of exercise I undertake in order to allow a sufficient amount of 'fuel' for my body during these periods of exercise.

Carbohydrate intake for muscle building; Carbohydrate is the predominant energy source during a strength training workout. Stored as glycogen in the muscles, it is the fuel used to supply energy for short, intense bursts of power. The harder and longer you work out, the more glycogen your muscles require. Once these stores of glycogen are gone your energy level will drop and you will run out of fuel to power muscle contractions. For this reason, athletes doing strength training exercise in the hopes of building lean muscle need to have an adequate carbohydrates intake.

Although the sufficient amount of carbohydrate I must intake in order to require the needs from my training is very vague and very difficult to work out, there are rough estimates of the amount needed in order to meet the demands for an athlete aiming to improve muscular strength, such as myself.

For those doing moderate workouts of less than an hour, you may only require 2 grams of carbohydrate per pound of body per day. Those doing long and intensive training for two hours or more may require 3-4 grams of carbohydrate per pound of body weight each day.

Sports nutrition experts recommend up to 400-600 (1) grams of carbohydrate per day for the average male performing regular intense exercise and strength training workouts in order to keep the muscle glycogen stores high. Personal carbohydrate requirements vary based upon the intensity and length of workouts as well as your body size.

Protein intake for muscle building; All athletes need protein after vigorous exercise. Protein helps repair and rebuild muscle tissue that is broken down during hard exercise. Because protein is the basic building material for muscle tissue, if you strength train, or want to increase muscle size, you need to consume more protein than sedentary individuals or non-athletes. However, most strength athletes may overestimate their protein needs.

The USDA (United States Department of Agriculture) (2) recommends that the average person requires about 0.4 grams of protein per pound per day. Sports nutritionists recommend that strength athletes consume about 0.6 to 0.8 grams of protein per pound of body weight per day, not to exceed 1 gram per pound per day. Therefore, that's roughly 90 to 115 grams of protein per day for a 140 pound athlete and 128 to 164 grams for those weighing 200 pounds.

Fat: Fat is an essential nutrient, however, you require a small amount of it to remain healthy. Less than 30% of your total daily calories should come from unsaturated fat, such as olive oil, lean meats and fish, nuts, seeds, and avocados.

The Australian guide (3) to healthy eating recommends the following servings per day for boys aged 14 to 18;

- 5–11 servings from the bread, cereals, rice, pasta, noodles group

An example of one serving is 2 slices of bread; 1 medium bread roll; 1 cup of cooked rice, pasta or noodles; or 1 1/3 cup of breakfast cereal flakes.

- 4 servings from the vegetables group

An example of one serving is 75 g or 1/2 cup cooked vegetables; 1/2 cup cooked dried beans, peas, lentils or canned beans; 1 cup salad vegetables; or 1 small potato.

- 3 servings of fruit

An example of one serving is 1 medium apple; 2 small pieces (150 g) of fruit (apricots, kiwi fruit, plums); 1 cup of diced fruit pieces or canned fruit; 1/2 cup of fruit juice; or 1 1/2 tablespoons of sultanas.

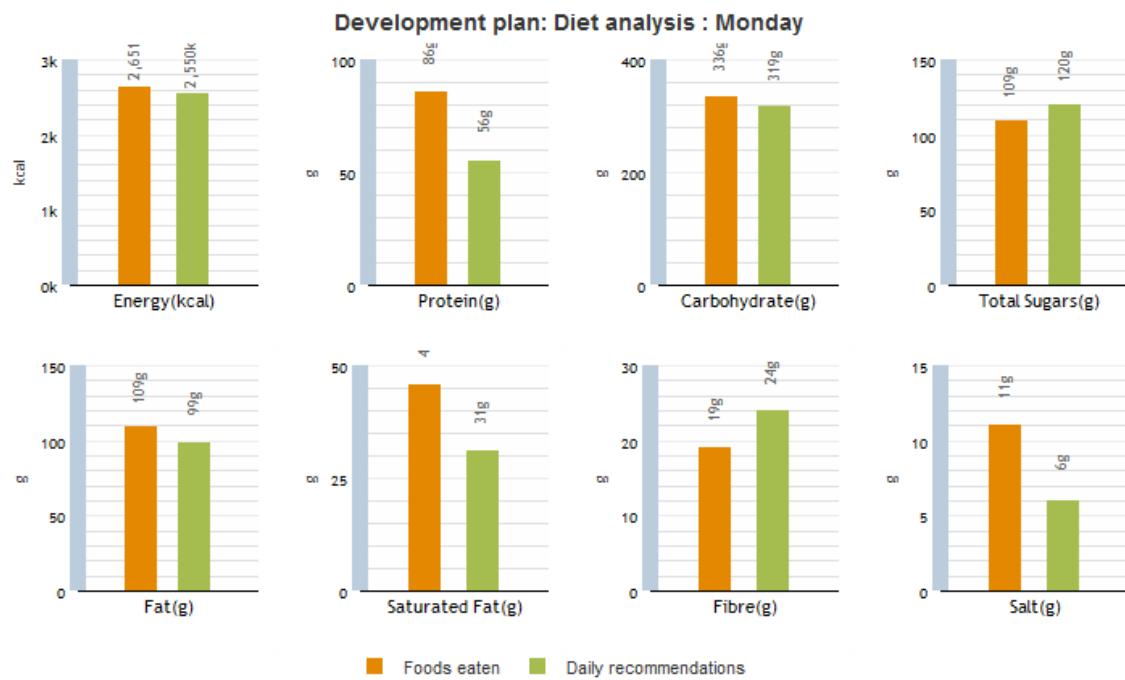
- 3 servings from the milk, yoghurt, cheese group

An example of one serving is 250 ml of milk; 250 ml of calcium fortified soy beverages; 40 g (2 slices) of cheese; or 200 g (1 small carton) of yoghurt.

- 1 serving from the lean meat, fish, poultry, eggs, nuts and legumes group

An example of one serving is 65 – 100 grams cooked meat or chicken; 2 small chops; 2 slices of roast meat; 1/2 cup of cooked (dried beans); 80 – 120 grams of fish fillet; 1/2 cup of peanuts (almonds); or 2 small eggs.

Three day food diary of my diet:

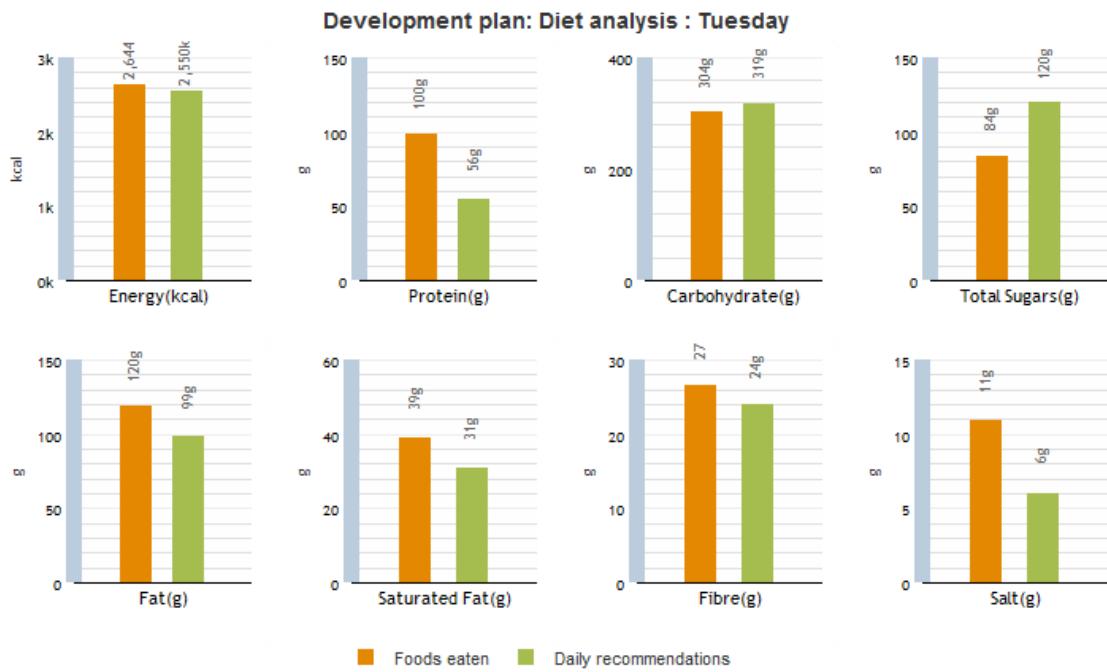


As you can see in this set of results, using the EAR (Estimated Average Requirement), although my calorie intake is almost ideal for the standard 18 year old man, I do participate in a lot of sport and exercise very regularly. As the EAR only gives the average amount of exercise needed for the average 18 year old boy, I believe that I undertake more exercise than the average 18 year old boy. Hence, I think that I should have a greater percentage of calorie intake than the average boy.

With the great amount of weights training I am undertaking presently, it is important to intake a greater amount of protein than the average 18 year old boy in order to repair and rebuild muscle tissue (as said previously). However, there is a limit to how much more protein should be eaten.

As with my calorie intake, although it seems almost perfect in comparison with the RNI (Reference Nutrient Intake), I should be aiming to intake a greater amount of carbohydrate as it is the main 'fuel' for the vast amount of exercise I undertake each day. Therefore, I should be eating more carbohydrates than this in order to have enough energy during exercising.

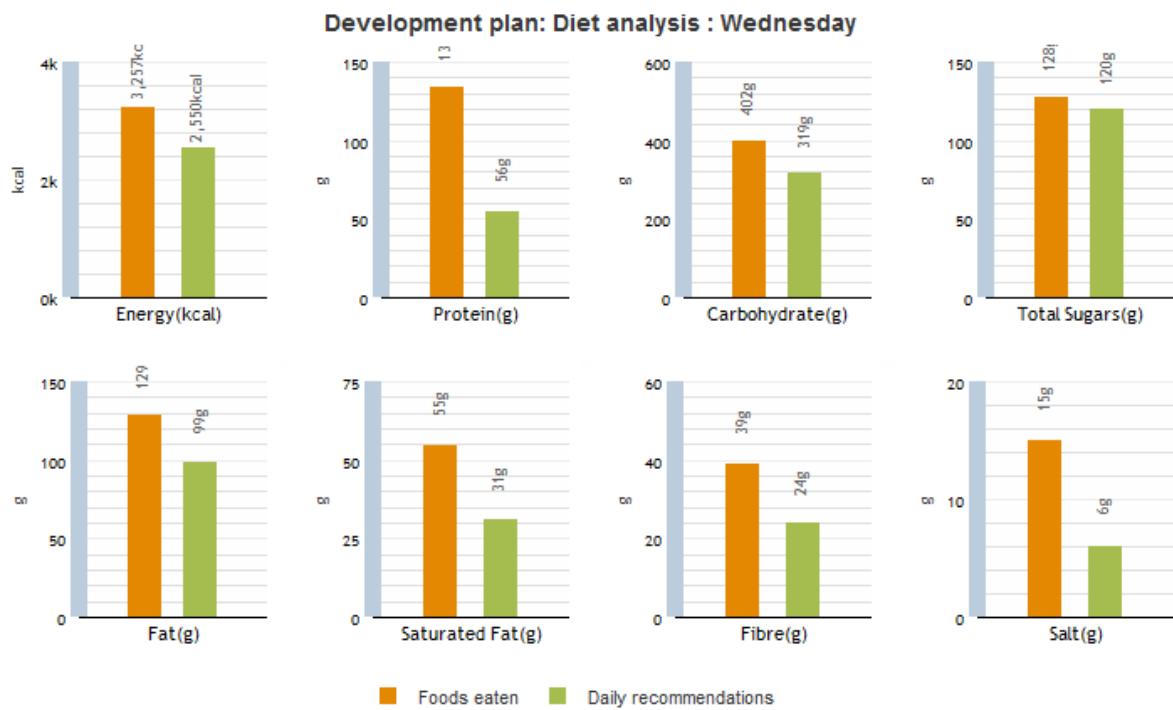
My fat intake for this day was also fine.



Again, on this day, similarly to Monday, my calorie intake is almost exactly what it should be in terms of using the EAR to work out what I should be in taking, but is still low when I compare how much exercise I do to the average 18 year old boy. Therefore, again, I should be having a greater calorie intake than this.

Again, my protein intake is very promising, as it is greater than that of the RNI (Reference Nutrient Intake). However, if I was to be very critical of myself, the intake could be greater than what it should be. It is often a case that athletes wishing to build muscle and exercising in programmes such as this think it's important to intake as much protein as possible, however this is not the case. As with every diet, the athlete must have a balanced diet, not just consisting of proteins. However, I believe in my case this amount of protein is a fair amount and is not harmful at all.

My carbohydrate intake, as stated previously, although perfect in terms of the RNI (Reference Nutrient Intake), it is a little lower than what should be eaten due to the vast amount of exercise I do participate in.



Having a large amount of carbohydrate in the diet is not harmful as long as it is in balance with the amount of exercise you do. The more exercise I do, the greater the amount of calories and carbohydrates I have to consume in order to provide sufficient amounts of energy for the exercises. Therefore, it is clear that I am undertaking more exercise than the regular person, of which these daily recommendations are based upon and so should be exceeding the recommendations.

This is the same with the amount of protein I consume. Such a great amount of protein is not harmful to me as long as this is not a regular occurrence every day, which it is not, and as long as generally I am able to exercise and use the protein to my advantage (muscular growth and repair).

One worry from all of these statistics is the large amount of salt I have been consuming within these last three days. Although there are few short term health issues associated with consuming large amounts of salt such as muscle cramps and dizziness there are far greater long term effects. Some associations with too much salt can be strokes, high blood pressure and cardiovascular disease. Previously I haven't noticed this and it can be easy to ignore until a later date, when I'm older, but if I do carry on with the diet I have, including such a high intake of salt, I must be wary of problems in the future.

When comparing these results to an elite performer:

The harder I work and the more intense my regular exercising becomes, in general, the more calories I have to consume each day. For example, Andy Murray who clearly exercises far more regularly than me, and at a greater intensity, aims to intake 6,000 calories, which is three times the amount of the government's recommend amount.

"Murray has six meals a day, starting off with a protein shake followed by a peanut butter bagel and yogurt.

The rest of his meals are a carefully planned mixture of lean proteins, derived from red meat and fish, and complex carbohydrates from pasta, rice and dark green, leafy vegetables.

Processed food is banned, as is sugar.

He always eats within 30 minutes of completing a match so that his muscles do not start to waste (since he has almost no body fat, if he does not get food quickly, his system will start to burn muscle instead)." (4)

Because I do not exercise 6 hours a day, as Murray does, there is no reason for me to intake anyway near as many calories and my diet should not be too similar to his. However, I should see similarities in the proportions of food groups in my diet.

- 1) http://sportsmedicine.about.com/od/sportsnutrition/a/Food_Strength.htm
- 2) http://fnic.nal.usda.gov/nal_display/index.php?info_center=4&tax_level=1
- 3) http://weighttraining.about.com/od/nutritionforweights/a/muscle_diet_2.htm
- 4) <http://www.uk-muscle.co.uk/general-conversation/65530-andy-murray-training-diet-article.html>

Hydration

The term hydration is used to describe a physiological state of optimum water balance. With water performing so many different roles within the body and accompanied with that fact that the body is constantly losing water through perspiration and urination, many of us live in a state of dehydration.

Dehydration refers to a state where the body does not have optimal water balance and so is not functioning as efficiently as it can.

Water is certainly the most important nutrient to an athlete, which can be represented in this table. (1)

<u>Body weight lost as sweat (%)</u>	<u>Physiological effect</u>	<u>Performance effect</u>
1		Loss of 5%
2	Impaired performance	Loss of 10%
4	Capacity for muscular work declines	Loss of 25%
5	Heat exhaustion	Potential failure to complete
7	Hallucinations	Potentially fatal
10	Circulatory collapse and heat stroke	Potentially fatal

Rehydration:

If no action is taken, the loss of body fluids and electrolytes will lead to dehydration and eventually to other side effects. Once one experiences thirst, it is assumed that they are already experiencing dehydration. If you experience dehydration during an event, you are unable to attain full hydration levels again until you stop exercising due to the rate at which you can absorb fluids being lower than the rate at which you lose them.

Drinking plain water can cause bloating and suppresses thirst, hence, causing further drinking. It also stimulates urine output and is therefore inefficiently retained. Water also contains no carbohydrates and electrolytes and so is not a great way to rehydrate.

“Electrolytes are substances containing free ions. They play a vital role in maintaining homeostasis in the body, helping to regulate and manage the water and fluid levels.” (2)

"Homeostasis is how the body regulates its internal environment to maintain a stable, constant condition." (1)

If you recover using a drink containing electrolytes, especially sodium and potassium, they can reduce urine output, enable the fluid to empty quickly from the stomach, promote the absorption from the intestine and encourage fluid retention. These can be found in supplements drinks such as sports drinks of which there are three types, all of which contain various levels of fluid, electrolytes and carbohydrate.

The electrolyte composition of sweat is variable but consists of the following;

- Sodium
- Potassium
- Calcium
- Magnesium
- Chloride
- Bicarbonate
- Phosphate
- Sulphate

A litre of sweat typically contains 0.02g Calcium, 0.05g Magnesium, 1.15g Sodium, 0.23g Potassium and 1.48g Chloride. (3)

Two main factors affect the speed at which fluid from a drink gets into the body:

- the speed at which it is emptied from the stomach
- the rate at which it is absorbed through the walls of the small intestine

The higher the carbohydrate levels in a drink the slower the rate of stomach emptying. Isotonic drinks with a carbohydrate level of between 6 and 8% are emptied from the stomach at a rate similar to water.

There are isotonic, hypotonic and hypertonic sports drinks, defined by the percentage make-up, or osmolality, of their components. "Osmolality is a measure of the number of particles in a solution. In a drink, the particles in solution comprise carbohydrates, electrolytes, sweeteners and preservatives." (1)

Type	Content
Isotonic	Fluid, electrolytes and 6 – 8% carbohydrate
Hypotonic	Fluid, electrolytes and a low level of carbohydrate
Hypertonic	High level of carbohydrate

- **Isotonic** - quickly replaces fluids lost by sweating and supplies a boost of carbohydrate. This drink is the choice for most athletes - middle and long distance running or team sports. Glucose is the body's preferred source of energy therefore it may be appropriate to consume Isotonic drinks where the carbohydrate source is glucose in a concentration of 6% to 8% - e.g. Lucozade Sport. (3)
- **Hypotonic** - quickly replaces fluids lost by sweating. This is suitable for athletes who need fluid without the boost of carbohydrate e.g. gymnasts. (3)
- **Hypertonic** - used to supplement daily carbohydrate intake normally after exercise to top up muscle glycogen stores. In very long distance events, high levels of energy are required and Hypertonic drinks can be taken during exercise to meet the energy demands. If used during exercise, Hypertonic drinks need to be used in conjunction with Isotonic drinks to replace fluids. (3)

I believe that I should be using isotonic drinks during my tennis training sessions and matches. I sweat a lot, and could easily become dehydrated due to body fluid and electrolytes loss and therefore. I also need to supplement my loss of carbohydrates and therefore, this type of sports drink provides all of the necessities for my sport. Generally I use Lucozade sport for matches but this can be very expensive, especially if I choose to drink them during training session. Therefore I have recently been making my own isotonic sports drinks to use during training sessions. (4)

I have recently been using these drinks which I have found to both, taste good and be a good quality, but also seem to be, according to the ingredients, healthier than lucozade sport drinks as they don't contain the amount of sugar content as the isotonic drinks bought in shops contain. Although it's difficult to see whether or not these drinks are as effective as the isotonic drinks bought in shops, they do seem to be helping in recovery and keeping me hydrated so do seem to be effective for me.

Drink one: Fruit Academy

- 200ml ordinary fruit squash
- 800ml water
- A pinch of salt
- Mix them all together in a jug and cool down in fridge.

Drink two: Thirst Burst

- 500ml unsweetened fruit juice (orange, apple, pineapple)
- 500ml water

- Mix them all together in a jug and cool down in fridge.

Drink Three: Feelin' fruity

- 50-70g sugar
- A litre of warm water
- Pinch of salt
- 200ml of sugar free squash
- Mix, cool and drink

Lucozade believe “Lucozade Sport only includes ingredients if they work, and only in the amounts that are proven to be effective.” (5) However, there are always arguments and disputes over which activities and which demands suit which exact quantities of the mixture of solution. Therefore, many people believe their own sports drink is right for their own specific needs.

- 1) Edexcel A2 PE Textbook – Mike Hill
- 2) Edexcel AS PE textbook – Mike Hill
- 3) Brian mac <http://www.brianmac.co.uk/drinks.htm>
- 4) http://news.bbc.co.uk/sport1/hi/health_and_fitness/4289704.stm
- 5) <http://www.lucozadeshop.com/about.html>

Physical Activity Readiness Questionnaire (PAR-Q)

The physical activity readiness questionnaire (PAR-Q) is a self-screening tool that can be used by anyone who is planning to start an exercise program. It is often used by fitness trainers or coaches to determine the safety or possible risk of exercising for an individual based upon their answers to specific health history questions. (1)

Being physically active is very safe for most people. Some people, however, should check with their doctors before they increase their current level of activity. The PAR-Q has been designed to identify the small number of adults for whom physical activity may be inappropriate or those who should have medical advice concerning the type of activity most suitable for them. (2)

1. Has your doctor ever said that you have a bone or joint problem, such as arthritis, that has been aggravated by exercise or might be made worse with exercise? **Yes/No**
2. Do you have high blood pressure? **Yes/No**
3. Do you have low blood pressure? **Yes/No**
4. Do you have Diabetes Mellitus or any other metabolic disease? **Yes/No**
5. Has your doctor ever said that you have raised cholesterol (serum level above 6.2mmol/L)? **Yes/No**
6. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by your doctor? **Yes/No**
7. Have you ever felt pain in your chest when you do physical exercise? **Yes/No**
8. Is your doctor currently prescribing you drugs or medication? **Yes/No**
9. Have you ever suffered from unusual shortness of breath at rest or with mild exertion? **Yes/No**
10. Is there any history of Coronary Heart Disease in your family? **Yes/No**
11. Do you often feel faint, have spells of severe dizziness or have lost consciousness? **Yes/No**
12. Do you currently drink more than the average amount of alcohol per week (21 units for men and 14 units for women)? **Yes/No**
13. Do you currently smoke? **Yes/No**
14. Do you currently exercise on a regular basis (at least 3 times a week) and work in a job that is physically demanding? **Yes/No**
15. Are you, or is there any possibility that you might be pregnant? **Yes/No**
16. Do you know of any other reason why you should not participate in a programme of physical activity? **Yes/No**

If YES please give details _____

If you answered: **YES to one or more questions:**

If you have not recently done so, consult with your doctor by telephone or in person before increasing your physical activity and/or taking a fitness appraisal. Tell your doctor what

questions you answered ‘yes’ to on PAR-Q or present your PAR-Q copy. After medical evaluation, seek advice from your doctor as to your suitability for:

- 1) Unrestricted physical activity starting off easily and progressing gradually, and
- 2) Restricted or supervised activity to meet your specific needs, at least on an initial basis.

NO to all questions:

If you answered PAR-Q accurately, you have reasonable assurance of your present suitability for:

- 1) A graduated exercise programme
- 2) A fitness appraisal

- 1) <http://sportsmedicine.about.com/od/fitnessevaluandassessment/qt/PAR-Q.htm>
- 2) <http://www.steve-haywood.com/parq-form-physical-activity-readiness-questionnaire/24/>

Literature Review

To stretch or not to stretch? That is the eternal exercise question...

Stretching is one of the most debated subjects in sports science. Whenever you stretch and what type of stretching you do, there will normally be some scientific evidence behind, both to support your technique and to disagree.

The article states that “when the findings of five studies were analysed, there was no significant benefit from stretching on injury risk or muscle soreness, while the evidence on sports performance was inconclusive”. The article also says that the leader of the study, senior lecturer in physiotherapy, at the University of Sydney, Rob Herbert suggested that “stretching is a waste of time”.

However, the article also disagrees with this statement. It states that “fitness experts and personal trainers... recommend regular stretching to everyone from occasional exercisers to full time athletes”. The College’s most recent exercise prescription guideline says that “Properly performed stretching exercises can aid in improving and maintain range of motion in a joint or series of joints.”

There is a great deal of scientific research in this issue and I believe that the majority of scientists believe that there is still a need to stretch prior and after exercising. Although this article believes that there is no benefit such as; preventing injury or muscle soreness but there may still be a benefit of improving performance from stretching.

Although the topic is very controversial, most athletes believe that once muscle temperature has been raised by a gross motor activity that dynamic stretches are more appropriate to as they help reduce muscle stiffness. Whereas; static stretches are more appropriate to the cool down as they help muscles to relax, realign muscle fibres and re-establish their normal range of movement. Therefore, I have chosen to warm up using dynamic stretching techniques and cool down using static stretching during my development plan.

From Junk food to Jamaica – The dietary needs of an elite netballer

This article talks of an England Under-21 netballer, Natalie Haythornthwaite who explains the importance of diet and nutrition in her performance. In the past, she has said that she has enjoyed eating foods with a high glycaemic index, such as chocolate and said “these simple carbohydrates only allowed me to perform to the best of my ability for a short period of time due to the rapid release of glucose to her blood.” She said that “I became fatigued

and drained from the demands the game had placed on me... This had knock-on effects on my decision making, speed, release of pass and other aspects of my game." She also said that "I began to make more unforced errors and my confidence was negatively affected."

Natalie believes that she should have eaten foods such as pasta that supply a slow release of glucose, so she could perform for long periods of time at higher intensity levels.

In order to improve her diet and help sustain the energy levels needed Natalie began using an endurance athlete's diet, consisting of;

- Carbohydrates 60-70%
- Fats 20-25%
- Protein 10-15%

She also now consumes minerals that are promoted in an athlete's diet, such as iron to form the oxygen-transporting compound, haemoglobin, calcium to strengthen teeth and bones and to help with the transmission of nerve impulses, and fibre to slow down the time it takes for energy to be released.

Natalie now eats 3-4 hours prior to a match and tends to be "a large bowl of pasta with chicken and vegetables, which contains a high amount of carbohydrates so the energy is absorbed and used efficiently."

During matches, I often find that towards the end of the match, I suddenly become very tired and fatigued and feel that I have suddenly lost a great deal of energy. Therefore, from this literature review, I will focus far more on my diet both during training and particularly prior to matchplay in order to allow that I have a sufficient supply of energy to last the entire match, no matter how many sets it lasts. I will focus on a large meal of mainly carbohydrates 3 to 4 hours prior to a match, like Natalie, and must also remember to have a good supply of carbohydrates beside me, court-side during matches.

Stretching has no effect on tennis serve performance.

This review shows that stretching prior to exercise has been shown to decrease high-force muscular performance, but there is little information on whether stretching has an effect on speed and accuracy movements.

"Serving percentage and radar measurements of ball speed were studied to examine the acute effect of stretching on tennis serve performance. Eighty-three tennis players from beginning level to advanced volunteered to serve following traditional (T) warm-up and traditional plus stretching (S) conditions. Service speeds and service percentage of each

condition were measured. Dependent t-tests showed nonsignificant effects of stretching on service speed ($p = 0.06$) or accuracy ($p = 0.35$), and this lack of an effect was similar for all skill levels, age, and gender. The large sample and good statistical power in this study indicated that these observations are not likely type II errors. There was no short-term effect of stretching in the warm-up on the tennis serve performance of adult players, so adding stretching to the traditional 5-minute warm-up in tennis does not affect serve performance." (1)

Although this review states that stretching has no effect on the tennis serve, I will continue to stretch during my warm up as there is no evidence which suggests that stretching can be dangerous or necessarily bad for the player. Again, there is a great deal of controversies in the topic but personally, I still feel that there is more evidence for warming up traditionally with the use of stretches than there is without. I also feel there are slight long term benefits from stretching during warm ups such as a general increase in flexibility. With greater flexibility, it means that in the long term I would be slightly less vulnerable to getting injuries.

- 1) <http://www.ncbi.nlm.nih.gov/pubmed/15320640>

Planning programme compared to that of an elite performer's

Within recent years, Andy Murray has worked particularly hard on improving his muscular strength, particularly in the upper body, like myself.

This is a typical training session for Andy Murray;

"Murray's workouts fall into distinct categories: in tournament and out of tournament. They are equally tough.

In the winter, when he is out of tournament, he checks into a gruelling tropical climate body boot camp for a month where he will exercise in hot temperatures for six hours a day.

On a typical boot camp day he will start with one hour of aerobic sprint training on an athletic track where he runs 400-metre laps at intervals of five minutes, aiming to get faster with each lap. He will also jump hurdles sideways, to improve balance.

This will be followed by a one-hour upper body weight training session in the gym where, among other drills, he ties a rope around his stomach and pulls 40lb weights using just his abdominal muscles.

A 90-minute Bikram yoga session comes next, where he stretches and performs dynamic yoga movement in a room heated to 40c, during which he will burn 1,600 calories and lose four litres of sweat.

His workout will be rounded off with a two-hour tennis practice session with his coach.

In tennis season, his gym sessions are reduced to an hour a day but he still hits the practice court for two hours before a match." (1)

As his career has developed, Murray says he has learned that, whatever your discipline, much of what you do in competitive sport is actually built on long hours in the gym. "Earlier in my career I used to spend a lot of time practising my tennis on court," he says. "Now I've learned that it's better to do just a couple of hours on court and two gym sessions a day. That's what's made me fitter and stronger." (2)

This is an idea of a type of training session at the gym with Andy Murray. In preparation for Wimbledon in 2010, Green, one of Murray's fitness coaches said "Do 6 sets of 5 reps of each of the following exercises. After the lift (A exercise), go straight into the plyometric move (B exercise) for power without bulk." (3)

The exercises consisted of;

- Exercise A1: A back squat – Stand under a squat rack, with a loaded barbell on your shoulders. Take the full weight of the bar. Keep your chest out, back straight and

bend at the knees and hips until your quads are parallel with the floor. Then drive back up.

- Exercise B1: 1 Metre box jump – Stand in front of a box 1 metre high. Bend at the knees and drive explosively, jumping and landing on the box with your feet flat. Step down and repeat.
- Exercise A2: Walking Lunge – Grab a heavy dumbbell in each hand. Walk across the room, taking as large strides as possible, bending so that your front knee is parallel with the floor at every step.
- Exercise B2: Cycle Split Jump – Get into a split-squat position, with your back knee almost touching the floor. Now jump in the air, switching leg position before you land.
- Exercise A3: Weighted pull up – Wearing a weight belt (Murray loads his with 20kg), grab a pull-up bar with an overhand grip. Pull with both hands until your chin is level with the bar, then lower, to challenge your lats and biceps.
- Exercise B3: 5kg medicine ball throw-down – Stand with feet wider than shoulder-width apart. Grab a medicine ball in both hands. Raise it above your head then explosively throw it down to the floor. Avoid your toes.
- Exercise A4: Weighted dip – Wearing the same weight belt you wore for the pull up, grab two dip bars. Push down with your hands, until your arms are straight, then lower to the start position.
- Exercise B4: 5kg medicine ball chest-pass – Grab a medicine ball and stand a couple of metres from a partner. Pass it like a basketball to your partner, making sure you work as quickly and explosively as possible.
- Exercise A5: Lateral side lunge – Lunge out to the left until the thigh of your left leg is parallel to the floor. Push off with your left leg in a controlled manner to return to the start. Repeat on your right leg.
- Exercise B5: Max distance lateral hop – Balance on one leg. Bend at the knee, and explosively jump sideways, bending your knee again as you land to absorb the impact. Do three sets on each leg.
- Exercise A6: Cable woodchop – Hold a cable handle with both hands. Pull the cable from above your right shoulder, across the front of your body, then return to the start. Alternate sides with each set.

- Exercise B6: 5kg medicine ball throw – Grab a medicine ball in one hand, with a partner standing on the opposite side. Using your core rotation for explosive power, throw the ball as hard as you can to your partner. Change sides every 5 reps.
- Triple extension power – To finish your session, do 5 sets of 5 reps of an Olympic lifting movement. Green recommends the power clean. Bend your knees and hips and grab a loaded barbell. Drive your heels into the floor and straighten at the waist, so you pull the barbell up in front of you. Now drop under the barbell and ‘catch’ it at the top of your chest. Drive up, straightening your legs to finish.

“This builds triple extension power,” says Green. So you’ll be able to transfer power from your feet to your hips more efficiently. “It also helps with power on the serve and with first-step acceleration,” he says.

Murray obviously focusses on a far broader fitness program, training every aspect of his fitness. He obviously sees the relevance of improving his upper body muscular strength, like most elite tennis players have done in recent years, as he spends a great deal of time in the gym and we have seen great improvements in his power and strength on court. If I were to carry out my development plan, I would have to widen and broaden the training I did on different aspects of fitness. Although seeing an increase in upper body strength is of great relevance to me and my tennis, eventually, in the long run, I would see great improvements in my upper body strength but other aspects of my fitness would deteriorate. Therefore, my training will need to be spread out through the aspects of fitness.

<http://www.uk-muscle.co.uk/general-conversation/65530-andy-murray-training-diet-article.html>

- 2) <http://www.menshealth.co.uk/living/men/mh-interview-andy-murray>
- 3) <http://www.menshealth.co.uk/building-muscle/get-big/andy-murrays-strength-session>

Use of technology

Protein shakes

Protein shakes have become far more increasingly popular within recent years for all types of athletes at every level of sport. This is a very controversial topic as there are lots of different brands and types of protein shakes. Many people do not know exactly how much to take, when to take them and how much exercise is needed in order to satisfy the intake.

Performers often supplement their diets with a powdered form of protein. The powder is mixed with water, milk or juice. Protein powder is generally consumed immediately before and after exercising, or in place of a meal. While some types of protein are to be taken directly before and after a workout (whey protein), while others are to be taken before going to bed (casein protein). The theory behind this supplementation is that performers, because of the higher intensity and greater amount of training, require higher than average quantities of protein to support maximal muscle growth.

Protein is composed of building blocks called amino acids which perform a variety of functions in the body such as; build and maintain healthy muscles when combined with diet and exercise. Protein also:

- Supports red blood cell production
- Supports the immune system
- Maintains your hair, fingernails, and skin healthy

Proteins are also used to manufacture hormones, enzymes, cellular messengers, nucleic acids, and immune-system components. Without adequate protein, our bodies can't put together the structures that make up every cell, tissue, and organ and nor can it generate the biochemical substances needed for muscle contraction, growth, and healing. Without an adequate amount of protein our muscles wouldn't heal up as quickly and could therefore lead to overtraining your muscle which could lead to injury.

There are also many types of protein powders;

- "Whey Protein makes up 20% of total milk protein. Whey is acknowledged for its superior amino acid profile, high cysteine content, fast digestion, and mixture of peptides. Since it is very quickly digested the best time to consume it is before your workout, during your workout or immediately after your workout. These would be considered the phase-in the day where you need energy the most and when your body is in anabolic state."
- "Casein Protein makes up 80% of total milk protein. Casein is acknowledged for its superior amino acid profile, slow digestion and mixture of peptides. Since casein is

slowly digested into your bloodstream, it should not be used during or after workouts – a fat absorbing protein is needed at these times. Instead, use casein protein for all other times outside the pre and post workout window.”

- “Soy protein is the most controversial of all protein types. While the soy groupies have gone to great lengths to label soy as a super food with magical effects, there is also a good amount of research that suggests soy protein may be contraindicated in many situations.”
- “Protein Blends are generally a combination of several types of protein blends such as whey protein concentrate, whey protein isolate, egg protein, casein protein, and soy protein. You will receive the full spectrum of proteins and you will receive varying rates of absorption from the different types of protein. Using a blend will create an anabolic environment from the whey and an anti-catabolic environment from the casein - use this kind at any time of the day but not before a workout or after a workout.” (1)

How much protein should be taken in?

The minimum amount of protein that you should take in for building muscle is 1 gram of protein per pound of body weight (for instance, if you weigh 200 pounds than the minimum amount of protein you should take in is 200 grams of protein for muscle growth). Any additional protein that exceeds the daily minimum for muscle gain just helps to speed up the healing process. (2)

There has been lots of debate over a maximum amount of protein you should take in, but some believe it is not possible for somebody to take in too much protein as not only do muscles require the ingredient to repair and grow but also three-quarters of the solids in the body are comprised of proteins. However, if you take in huge amounts of protein it is a good idea to supplement your diet with calcium and magnesium since excessive amounts of protein has been proven to deplete the amount of calcium and magnesium in the body.

Generally, I do not take protein shakes and have not and will not take them during my development plan. Although there are obvious benefits to be made from taking the protein, I believe that I do not train enough every week in order to make the shakes completely worth it. They cost a great deal of money in order to keep using them properly every day and instead, I believe that a better way of increasing the amount of protein you consume is to change your diet and so I have decided to focus far more on my daily meals than taking protein shakes.

In the appendix, I have copied an article the quantity and when to consume protein shakes when referring to what aspect of fitness you wish to improve on. (3)

1. <http://www.bodybuilding.com/fun/vinced7.htm>
2. <http://www.bodybuilding.com/fun/proteinshakebenefits.htm>
3. http://www.menshealth.co.uk/food-nutrition/muscle-foods/five-targeted-protein-shakes?click=main_sr

Compression clothing

Compression clothing has become increasingly more popular within the last few years. Manufacturers such as Skins, Nike Pro and Canterbury Armourfit all claim that the gains from wearing the compression clothing consist of; injury prevention, performance enhancement and speeding up of recovery.

The garments have been based around knowledge from medical therapy of which have been used in the treatment of poor venous blood flow. Manufacturers of these garments have reported that the compression garments improve recovery, increase power and enhance athletic performance in a variety of sports. Studies have shown that wearing the clothing speeded up recovery as it helped to increase blood flow to the areas covered and also had a positive impact on venous return.

The key is that the compression effect creates a constant pressure on the working muscles, which in turn has a stimulatory effect on blood flow. The increased blood flow helps feed the muscle oxygen and energy, and also speeds up the removal of waste products, which has a positive impact on recovery. Further evidence suggests that compression clothing also reduces muscle vibration, which can reduce the possibility of delayed-onset muscle soreness. (2)

“Recent research with athletes has shown that compression garments may provide ergogenic benefits for athletes during exercise by enhancing lactate removal, reducing muscle oscillation and positively influencing psychological factors. The early research on compression garments demonstrated a reduction in blood lactate concentration during maximal exercise on a bicycle ergometer (Berry and McMurray 1987) . Later investigations have shown improved repeated jump power (Kraemer, Bush et al. 1996; Kraemer, Newton et al. 1997; Kraemer, Bush et al. 1998) and increased vertical jump height (Doan, Kwon et al. 2003) . The suggested reasons for the improved jumping ability with compression garments include an improved warm-up via increased skin temperature, reduced muscle oscillation upon ground contact and increased torque generated about the hip joint (Doan, Kwon et al. 2003). Combined, these results show that compression garments may provide both a performance enhancement and an injury reduction role during exercises provoking high blood lactate concentrations or explosive-based movements.” (1)

“Although some studies have shown compression garments to provide ergogenic benefits for athletes during recovery, others have been unable to support these findings. For

example, Berry et al. (1990) examined the effects of elastic compressive tights on eight healthy males following high-intensity exercise (110 per cent VO_{2max}) for up to three minutes on a treadmill. Results from this study showed that there were no significant differences in energy expenditure, heart rate and blood lactate concentration between athletes wearing elastic tights and a control group at rest and at five, 15 and 30 minutes post-exercise. However, since it has been shown that compression garments require a minimum pressure of 18 mm Hg at the ankle and 8 mm Hg at the mid thigh to mimic the hemodynamic effect of exercise and to increase venous return (Lawrence and Kakkar 1980), it is possible that the pressure of the elastic tights used in this study may not have been sufficient."

"Although there has been limited investigations linking the influence of compression garments on athletic performance, it appears the use of compression garments may have a positive effect on athletes during exercise and during recovery periods following exercise. As no studies have reported negative effects on exercise performance or perceptions of pain, the use of compression garments may provide a useful training tool for athletes across a wide variety of sports."

The suggested benefits of compression clothing based on current research findings:

- enhancing blood circulation to peripheral limbs
- reducing blood lactate concentration during maximal exercise bouts
- enhancing warm-up via increases in skin temperature
- increasing vertical jump height
- improving repetitive jump power
- reducing muscle oscillation upon ground contact
- increasing torque generated about joints, improving performance and reducing the risk of injury, for example, assisting the eccentric action of the hamstring at the end of the swing phase in running
- enhancing recovery following strenuous exercise by aiding in the removal of blood lactate and improving subsequent exercise performance
- reducing the effects of delayed onset muscle soreness in the days following strenuous exercise
- increasing feelings of positive leg sensations both during and following strenuous exercise.

To conclude, I believe that the compression clothing may contribute to some ergogenic benefits for the athletes. Some studies have also reported that compression clothing can improve muscular power, strength and enhance recovery. However, caution should also be taken in order to make sure enough pressure is applied on the body parts in order to provide enough pressure to promote venous return. The compression clothing itself has no risk to decrease performance level and may well also act, psychologically to increase performance if the performers believe the clothing is helping.

- 1) http://www.ausport.gov.au/sportscoachmag/sports_sciences/compression_garments_do_they_influence_athletic_performance_and_recovery
- 2) A2 PE Textbook – Mike Hill

The E-Flex forearm bar



The E-Flex forearm bar increases strengthening of the lower arms including the forearms, wrist flexors, grip flexors and all the tendons and ligaments.

“The E-Flex Forearm Bar is a free-weight forearm / wrist strength isolation bar that targets the specific needs of the tennis player. The E –Flex forearm Bar will build and strengthen the forearms which will provide more power, it will strengthen the wrist flexors for improved racquet control. It is also designed with an extensor muscle specific exercise that will build and strengthen the extensor muscles that are responsible for elbow and wrist rotation which will also provide for better racquet control and can also prevent or stop tennis elbow from recurring.” (1)

- The extensor wrist curl – Targets the muscles that are responsible for elbow and wrist rotation
- The reverse wrist curl – Targets the forearms and grip flexors
- Wrist curl – Targets the wrist flexors forearms and grip flexors

For my development plan, using the E-Flex forearm bar should allow me to see increases in strength in some important muscles for tennis. Although it is very important to be strong in all areas of the body, it has been said that a lot of the power and spin when hitting the ball in tennis comes from the wrist and forearm, especially when hitting groundstrokes. It is also crucial that I have a strong wrist when serving, as a lot of the spin comes from mainly the wrist whereas a lot of the other power comes from the rest of the upper body. Therefore, I believe this is a good use of technology and will try and use this equipment at the gym, during training.

- 1) <http://www.tennisstrengthtraining.com/>

Ball machine

Ball machines have been very useful to performers over many years. They allow players to train when there are no coaches or trainers to play with them, and they allow the sessions to be of a very high intensity, and as high as they may expect from competition standards. Players can set the machines in order to practise weaker shots that need practising and are able to change the speed, spins and serving intervals. There is also often a chance to use a random variable feature, allowing for a more match-like training session. In some cases, the heights of the ball machines can be changed in order to allow for a true estimation of how a served may be played by a particular opponent.

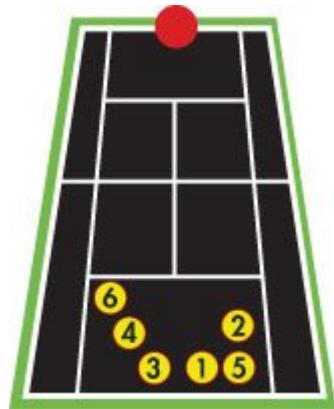
The Lobster Phenom 2: is an example of one of the leading tennis ball machines in the market, costing roughly £3400.

One particularly impressive use of technology from this particular model is the ability to use pre-programmed court drills that simulate the most popular styles of tennis played today.

For example;

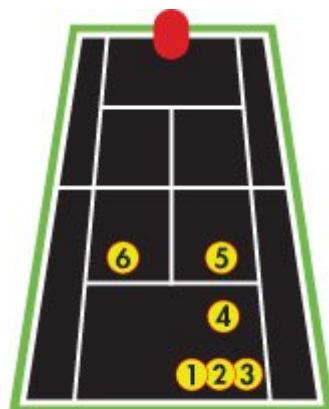
The power baseliner drill: The Power Baseline is a player who is explosive in their shot selection, playing with pace and aggression and minimal spin. This player exhibits an attacking style, known as "first strike" tennis.

"A six ball drill that utilises full back court with little spin and more ball speed." (1)



In addition, the Phenom 2 is loaded with three additional drills replicating game-like rallies such as the approach drill.

The Approach drill throws balls with various spins and arcs aimed for the player to approach into the court after playing an aggressive ball. This drill will promote correct approach and net position, along with the proper covering of the line.



“A six ball drill emphasising the approach from behind the baseline into the front court with balance and speed.” (1)

Generally, I don't use the ball machine when training as my coach has always fed the ball in. However, if training by myself, I have occasionally used the machine. I find it can be very helpful when wanting to improve on a very specific shot. For example, if I set the ball machine to feed in mid court balls onto my backhand side in order for me to work on my attacking backhand down the line, as long as I feel this is an area that needs improving on. There are also, obviously, financial barriers which restrict me from having a model as expensive and high quality as this and am unable to use the ball machine we have at the club with specific drills as the Lobster phenom 2 can perform.

- 1) <http://www.tennisballmachines.co.uk/lobster/lobsterphenom2ballmachine.html>

Fitness testing results half way through and final fitness testing results

Midpoint testing

Testing my 1RM (1 repetition max) – Fixed weights (machines)

Exercise	Primary Muscle(s) tested	Result	95% of 1RM	90% of 1RM	85% of 1RM
Pec Fly	Pectorals	126kg	120kg	113kg	107kg
Leg press	Quadriceps, hamstrings	70kg	67kg	63kg	59kg
Lat Pull	Latissimus Dorsi	79kg	75kg	71kg	67kg
Seated Row	Latissimus Dorsi, Biceps, Triceps	86kg	82kg	77kg	73kg
Chest Press	Pectorals	73kg	69kg	66kg	62kg
Leg Extension	Quadriceps	96kg	91kg	86kg	82kg

Testing 1RM – Free weights

Exercise	Primary Muscle(s) tested	Result	95% of 1RM	90% of 1RM	85% of 1RM
Bicep Curl	Biceps	22kg	21kg	20kg	19kg
Triceps extension	Triceps	32kg	30kg	29kg	27kg
Dumbbell bench press	Pectorals	30kg	29kg	27kg	26kg

End of Development plan testing

Type of testing	Aspect of fitness tested	Description of testing used	Results
Illinois Agility Run	Agility	The athlete runs around cones on a marked-out course of 10m x 5m. The athlete begins in a prone position behind the base line. When they start, the time is recorded. The course should be covered as quickly as possible and in order to get the most accurate result, should be taken three times, getting the average. (3)	14.95 seconds
Standing Broad Jump	Power	This involves jumping as far as possible from a two-footed starting position. The distance is measured with a metre ruler and is measured from the starting line to the back of the foot. (3)	2.17 metres
Standing Sergeant jump (Vertical Jump)	Power	The athlete stands sideways against a wall. Their maximal vertical reach is measured before performing a stationary two-footed jump, reaching as far as possible. Their maximum reach height is subtracted from their maximum jump height, giving a value indicating their leg power. (3)	58 cm
Press-ups in 60 seconds	Isotonic muscular endurance	Simply how many press-ups the performer can undertake within one minute. (3)	42
Wall sit	Isometric muscular endurance	The athlete squats against a wall, ensuring the knees form a 90 degree angle, the feet are flat against the floor and the back and head are straight against the wall. The athlete times how long they can remain in this position, continuing to keep in this form mentioned and recording the time. (3)	1 minute 23 seconds
Sit and Reach	Flexibility	This test provides a good indication of the flexibility of the hamstring muscles and the lower back. The athlete sits down on the floor with their legs out straight and feet against a box. Without bending the	9 cm

		knees, bending forwards with arms outstretched, the athlete reaches as far as possible, measuring how far passed the toes is reached, using a metre ruler. (3)	
Shoulder Raise	Flexibility	Here a performer lies flat with a straight back and your face facing the floor. The athlete holds a metre ruler horizontally and lifts the ruler vertically as high as possible above your shoulders. Using another metre ruler, someone else measures how high off the ground you lift the ruler. (3)	28 cm
Standing Stork	Static balance	Stand on both feet with hands in front of the chest. One leg is raised and held on the inside of the opposite leg's knee. With the leg holding you up, the foot is raised so that the heel is raised above the ground, making balancing far more difficult. Take the time between when the heel is lifted off the ground and when the heel touches the ground. (1)	22 seconds
30 Metre Sprint	Speed	A 30 metre flat area is marked out with enough room for the athlete to accelerate up to full speed before reaching the start line. The time to travel the 30 metres is the speed travelled. (3)	4.55 seconds
Cooper's 12 minute Run	Cardiovascular fitness	An endurance test used to predict VO ₂ max. An athlete runs around a 400 metre track for 12 minutes at a constant pace throughout. A prediction of the VO ₂ max is calculated using this formula; $0.0225 \times \text{metres covered} - 11.3$ (3)	2700 metres
1 repetition max (1RM)	Maximal strength	The athlete performs one repetition with the greatest possible resistance. By definition, this will be the greatest resistance that they can perform in one complete repetition without struggling or losing form. (1)	(shown below for a range of exercises)
Seated Medicine Ball Throw	Power	This test measures upper body (arm) strength and explosive power. By keeping the back in contact with the wall the strength of the arms only are tested. (1)	

Fitness test	Prior to development plan	Post development plan
Illinois agility run	14.86 seconds	14.95 seconds
Standing broad jump	2.08 metres	2.17 metres
Standing sergeant jump	52 cm	58 cm
Press ups in 60 seconds	28	42
Wall sit	1 minute 36	1 minute 23
Sit and reach	12 cm	9 cm
Shoulder raise	31 cm	28 cm
Standing stork	18 seconds	22 seconds
30 metre sprint	4.62 seconds	4.55 seconds
Cooper's 12 minute run	2800 metres	2700 metres

Testing my 1RM (1 repetition max) – Fixed weights (machines)

Exercise	Primary Muscle(s) tested	Result	95% of 1RM	90% of 1RM	85% of 1RM
Pec Fly	Pectorals	132kg	125kg	119kg	112kg
Leg press	Quadriceps, hamstrings	70kg	67kg	63kg	60kg
Lat Pull	Latissimus Dorsi	83kg	79kg	75kg	71kg
Seated Row	Latissimus Dorsi, Biceps, Triceps	89kg	85kg	80kg	76kg
Chest Press	Pectorals	78kg	74kg	70kg	66kg
Leg Extension	Quadriceps	94kg	93kg	88kg	83kg

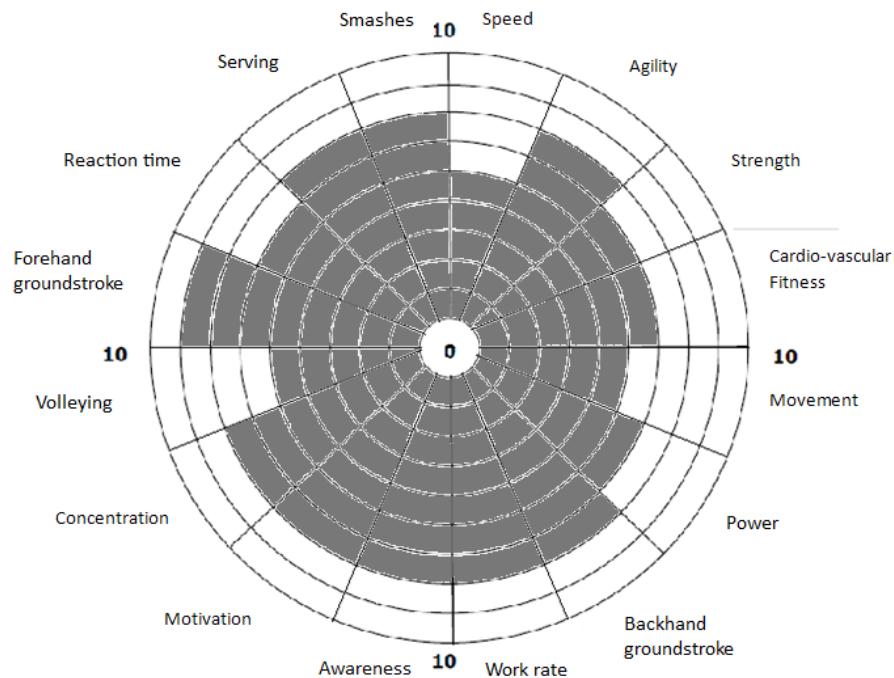
Testing 1RM – Free weights

Exercise	Primary Muscle(s) tested	Result	95% of 1RM	90% of 1RM	85% of 1RM
Bicep Curl	Biceps	26kg	25kg	23kg	22kg
Triceps	Triceps	36kg	34kg	32kg	31kg

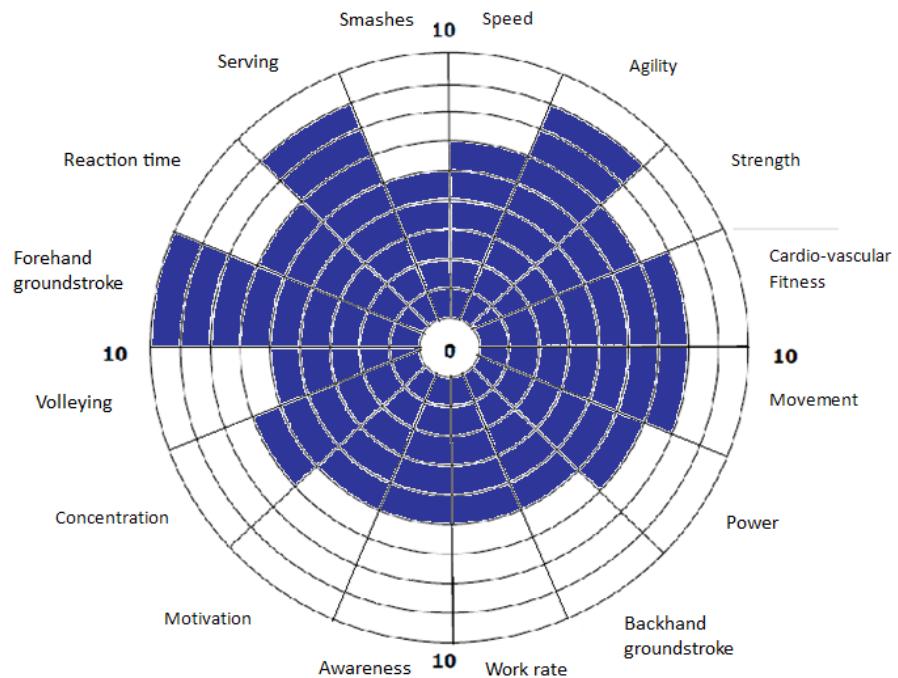
extension					
Dumbbell bench press	Pectorals	32kg	30kg	29kg	27kg

End of development plan fitness profile – wagon wheel

My self-evaluation



My coach's evaluation



Evaluation

Strengths and weaknesses of the development plan

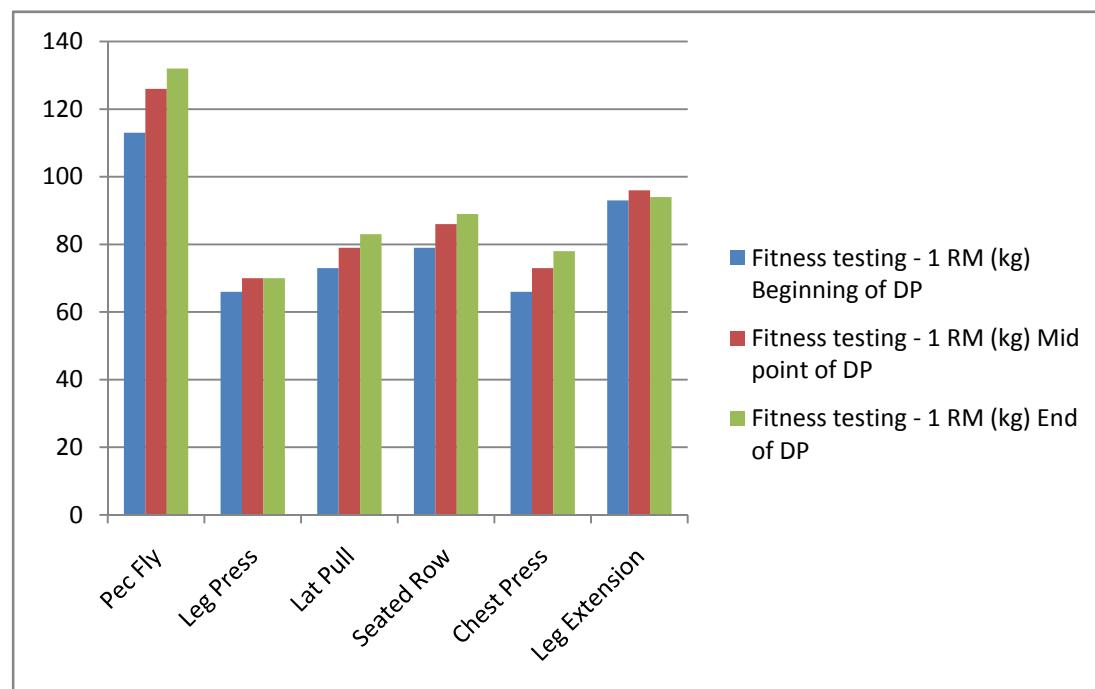
This was a very successful development plan overall. The main objective, to improve my muscular strength in the upper body was achieved. The development plan was enjoyable and I was able to meet the majority of the principles of training. There weren't signs of tedium as I didn't get bored of any particular training methods or exercises. Due to using weight's training, there is a great variety of exercises which can be used to keep the training enjoyable and although for the majority of the time I was using similar exercises to previous training sessions in order to be able to acknowledge improvements in strength, I was able to enjoy the session enough and keep motivated throughout. Another reason for why I was able to remain motivated was due to the fact that with weights training, I feel there is always an aspect of competition each time the same exercise is undertaken. It is easy to identify improvements in strength due to increases in repetitions and resistance in certain exercises and I believe a great deal of motivation came from the increases in resistance in exercises.

A weakness of my development plan is the fact that I saw a few decreases in other aspects of my fitness when comparing the fitness testing of prior to my development plan and the final results.

Fitness test	Prior to development plan	Post development plan
Illinois agility run	14.86 seconds	14.95 seconds
Standing broad jump	2.08 metres	2.17 metres
Standing sergeant jump	52 cm	58 cm
Press ups in 60 seconds	28	42
Wall sit	1 minute 36	1 minute 23
Sit and reach	12 cm	9 cm
Shoulder raise	31 cm	28 cm
Standing stork	18 seconds	22 seconds
30 metre sprint	4.62 seconds	4.55 seconds
Cooper's 12 minute run	2800 metres	2700 metres

These results show decreases in certain fitness test results. It appears my flexibility has decreased as the sit and reach and shoulder raise shows decreases in my results. There is also a decrease in the distance covered in the 12 minute run, showing a possible decrease in my cardio vascular fitness. Therefore, despite the obvious increases in upper body strength, there may have been decreases in other aspects of my fitness. This may have been due to spending more time on strength training, however, these results are not completely reliable and would possibly be varied if I were to undertake the tests at another time so there is no certainty that my fitness has decreased in some aspects of fitness because of the development plan.

Strength test results

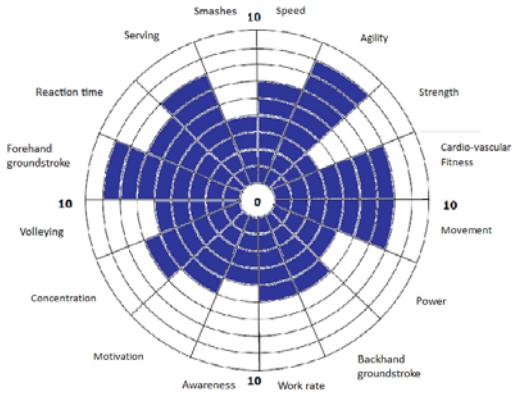
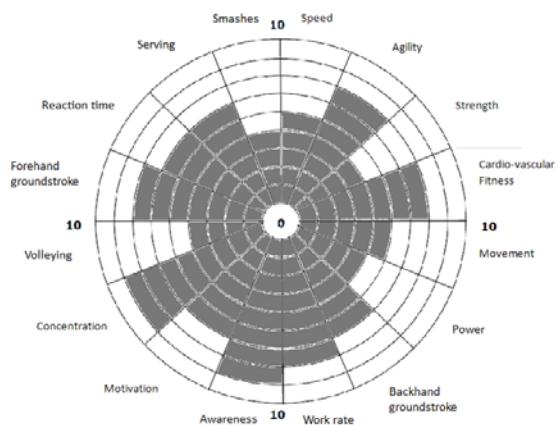


The diagram, showing testing for muscular strength, reveals improvements in all of the upper body exercises testing my 1RM. Although I tested my strength in the lower body, I did

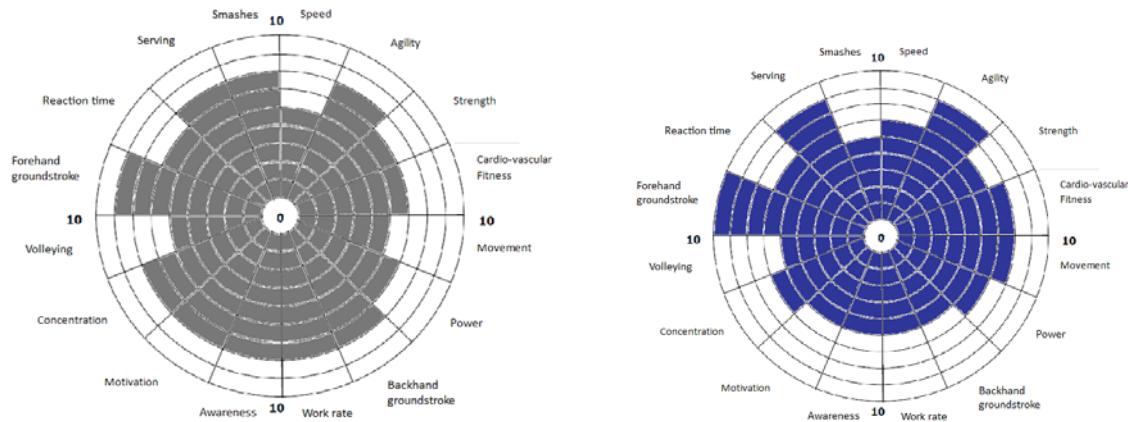
not focus on my lower body when training, hence the decrease in strength at the end of development plan with the leg extensions. Although difficult to see in the graph, generally there were larger increases in testing from the beginning of the development plan, to the mid-point testing than there were further increases from the mid-point testing to the end of the development plan. This may have been due to me not recognising when I was able to increase the resistance of the weight exercises and increase the intensity when necessary and instead, remaining with the same resistance towards the end of the Development plan, hence, potentially not increasing my strength as much as possible. However, maybe at the beginning of the development plan I did not set a high enough intensity for each exercise to begin with, and therefore was able to increase the resistance soon after starting or it may have been that once starting the development plan, features such as, improvements in technique may have allowed me to increase the resistance early on.

Fitness profiling – wagon wheels

Profile prior to development plan



Profile after the development plan



As we can see in these wagon wheels, both my self-evaluation and my coach's views believe that we have seen an improvement in my strength and my power since the beginning of the development plan. We can also see an improvement in many shots which acquire a certain amount of my strength for example, my serve has been said to have been improved by both myself and my coach due to the improvement in strength, allowing me to be able to have greater speed on the ball. We also feel that my groundstrokes have also improved due to the fact that I am hitting them more powerfully than previously. We also feel that there have not been any real decreases in other aspects of my fitness and skills, but of which may be contradicting my test results slightly.

How the Development Plan has benefited my competitive performance

The most obvious way the development plan has benefited my competitive performance is through the training on my muscular strength which has allowed me to become more powerful in my general strokes. For example, when rallying from the baseline I have been able to hit the ball more consistently at a higher intensity, as noticed by my coach in the witness statement and I have noticed ability to continue to serve at a high intensity throughout an entire match, rather than having to slow my serve down due to tiring towards the end of a match. Another way in which I have been able to improve my competitive performance is through the dietary plans. Although I haven't set specific times to eat or exactly what meals I want to eat, I have been able to understand better what types of meals and exactly what I should be consuming prior to match play in order to supply with the greatest amount of energy.

If I were to continue my development plan a further 8 – 10 weeks

One area I would change would be the time between each training session of a similar method of training. For example, I often trained with weights for three times a week, along with matches and tennis training and I would definitely choose to increase the duration

between each weights training session in particular. There were also times when I had a high intensity training session a day before a match, leaving me 'stiff' or still tired for the match.

Also, although I did cool down and gain more depth and understanding into the topic in the development plan, the topic is very vague and there are many researchers who have contradicted each other showing no exact way to cool down, particularly when stretching. Also, if I am able to undertake an even better cool down than I have been, my recovery time would not need to be as long as it has been. I wouldn't feel as fatigued and have to undertake such an extensive warm up in the next session and would possibly be able to increase the amount of times I train a week, depending on a variety of other factors such as; the intensity of the sessions and methods.

I would also use fitness testing more regularly, in order to identify any new areas of weakness in my fitness, possibly due to such an increase in weights training and little training helping other aspects of fitness, possibly similar to what we have seen in the development plan already.

Word count: 1,043

Bibliography

- 1) Edexcel AS PE Textbook – Mike Hill
- 2) <http://www.britishtennis.com/newtotennis/glossary/> - tennis terms
- 3) <http://www.sheetudeep.com/tennisglossary.html>
- 4) <http://www.tennisballmachines.co.uk/lobster/lobsterphenom2ballmachine.html>
- 5) <http://www.articlesbase.com/fitness-articles/8-key-training-principles-for-fitness-and-sports-training-805728.html>
- 6) <http://www.brianmac.co.uk/index.htm>

- 7) <http://www.brianmac.co.uk/plan.htm>
- 8) <http://www.brianmac.co.uk/index.htm>
- 9) <http://www.msnbc.msn.com/id/36553174/ns/health-fitness/t/want-better-workout-dont-stretch/#.TsFb-z0g-Ig>
- 10) <http://www.fittvo.com/3254/why-cool-down/>
- 11) <http://sportsmedicine.about.com/cs/strengthening/a/030904.htm>
- 12) <http://tweakfit.com/rate-exertion-burn-fat>
- 13) <http://www.sportpsychologytennis.com/?p=2611>
- 14) http://www.competitivedge.com/sports_article_tennis.htm
- 15) http://tutor2u.net/business/people/motivation_theory_introduction.asp
- 16) http://sportsmedicine.about.com/od/sportsnutrition/a/Food_Strength.htm
- 17) http://fnic.nal.usda.gov/nal_display/index.php?info_center=4&tax_level=1
- 18) http://weighttraining.about.com/od/nutritionforweights/a/muscle_diet_2.htm
- 19) <http://www.uk-muscle.co.uk/general-conversation/65530-andy-murray-training-diet-article.html>
- 20) Edexcel A2 PE Textbook – Mike Hill
- 21) Brian mac <http://www.brianmac.co.uk/drinks.htm>
- 22) http://news.bbc.co.uk/sport1/hi/health_and_fitness/4289704.stm
- 23) <http://www.lucozadeshop.com/about.html>
- 24) <http://sportsmedicine.about.com/od/fitnessevalandassessment/qt/PAR-Q.htm>
- 25) <http://www.steve-haywood.com/paqrq-form-physical-activity-readiness-questionnaire/24/>
- 26) <http://www.ncbi.nlm.nih.gov/pubmed/15320640>
- 27) <http://www.uk-muscle.co.uk/general-conversation/65530-andy-murray-training-diet-article.html>
- 28) <http://www.menshealth.co.uk/living/men/mh-interview-andy-murray>
- 29) <http://www.menshealth.co.uk/building-muscle/get-big/andy-murrays-strength-session>
- 30) <http://www.bodybuilding.com/fun/vinced7.htm>
- 31) <http://www.bodybuilding.com/fun/proteinshakebenefits.htm>

- 32) http://www.menshealth.co.uk/food-nutrition/muscle-foods/five-targeted-protein-shakes?click=main_sr
- 33) http://www.ausport.gov.au/sportscoachmag/sports_sciences/compression_garments_do_they_influence_athletic_performance_and_recovery
- 34) <http://www.tennisstrengthtraining.com/>
- 35) <http://www.brianmac.co.uk/eval.htm>
- 36) <http://www.teachpe.com/fitness/testing.php>

Appendix

Witness statement

General report: "I have worked and coached with [REDACTED] since he was very young and in primary school. Over the years, he has developed a strong tennis game, being able to apply many aspects of his game to match play. He has developed a particularly strong forehand, being both reliable and consistent and he is able to use these well in competitive situations."

"I am aware that [REDACTED] has been aiming to improve his muscular strength within the last few weeks and I believe I have been able to see improvements in his play, as result of this. [REDACTED] has looked stronger in competitive situations and is generally able to consistently hit



strong groundstrokes when rallying, making the shots both reliable and strong. I have also witnessed and overall improvement in Tommy's attacking play. He is now able to attack the ball better, particularly on his forehand side which is noticeably his stronger side, which has enabled him to finish off points better when playing and give him the advantage in winning the point earlier on in rallies."

Men's health – food nutrition article

Whether you're looking to bulk up, lose weight or rediscover your six-pack we've got a combination of real foods and proteins which will provide the perfect nutrient-packed accompaniment to your workouts. If you need your protein hit to go the extra mile, take a look at the five super-shakes below. You'll see how, with a few simple additions, you can build a nutritionally complete drink, tailored specifically to your needs. So to get more from your muscles, get in the mix now.

Muscle builder

What? 40g protein blend (Total Milk and Whey £24.95 for 2.5kg, myprotein.com), 3tbsp of oats, banana, 2tsp of peanut butter.

Why? Protein, fat and carbohydrate are all important for muscle growth. The oats are a slow-burning carb source and the banana and peanut butter provide quality calories from nutrient-dense sources.

How? Blend ingredients together with 400ml of milk or water and consume slowly between meals.

Pre-training shake

What? 40g whey protein or protein blend, 50g maltodextrin (£9.96 for 2.25kg, phd-fitness.co.uk), blueberries.

Why? Research shows a pre-training shake is twice as effective as post-training, when it comes to muscle building.

How? Blend with 500ml of water, have one third 20mins before training, one during and one after.

Six-pack saviour

What? 40g casein protein, 2tbsp flaxseed powder (£2.89 for 100g, myprotein.com)

Why? Flax powder has omega-3 fats which help fat-loss, and lignans, which are antioxidants – important if you're reducing food intake or doing lots of cardio.

How? Blend with 500ml of water. Drink between meals or to replace one carb-heavy meal.

Meal replacer

What? 40g protein blend, 2tsp almond butter, 3tbsp yoghurt, 1tsp Barley Grass Powder (£5.49 for 100g, myprotein.com), 2tsp flaxseed powder.

Why? Real meals are the best way to get nutrients, so use as many 'real' foods as you can in your more convenient shake.

How? Blend with 500ml of water and consume between meals.

Lean machine

What? 40g protein blend, 1tbsp flaxseed oil (£9.99 for 473ml, hollandandbarrett.com), 3tbsp oats, strawberries.

Why? Flaxseed oil is a source of omega-3 fats, while the oats provide low-GI carbohydrates for keeping energy levels steady, and fibre which supports gut health.

How? Blend the mixture together in 400ml of water or milk.

http://www.menshealth.co.uk/food-nutrition/muscle-foods/five-targeted-protein-shakes?click=main_sr

Recording:

Date beginning; 3/10/2011

Day & Location	Warm up/cool down	Session plan and actual session	Evaluation
Monday at school	Gentle jogging, followed by dynamic stretching to increase heart rate; skipping, cross-overs, high knees, heel flicks. Then Short dynamic stretching to prepare the muscles for testing. Cool down; gentle jogging to keep the heart rate raised followed by static stretching.	Testing: 1 repetition x each test <ul style="list-style-type: none"> - Illinois Agility Run - Standing broad jump - Vertical jump - 60 second press ups - Wall sit - Sit and reach - Shoulder raise - Standing stork 	Completed all of the tests. However, would have been ideal to test the areas more than once in order to get an average and make the testing more reliable, but ran out of time. The results of these tests were recorded previously. BORG: 17
Tennis training at [REDACTED] College	Gentle jogging around all three courts, twice. This is followed by dynamic stretching from the baseline and back; side steps, cross-overs, high knees, heel flicks and skipping. We then rally from the service line, baseline, and then volley while one of us is at the baseline and vice versa, increasing the intensity as we do. Cool down; gentle jogging to keep the heart rate raised followed by static stretching.	<ul style="list-style-type: none"> - We started with some feeding exercises, working me from side to side. A 6 ball exercise, feeding us deep and with the aim of defending and hitting cross court. - We then worked on a 4 ball exercise, again moving us side to side but with an emphasis on attacking the ball. The first ball went wide, having to hit the ball cross court, the second went wide onto the back hand side, again hitting crosscourt, the third went short on the forehead side to which we had to attack down the line and the final ball was the same on the backhand side. 	To begin with, the defending exercise wasn't of a very high intensity. However, the attacking, 4 ball exercise was. We had to work extremely hard to get to the ball in order to try and strike where the ball is at the top of its bounce and we had to use a great deal of strength and power when attacking the ball. I think it was because the exercise was at such a high intensity that I attacked the ball so much. There was no real worry of the end result of the shot (whether or not the ball went in), as there was no point scoring and so the main aim was to attack the ball as best as you could which I think worked very well. BORG: 15

Thursday at the gym	Gentle 5 minute row to increase the heart rate and warm up the upper body of which will be used in the main session. Followed by dynamic stretching in the upper body. Cool down: A gentle 5 minute row, used in order to keep the heart rate up and then followed by static stretching in the upper body.	Testing - One repletion maximums - Seated medicine ball throw	To begin with, I felt very strong and energetic when taking my 1RM's for different exercise but towards the end, I believe the results could have been a little unreliable due to the amount of work I undertook in this session and at a high intensity and therefore feel I could have possibly achieved some greater results on other days. BORG: 17
---------------------	--	---	--

Week beginning; 10/10/2011

Monday at school	Gentle jogging, followed by dynamic stretching to increase heart rate; skipping, cross-overs, high knees, heel flicks. Then Short dynamic stretching to prepare the muscles for testing. Cool down; gentle jogging to keep the heart rate raised followed by static stretching.	Testing: 1 repetition x each test - 30 metre sprint - Cooper's 12 minute run	Completed both sets of test however, I attempted the 30 metre sprint after the 12 minute run, which may have resulted in potentially a slower sprint than what I can perform, due to fatigue from the cardio vascular testing. BORG: 16
Tuesday Tennis training at [REDACTED] College	Gentle jogging around all three courts, twice. This is followed by dynamic stretching from the baseline and back; side steps, cross-overs, high knees, heel flicks and skipping. We then rally from the service line, baseline, and then volley while one of us is at the baseline and vice versa, increasing the intensity as we do.	- Because of the success of last week's attacking exercise, we undertook a similar exercise. However, this week, we played out a 4 ball exercise but the first ball was wide on the forehand side, and was followed by a mid court ball on our forehand side again, which we had to play as an inside out forehand attacking shot down the line. We did the same on the backhand side also. We played a set to	This week's session again went well I thought. The intensity was very high in the attacking exercise, using a great deal of footwork to get around the ball quickly and again, using a lot of muscular strength and power to attack the ball. It was good that we played points at the end of the session to put in our practise into matchplay. Although easy to do in certain exercises, when it comes to matchplay, there may be many different areas revealed that need

	Cool down; gentle jogging to keep the heart rate raised followed by static stretching.	finish with. Trying to work specifically on attacking the ball whenever possible and gain advantage of the point early on.	improving once there is pressure involved. BORG: 15
Thursday at the gym	Gentle 5 minute row to increase the heart rate and warm up the upper body of which will be used in the main session. Followed by dynamic stretching in the upper body. Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.	A workout out to improve my muscular strength in the upper body. 6 repetitions x 5 sets <ul style="list-style-type: none"> - Bench press on the fixed machine; 50kg - Biceps barbell curls; 25kg - Triceps extension; 18kg 	Completed all of the sets well and at a high intensity apart from the final set with the triceps extensions of which I was only able to just about manage 5 repetitions. Despite the fact that I was unable to complete all 6 repetitions, it does prove that I am working at a high enough intensity and using the principle of overload well enough to improve fitness. BORG: 16
Saturday at the gym	Gentle 5 minute row to increase the heart rate and warm up the upper body of which will be used in the main session. Followed by dynamic stretching in the upper body. Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.	Session targeting improving strength predominantly in the chest and the arms, working the pectorals, biceps and triceps. 6 repetitions X 5 sets <ul style="list-style-type: none"> - Pec flys; 79kg - Chest press; 49kg - Bench press on the fixed machine; 50kg 	This was a very heavy workout purely on the same muscle group in the pectorals, but despite the high level of intensity, I was able to complete the workout. Before the workout started, I was already feeling stiff from the previous workout completed 2 days before but after the warm up, I felt warm and in particular, my pectorals felt far more relaxed. BORG: 15
Week beginning: 17/10/2011			
Monday at school	Gentle 5 minute row which is used to increase the heart rate and allow me to warm up my upper body muscles, especially in the arms (biceps and triceps) where a large proportion of the workout is based around.	This school session is mainly targeted on plyometric training in the upper body. 10 repetitions x 3 sets in each exercise with 2 minutes rest between each set when setting in with different muscle groups and 3 minutes rest between each set for the plyometric press ups. <ul style="list-style-type: none"> - Press up claps, setting 	Prior to this session, I felt like I was recovering from the previous training session, focussing primarily on my strength in my chest. However, after the warm up again, I felt warm and far less stiff as before. So despite the heavy and intensive session 2 days ago, I was able to complete today's work out. Although I was able to

	<p>Followed by roughly 2 minutes of dynamic stretching in the upper body. Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.</p>	<p>in with decline crunches, allowing rests of the targeted muscles.</p> <ul style="list-style-type: none"> - Close arm press ups, setting in with decline oblique crunches. - Plyometric press ups 	<p>complete the workout, the intensity was slow towards the final sets of the plyometric press ups in particular.</p> <p>BORG: 15</p>
<p>Tuesday Tennis training at [REDACTED] College</p>	<p>Gentle jogging around all three courts, twice. This is followed by dynamic stretching from the baseline and back; side steps, cross-overs, high knees, heel flicks and skipping. We then rally from the service line, baseline, and then volley while one of us is at the baseline and vice versa, increasing the intensity as we do. Cool down; gentle jogging to keep the heart rate raised followed by static stretching.</p>	<p>This week we focussed much more on our serving, and in particular, our direction of serve; both first and second serve.</p> <ul style="list-style-type: none"> - Cones are set up in the corners of the baseline with the main aim being to serve out wide, into the corners of the service box. If you serve wide enough, the ball should end up moving wide of the cones. You score a point every time you serve wide enough so that the ball ends up crossing the baseline to the side of the cones set up. - We then played out an exercise, which started with both players starting on their forehand side, at the baseline. The ball is fed in to the mid court by one player (the defending player) and is then attacked by the attacking player. This player can either hit down the line or continue to hit cross court. As long as he continues to hit cross court, the defending player can't hit down the line. Once the 	<p>This session worked very well again. There was good variation so that we weren't just focussing on our attacking play but had some variation on our serving as well. There was high intensity in both the serving practise and the defensive/attacking exercise.</p> <p>The attacking/defensive exercise is very popular because it works both attacking play and defensive play. This means that player's work both sides of their game and the exercise also involves point scoring which motivates the players and adds some competition into the play.</p> <p>BORG: 14</p>

		attacker does hit down the line, the defender can also hit down the line as it's open play.	
Wednesday at the gym	Gentle 5 minute row to increase the heart rate and warm up the upper body of which will be used in the main session. Followed by dynamic stretching in the upper body. Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.	<p>Session targets to improve muscular strength in the upper body.</p> <ul style="list-style-type: none"> - Pec flys; 3 sets of 8 reps at 79kg - Dumbbell bench press; 3 sets of 8 reps at 18kg - Tricep extensions; 3 sets of 8 reps at 18kg - Seated row; 3 sets of 8 reps at 59kg - Biceps curl with bench; 3 sets of 8 reps on each arm at 8kg 	<p>This session again went very well. I feel I got the intensity just right so that the exercising wasn't so intense that I could not complete the last sets or exercises and yet the intensity was definitely not low enough that I felt I was not working hard. I believe one of the main reasons I was able to achieve every set is because I left a long enough time between each set and exercise so that I could recover well enough (restoring my PC stores)</p> <p>BORG: 17</p>
Saturday at the gym	Gentle 5 minute row to increase the heart rate and warm up the upper body of which will be used in the main session. Followed by dynamic stretching in the upper body. Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.	<p>A workout out to improve my muscular strength in the upper body.</p> <p>6 repetitions x 5 sets</p> <ul style="list-style-type: none"> - Bench press on the fixed machine; 55kg - Biceps barbell curls; 30kg - Triceps extension; 18kg 	<p>This session went very well again as I just focussed on a few exercises, but continuing with a high intensity as I completed more sets. I was also able to increase the resistance on the bench press, up to 55kg, but completing the correct amount of sets also, which was promising.</p> <p>BORG: 16</p>
Week beginning: 24/10/2011			
Monday at the gym	<p>Gentle jogging to increase heart rate; followed by dynamic stretching, focused in the upper body.</p> <p>Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by</p>	<p>Session targets to improve muscular strength in the upper body.</p> <ul style="list-style-type: none"> - Pec flys; 3 sets of 8 reps at 79kg - Dumbbell bench press; 3 sets of 8 reps at 20kg - Tricep extensions; 3 sets of 8 reps at 18kg - Seated row; 3 sets of 8 reps at 59kg - Biceps curl with bench; 	<p>This week was half term week, meaning there was no session in school and therefore, I decided to make use of the facilities at the gym. I was able to increase the resistance on my dumbbell bench press, from 18kg to 20kg which was promising as it revealed an increase in strength, particularly in the pectorals.</p>

	static stretching in the upper body.	3 sets of 8 reps on each arm at 10kg	BORG:16
Wednesday at the gym	Gentle 5 minute row to increase the heart rate and warm up the upper body of which will be used in the main session. Followed by dynamic stretching in the upper body. Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.	Session targeting improving strength predominantly in the chest and the arms, working the pectorals and biceps. 6 repetitions X 5 sets <ul style="list-style-type: none">- Pec flys; 79kg- Chest press; 55kg- Bench press on the fixed machine; 55kg	This session was very challenging as it contained a very high intensity and on a small range of targeted muscle groups, the pectorals. I was only able to sets of 5 repetitions for the bench press and will therefore look to manage the same session, but managing the 6 repetitions next time. BORG:17

Week beginning: 31/10/2011

Monday at school	Gentle 5 minute row which is used to increase the heart rate and allow me to warm up my upper body muscles, especially in the arms (biceps and triceps) where a large proportion of the workout is based around. Followed by roughly 2 minutes of dynamic stretching in the upper body. Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.	This school session is mainly targeted on plyometric training in the upper body. 12 repetitions x 3 sets in each exercise with 2 minutes rest between each set when setting in with different muscle groups and 3 minutes rest between each set for the plyometric press ups. <ul style="list-style-type: none">- Press up claps, setting in with decline crunches, allowing rests of the targeted muscles.- Close arm press ups, setting in with decline oblique crunches.- Plyometric press ups	I was very happy with this session as it was the first time I have really felt that the training I put into in school training sessions has made a difference. I was able to complete the session in exactly the same way as prior to this week, although I felt very confident about being able to complete the workout, adding 2 repetitions to each exercise and set. BORG:15
Tuesday Tennis training at [REDACTED] College	Gentle jogging around all three courts, twice. This is followed by dynamic stretching from the baseline and back; side steps, cross-overs, high knees, heal	This session was based mainly on attacking play again. The main drill we worked on was; <ul style="list-style-type: none">- Two players are at the net, returning any ball hit by the opponent on the other side of the net and at the baseline. The opponent on the other side of the net is the main	I really enjoy this particular exercise. Its good fun as you're main objective is to strike the ball hard and really attack the ball. It also has to be performed at a very high intensity as you're

	<p>flicks and skipping. We then rally from the service line, baseline, and then volley while one of us is at the baseline and vice versa, increasing the intensity as we do. Cool down; gentle jogging to keep the heart rate raised followed by static stretching.</p>	<p>player in this activity and returns balls fed in by the coach as well as he can. A point is scored by the attacking player if the volleyers are unable to return the ball back in court, and if they're able to pass the volleyers. The volleyers then have the aim of reducing as many points as possible from being scored by the attacking player, within the time limit, by trying to return as many shots in court as possible. This is normally a timed based exercise, which increases the intensity of the session and ups the work rate. Players shouldn't be awarded with a point if they purposely lob the volleyers as it defeats the purpose of the exercise; to improve striking the ball harder, but also more accurately, away from the volleyers.</p>	<p>playing against the clock. The exercise also challenges both; your attacking side of play and also your defensive volleying and it should be played with 3 players so there isn't a great amount of time that a particular player may be having to sit out for.</p> <p>BORG: 16</p>
<p>Wednesday Tennis match – Framlingham Men's 1st VS Felixstowe</p>	<p>First of all, we arrived with plenty of time before the match was due to start. From past experiences, playing at Felixstowe has always meant extremely strong winds and playing on astro. Although astro is one of my stronger playing surfaces, it can be difficult to adjust to this as the wind at the same time so it's crucial that a good warm up is undertaken. We first take a gentle jog around the courts, and then follow this with</p>	<p>With the opposition, we first rally from the service line, then we move back to the baseline. Once we both feel comfortable, one of the player's moves to the net and volley's while the other hits from the baseline. Then the roles are reversed and finally we hit some serves until we're both satisfied and ready to play.</p> <p>From past experiences with these players, I always believed the match would be difficult. Despite the large warm up, to begin with we found the conditions very difficult to play on. I had the end with the wind behind us on my serve which meant that my serving game was very attacking and I was very pleased with the way I was able to adapt to the high winds. I felt I was able to slow my serve down but concentrate more so on direction as I knew the wind behind me would add the power. Up until the 6th game, my partner lost his serve and for the rest of the set we were unable to break back.</p> <p>We started the first game of the second set a break down and I think that psychologically, we found it extremely difficult to come back from then.</p> <p>Personally, I felt we played extremely well in the first set. We used our tactics well, consisting and found out our opponent's weaknesses early on. At times, we used the wind to our advantage, especially in my service games and</p>	

	<p>dynamic stretches; high knees, heel flicks, cross overs, skipping and then any other stretches personal to you. Cool down; gentle jogging to keep the heart rate raised followed by static stretching.</p>	<p>we used elements of play that we knew were our strongest points such as the serve out wide to the opponent's backhand, causing him to return back to my partner at the net and give us the advantage early on.</p> <p>However, our main fault was not being able to find any way back into the match after losing the first set. I believe this is mainly psychological, as personally, I felt after performing so well in the first set, but still not being able to win it meant that we possibly didn't believe we could win it as much as at the start of the match. In the second set we became frustrated and there were many unforced errors which we would not usually make.</p> <p>However, overall, I believe the opponents were the better players and it is fair to say that they did play better than us. They were extremely consistent, especially with their groundstrokes and played very well together, as a pair.</p>	
Saturday at the gym	<p>Gentle jogging to increase heart rate; followed by dynamic stretching, focused in the upper body.</p> <p>Cool down: A gentle 10 minute row, gradually lowering the intensity in order to gradually lower the heart rate.</p>	<p>Workout focussed on improving strength on arms; biceps and triceps.</p> <p>6 Reps x 3 Sets</p> <ul style="list-style-type: none"> - Seated row; 63kg - Triceps extension; 20 kg - Alternate bicep curls; 16kg - Barbell curl; 30kg - Bar dips 	<p>The session was successful; all of the exercises were completed fully. However, due to a minor injury picked up in my chest from the rugby match on the 3rd, I did struggle with the bar dips. I was able to complete the task but at a much slower pace than intended.</p> <p>I was also able to witness signs of improvement due to the increase in resistance I used for the triceps extension, showing improvements in the strength on my triceps.</p> <p>BORG: 14</p>

Week beginning: 7/11/2011

Monday at school	<p>Gentle jogging to increase heart rate; followed by dynamic stretching, focused in the upper body.</p> <p>Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.</p>	<p>This school session is mainly targeted on plyometric training in the upper body. 12 repetitions x 3 sets in each exercise with 2 minutes rest between each set when setting in with different muscle groups and 3 minutes rest between each set for the plyometric press ups.</p> <ul style="list-style-type: none"> - Press up claps, setting in with decline crunches, allowing 	<p>This was another good session. I felt even more confident with the 12 repetitions this time as I did last time which has motivated me well as I am seeing more signs of improvement. There was also no problem with my previous worry from my slight chest injury which was encouraging to see especially as a lot of the exercises were predominantly focussed on</p>
------------------	--	---	---

		<p>rests of the targeted muscles.</p> <ul style="list-style-type: none"> - Close arm press ups, setting in with decline oblique crunches. - Plyometric press ups 	<p>the chest and pectorals.</p> <p>BORG: 15</p>
<p>Tuesday</p> <p>Tennis</p> <p>training at</p> <p>██████████</p> <p>College</p>	<p>Gentle jogging around all three courts, twice. This is followed by dynamic stretching from the baseline and back; side steps, cross-overs, high knees, heel flicks and skipping. We then rally from the service line, baseline, and then volley while one of us is at the baseline and vice versa, increasing the intensity as we do. Cool down; gentle jogging to keep the heart rate raised followed by static stretching.</p>	<p>In this week's session, we focussed more on our defensive play.</p> <ul style="list-style-type: none"> - After the warm up, our coach fed us sets of 4 balls; 2 of which were wide on each side and then 2 of which were deep on each side. The deep balls took us back roughly 2 metres behind the baseline and it meant we really had to focus on getting enough topspin to get the ball up, high over the net, but back in court deep in the opponent's half. - We were then fed a series of balls which could have gone either side; backhand or forehand, in quick succession. - Finally, we finished by playing a short doubles match of 1 set. 	<p>Recently we have been working far more on our attacking play and so it was a nice change and variation to improve and work on a more defensive side of our game.</p> <p>The session was all of a very high intensity again; especially the 4 ball exercise which could have been on either side. We had to react very quickly to the ball, working on our movement towards the ball and our speed and agility.</p> <p>BORG: 15</p>
<p>Wednesday</p> <p>at the gym</p>	<p>Gentle 5 minute row to increase the heart rate and warm up the upper body of which will be used in the main session. Followed by dynamic stretching in the upper body. Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.</p>	<p>Workout focussed mainly on improving power in the pectorals with an element of the workout on the biceps.</p> <p>3 sets of 8 repetitions.</p> <ul style="list-style-type: none"> - Pec flys; 86kg - Dumbbell bench press; 20kg - Seated row; 63kg - Chest press; 59kg 	<p>Again, in this session I was able to increase the resistance on the Pec fly's, increasing the weight to 86kg which felt as comfortable as at 79kg. This may be due to the fact that I possibly wasn't targeting a high enough intensity at 79kg to begin with, but the increase to 86kg certainly felt a high enough intensity. I also felt the need to increase the resistance of the chest press' to 59kg in order to feel a greater intensity. This was partly due to the fact that I have already</p>

			<p>increased the resistance on other exercises which had been targeting my pectorals and so felt that I could manage the chest press' at a higher intensity.</p> <p>BORG:16</p>
Saturday at the gym	<p>Gentle 5 minute row to increase the heart rate and warm up the upper body of which will be used in the main session. Followed by dynamic stretching in the upper body. Cool down: A gentle 10 minute row, gradually decreasing the intensity in order to gradually decrease the heart rate.</p>	<p>Workout focussed on improving strength on arms; biceps and triceps.</p> <p>6 Reps x 3 Sets</p> <ul style="list-style-type: none"> - Seated row; 63kg - Bench press using the fixed machine; 60kg - Triceps extension; 20 kg - Alternate bicep curls; 16kg - Barbell curl; 30kg 	<p>I was very pleased to be able to achieve the task at another increase in resistance for the barbell curls, increasing the weight to 30kg which shows an improvement in the strength of mainly my biceps. I also made an increase to the resistance of the bench press' as I felt that staying at 55kg was not challenging enough for me.</p> <p>BORG: 16</p>

Week beginning: 14/11/2011

Monday at school	<p>Gentle 5 minute row which is used to increase the heart rate and allow me to warm up my upper body muscles, especially in the arms (biceps and triceps) where a large proportion of the workout is based around. Followed by roughly 2 minutes of dynamic stretching in the upper body. Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.</p>	<p>This school session is mainly targeted on plyometric training in the upper body. 12 repetitions x 3 sets in each exercise with 2 minutes rest between each set when setting in with different muscle groups and 3 minutes rest between each set for the plyometric press ups.</p> <ul style="list-style-type: none"> - Press up claps, setting in with decline crunches, allowing rests of the targeted muscles. - Sit up and medicine ball throw (5 repetitions with a medicine ball of 2kg) - Plyometric press ups 	<p>This session, instead of undertaking my previous exercises, I decided to give some more variety in the way in which I train by using another challenging exercise. I used a power based exercise which works both the abdominals and the power in the upper body, mostly including the shoulders. This exercise is also very relevant to improving my tennis as it works the critical muscles used in the tennis serve and improving the correct aspect of fitness also.</p> <p>BORG: 16</p>
Tuesday Tennis training at	<p>Gentle jogging around all three courts, twice. This is</p>	<p>In this session, we worked far more on our attacking side of play.</p>	<p>The session worked well. The first drill went better than the second I thought. The</p>

Framlingham [REDACTED]	<p>followed by dynamic stretching from the baseline and back; side steps, cross-overs, high knees, heel flicks and skipping. We then rally from the service line, baseline, and then volley while one of us is at the baseline and vice versa, increasing the intensity as we do. Cool down; gentle jogging to keep the heart rate raised followed by static stretching.</p>	<ul style="list-style-type: none"> - To begin with, we started with a four ball drill, moving us from side to side, 2 balls to each side with the aim to hit these cross court and 2 balls much shorter for us to attack down the line. - The second exercise made us attack down the line for 1, then play an inside out forehand down the line, and play the same on our other side. - We finished with 2 short sets to 4. 	<p>disadvantage of the second exercise was that we were on and off the court quite quickly. We only played 2 balls at once, and then 2 on our other side when we came back in, and so there was little time to really try and improve on areas I felt.</p> <p>BORG: 14</p>
Thursday Tennis match – Framlingham men's 1 st VS St Johns	<p>Roughly a 3 minute run around the courts.</p> <p>Then Dynamic stretching from the base line to the net; side steps, high knees, heel flicks, skipping and cross overs.</p> <p>Rallying at match intensity; service line, base line, volleyer then 2 minutes serving to end with.</p> <p>Cool down; gentle jogging to keep the heart rate raised followed by static stretching.</p>	<p>I thought this match went very well. Although the players weren't very attacking at all, they were very good defensively and were able to get lots of our mid court, attacking balls, back consistently.</p> <p>It was difficult not to try and hit the ball too hard because these just caused unforced errors from us. Instead, we focussed far more on remaining attacking, but not forcing too many winners and trying to become far more consistent.</p> <p>I was serving well and my partner and I used the serve and volley tactic a lot in order to force pressure on the opponents.</p> <p>Overall, I thought it was a good game by us. We had to use our tactics well in order to upset the routine from the opponents of playing from the back of the court. We were clever about our play and it could have been very easy for us to continue trying to get winners and not consider tactics.</p>	
Friday at the gym	<p>Gentle 5 minute row to increase the heart rate and warm up the upper body of which will be used in the main session. Followed by dynamic stretching in the upper body.</p> <p>Cool down: A gentle</p>	<p>Workout focussed mainly on improving power in the pectorals with an element of the workout on the biceps.</p> <p>5 sets of 6 repetitions.</p> <ul style="list-style-type: none"> - Pec flys; 86kg - Bench press on the fixed machine; 60kg - Seated row; 59kg 	<p>I found this session very difficult which was slightly surprising but I think this was due to the tennis match last night. I wasn't feeling stiff at all, which is occasionally the case after a tennis match due to not cooling down well enough, but I felt physically tired in more of a mental</p>

	5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.	<ul style="list-style-type: none"> - Chest press; 59kg 	state. BORG:14
Week beginning: 21/11/2011			
Monday at school	<p>Gentle 5 minute row which is used to increase the heart rate and allow me to warm up my upper body muscles, especially in the arms (biceps and triceps) where a large proportion of the workout is based around. Followed by roughly 2 minutes of dynamic stretching in the upper body. Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.</p>	<p>This school session is mainly targeted on plyometric training in the upper body. 12 repetitions x 3 sets in each exercise with 2 minutes rest between each set when setting in with different muscle groups and 3 minutes rest between each set for the plyometric press ups.</p> <ul style="list-style-type: none"> - Press up claps, setting in with decline crunches, allowing rests of the targeted muscles. - Sit up and medicine ball throw (5 repetitions with a medicine ball of 2kg) - Close arm press ups 	<p>This was another good session at school. I felt very strong and positive when undertaking every exercise. The sit up and throw exercise also went very well again, and although there was no noticeable improvement in the distance I could throw, I felt that the co-ordination aspect of the exercise was stronger which lead me to believe the exercise went better. At the end of this session, I didn't feel I had worked at as high intensity as perhaps I could have done. This may be due to the fact that I replaced the plyometric press ups, which I find most challenging, with the close arm press ups and therefore believe I should change these exercises back in the next school session.</p> <p>BORG: 15</p>
Tuesday Tennis training at [REDACTED] College	<p>Gentle jogging around all three courts, twice. This is followed by dynamic stretching from the baseline and back; side steps, cross-overs, high knees, heel flicks and skipping. We then rally from the service line, baseline, and then volley while one of us is at the baseline and vice versa, increasing the</p>	<ul style="list-style-type: none"> - We started with some feeding exercises, working me from side to side. A 6 ball exercise, feeding us deep and with the aim of defending and hitting cross court. We had to focus on using plenty of topspin and generating plenty of height over the net in order to get the ball deep enough into the opponent's side. - We then played out a set each, twice. One 	<p>I am glad we started with defensive training today. I think that overall, this may be seen as a slight weakness to my play as I can quite inconsistent when defending deep balls. Often I don't generate enough topspin and height over the net to be able to send the ball deep enough into my opponent's side.</p> <p>I didn't feel I played very well in the sets against my friends in the squad. I was often miss timing the ball and found it difficult to read the game at times.</p>

	intensity as we do.	with each other player in my squad.	BORG: 14
Thursday at the gym	<p>Gentle 5 minute row to increase the heart rate and warm up the upper body of which will be used in the main session. Followed by dynamic stretching in the upper body. Cool down: a gentle 10 minute row, followed by static stretching in the upper body. Cool down; gentle jogging to keep the heart rate raised followed by static stretching.</p>	<p>Workout focussed mainly on improving power in the upper body.</p> <p>3 sets of 8 repetitions</p> <ul style="list-style-type: none"> - Pec flys; 86kg - Chest press; 59kg - Triceps extension; 22kg - Biceps curl with bench; 12kg 	<p>This was a good session. I had a few days to recover from my last session at school and I felt strong when exercising today.</p> <p>BORG: 15</p>

Week beginning: 28/11/2011

Monday at school	<p>Gentle 5 minute row which is used to increase the heart rate and allow me to warm up my upper body muscles, especially in the arms (biceps and triceps) where a large proportion of the workout is based around. Followed by roughly 2 minutes of dynamic stretching in the upper body. Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.</p>	<p>This school session is mainly targeted on plyometric training in the upper body. 14 repetitions x 3 sets in each exercise with 2 minutes rest between each set when setting in with different muscle groups and 3 minutes rest between each set for the plyometric press ups.</p> <ul style="list-style-type: none"> - Press up claps, setting in with decline crunches, allowing rests of the targeted muscles. - Sit up and medicine ball throw (5 repetitions with a medicine ball of 2kg) - Plyometric press ups 	<p>This was another strong session at school. I felt comfortable enough in each exercise to increase the number of repetitions up to 14 in order to increase the intensity of the exercises. Although, this is getting into danger of becoming more of a muscular endurance workout with the number of repetitions I am applying.</p> <p>Again, I also saw improvements of the medicine ball through in the distances I'm able to throw. I believe this is mainly due to the fact that my technique is still improving which is allowing me to gain greater distance.</p> <p>BORG: 16</p>
Monday Tennis match – Framlingham Men's 1 st VS	The match was at home this time which meant that we were already very used to the playing conditions in	Once the opposition arrived we first rallied from the service line, then we moved back to the baseline. Once we both felt comfortable, I moved forwards to the net to hit some volley's while the opposition hit from the baseline. Then the roles were reversed and finally we hit some serves until we were both satisfied and ready to play.	

Saxmundham	<p>which we play on every week.</p> <p>We arrived just 10 minutes before we were due to in order to go through an extended warm up. We started as usual, with a gentle jog around the courts, and then follow this with dynamic stretches; high knees, heel flicks, cross overs, skipping and then any other stretches personal to you. While we waited for the opposition to arrive, we gentle hit from the service line, gradually increasing the intensity and moving backwards towards the baseline.</p> <p>Cool down; gentle jogging to keep the heart rate raised followed by static stretching.</p>	<p>I thought we played very well throughout the match. It can be very easy to fall to lower levels and I find it particularly difficult to reduce the amount of unforced errors when playing opponents who are generally weaker and have fewer game plans than myself. However, we never allowed for the win to slip away from us and we continued to play sensible tennis and I never felt we became in any way too arrogant, which is also another common result of playing weaker opponents. I often find myself losing concentration and not working as hard when I have a large distance of a lead but we managed to not allow for this to happen.</p> <p>I was also very pleased not to lose a service game. I often struggle to keep concentration particularly on my serve when there is a clear lead. However, in this match I was able to keep the pressure on by not allowing to give the opposition too many cheap points on my serve.</p>
Thursday at the gym	<p>Gentle 5 minute row which is used to increase the heart rate and allow me to warm up my upper body muscles, especially in the arms (biceps and triceps) where a large proportion of the workout is based around.</p> <p>Followed by roughly 2 minutes of dynamic stretching in the upper body.</p> <p>Cool down: A gentle 5 minute row used</p>	<p>Workout focussed mainly on improving power in the upper body.</p> <p>3 sets of 8 repetitions</p> <ul style="list-style-type: none"> - Pec flys; 86kg - Chest press; 59kg - Triceps extension; 24kg - Biceps curl with bench; 14kg <p>I wanted to use the same exercises as I previously had used at the gym in order to identify which areas I was able to increase the resistance and hence, increase the intensity in. I was very happy with the results from today as although I increased the resistance of both; the triceps extensions and the bicep curls, I was still able to maintain the same number of repetitions. Although I felt noticeably more fatigued at the end of the session, I was very happy with being able</p>

	in order to keep the heart rate up and then followed by static stretching in the upper body.		to complete all of the exercises. BORG: 13
--	--	--	---

Week beginning: 5/12/2011

Monday at school	<p>Gentle 5 minute row which is used to increase the heart rate and allow me to warm up my upper body muscles, especially in the arms (biceps and triceps) where a large proportion of the workout is based around. Followed by roughly 2 minutes of dynamic stretching in the upper body.</p> <p>Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.</p>	<p>This school session is mainly targeted on plyometric training in the upper body. 12 repetitions x 3 sets in each exercise with 2 minutes rest between each set when setting in with different muscle groups and 3 minutes rest between each set for the plyometric press ups.</p> <ul style="list-style-type: none"> - Press up claps, using bench, setting in with decline crunches, allowing rests of the targeted muscles. - Sit up and medicine ball throw (5 repetitions with a medicine ball of 2kg) - Plyometric press ups, using bench 	<p>Last time I completed the school gym session workout, I was able to increase the number of repetitions in each of the exercises. However, I was aware that this may lead to an improvement in a different form of fitness to the desired effect of an improvement in muscular strength, so this week I decided to increase the intensity by doing my press ups, with a bench. The idea is that, with my feet on the bench, this should add extra 'force' onto my arms and upper body, increasing the difficulty of the exercises. With this method, I am having to lower the number of repetitions back to 12, which should therefore remain at a good number in order to improve power in the upper body, but I am increasing the intensity.</p> <p>BORG:15</p>
Tuesday Tennis training at [REDACTED] College	<p>Gentle jogging around all three courts, twice. This is followed by dynamic stretching from the baseline and back; side steps, cross-overs, high knees, heel flicks and skipping. We then rally from the service line, baseline, and then volley while one of us is at the baseline and vice versa, increasing the intensity as we do.</p> <p>Cool down; gentle</p>	<ul style="list-style-type: none"> - This week, we played out a 4 ball exercise. The first ball was wide on the forehand side, and was followed by a mid court ball on our forehand side again, which we had to play as an inside out forehand attacking shot down the line. We did the same on the backhand side also. 	<p>This week went well again. Although we started on attacking focussed drills, we soon moved on to a wider variety of exercises.</p> <p>It was good to have variety within the session, working on different aspects of our game as I think it makes the session more enjoyable.</p> <p>BORG: 14</p>

	jogging to keep the heart rate raised followed by static stretching.	<ul style="list-style-type: none"> - We then played out some simple serving drills with a set area and set targets to aim for. - We played a set to finish with. Trying to work specifically on attacking the ball whenever possible and gain advantage of the point early on. 	
Thursday at the gym	<p>Gentle jogging to increase heart rate; followed by dynamic stretching, focused in the upper body.</p> <p>Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.</p>	<p>Workout focussed on improving strength on arms; biceps and triceps.</p> <p>6 Reps x 3 Sets</p> <ul style="list-style-type: none"> - Seated row; 63kg - Bench press using the fixed machine; 60kg - Triceps extension; 24 kg - Alternate bicep curls; 16kg - Barbell curl; 30kg 	<p>Again, this session went fine. There were no improvements or increases in intensity made but I was able to complete all of the tasks, which was promising.</p> <p>BORG: 16</p>
Sunday; Tennis match Sunday League vs Kesgrave 2nds	<p>I arrived 15 minutes early in order to prepare fully. I knew it was potentially going to be a cooler morning and so thought it was necessary to arrive earlier in order to ensure I undertook a decent warm up prior to the match starting.</p> <p>I started with a 2 minute jog around the courts, then added in some dynamic stretching from the baseline to the net and back; sidesteps, skipping, cross-overs, high knees and heel flicks. Once the opposition arrived we could warm up using the ball; firstly rallying</p>	<p>Generally I was very pleased with the way we played today. First of all, I felt we got off to quite a slow start. This could have been because it was such a cold morning to begin with and so it took a little longer to complete the warm up than usual. However, we soon improved our game and started to play like usual. We didn't hit many unforced errors and were finishing off points well.</p> <p>Although, in the second set, we did lose our concentration slightly and took the pressure off after letting them break my partner's serve. He also served two double faults in a single game and I believe this was purely due to the fact that he was far more relaxed after winning the first set and starting to win the second set that he lost focus slightly.</p> <p>In the third set, we think that the opposition had more or less given up and were psychologically weakened by the first two sets. There seemed to be smaller rallies and far more mistakes and unforced errors from the opponents, including many more double faults to help us to win the final set comfortably.</p> <p>Throughout the match, there was only one occasion in the third set where our serve was broken, that we felt in any way pressured by the opponents. Overall, I felt we had complete control over the match and never really</p>	

	<p>from the service line, then the base line, then with one player volleying and finally we warm up our serves. Usually I start my serving with second serves, then build the speed up to second serve pace, ensuring I swap sides when feeling comfortable on one side.</p> <p>Cool down; gentle jogging to keep the heart rate raised followed by static stretching.</p>	<p>felt threatened by the opposition. Personally, my serving was strong and again was unbroken by the end of the match which was very positive.</p> <p>I think I have been able to recognise improvements in my strength in my matchplay. I don't seem to be tiring very much during long service games in my upper body as much as previously and I seem to be able to attack the ball much better and with ease now.</p>
--	--	--

Week beginning: 12/12/2011

Monday at school	<p>Gentle 5 minute row which is used to increase the heart rate and allow me to warm up my upper body muscles, especially in the arms (biceps and triceps) where a large proportion of the workout is based around. Followed by roughly 2 minutes of dynamic stretching in the upper body. Cool down: A gentle 5 minute row used in order to keep the heart rate up and then followed by static stretching in the upper body.</p>	<p>This school session is mainly targeted on plyometric training in the upper body. 12 repetitions x 3 sets in each exercise with 2 minutes rest between each set when setting in with different muscle groups and 3 minutes rest between each set for the plyometric press ups.</p> <ul style="list-style-type: none"> - Press up claps, using bench, setting in with decline crunches, allowing rests of the targeted muscles. - Sit up and medicine ball throw (5 repetitions with a medicine ball of 2kg) - Plyometric press ups, using bench 	<p>Again, I used the bench's in order to increase the level of intensity for the press up exercises. However, I didn't feel as comfortable and strong as I had last week when doing the exact same set of exercises. This may have been because of the tennis match I had yesterday but I felt far more fatigued after the final sets of the plyometric press ups as I remember feeling last week. I was able to complete all of the sets and repetitions but at a slower rate than previously.</p> <p>BORG: 15</p>
Tuesday Tennis training at [REDACTED] College	<p>Gentle jogging around all three courts, twice. This is followed by dynamic stretching from the baseline and back; side steps, cross-overs, high knees, heel</p>	<p>This week we focussed much more on our serving, and in particular, our direction of serve; both first and second serve.</p> <ul style="list-style-type: none"> - Cones are set up in the corners of the baseline with the main aim being to serve out 	<p>The session went well. I need a lot of work on the consistency on my serve at the moment and so any work on my serve is necessary.</p> <p>Both exercises were carried out at a very high intensity, partly due to the competitive aspect.</p>

	<p>flicks and skipping. We then rally from the service line, baseline, and then volley while one of us is at the baseline and vice versa, increasing the intensity as we do. Cool down; gentle jogging to keep the heart rate raised followed by static stretching.</p>	<p>wide, into the corners of the service box. If you serve wide enough, the ball should end up moving wide of the cones. You score a point every time you serve wide enough so that the ball ends up crossing the baseline to the side of the cones set up.</p> <ul style="list-style-type: none"> - We then played out an exercise, which started with both players starting on their forehand side, at the baseline. The ball is fed in to the mid court by one player (the defending player) and is then attacked by the attacking player. This player can either hit down the line or continue to hit cross court. As long as he continues to hit cross court, the defending player can't hit down the line. Once the attacker does hit down the line, the defender can also hit down the line as it's open play. 	BORG: 16
Thursday at the gym	<p>Gentle jogging to increase heart rate; followed by dynamic stretching, focused in the upper body.</p> <p>10 minute gentle row to cool down, gradually decreasing the intensity and then followed by static stretching in the upper body</p>	<p>Session targets to improve muscular strength in the upper body.</p> <p>3 sets x 8 repetitions</p> <ul style="list-style-type: none"> - Pec flies; 86kg - Dumbbell bench press; 20kg - Tricep extensions; 24kg - Seated row; 63kg - Biceps curl with bench; 14kg 	<p>Once again, in this session I chose not to increase the intensity and resistance on any of the exercises as I felt that they were already ideal and challenging enough for me. But I was able to complete all of the session.</p> <p>BORG: 15</p>
Week beginning: 19/12/2011			
Monday at	Gentle jogging,	Testing: 1 repetition x	

the gym	<p>followed by dynamic stretching to increase heart rate; skipping, cross-overs, high knees, heel flicks. Then Short dynamic stretching to prepare the muscles for testing.</p>	<p>each test</p> <ul style="list-style-type: none"> - Illinois Agility Run - Standing broad jump - Vertical jump - 60 second press ups - Wall sit - Sit and reach - Shoulder raise <p>Standing stork</p>
Wednesday at the gym	<p>Gentle 5 minute row to increase the heart rate and warm up the upper body of which will be used in the main session. Followed by dynamic stretching in the upper body.</p>	<p>Testing</p> <ul style="list-style-type: none"> - One repetition maximums - Seated medicine ball throw
Thursday at the gym	<p>Gentle jogging, followed by dynamic stretching to increase heart rate; skipping, cross-overs, high knees, heel flicks. Then Short dynamic stretching to prepare the muscles for testing.</p>	<p>Testing: 1 repetition x each test</p> <ul style="list-style-type: none"> - 30 metre sprint - Cooper's 12 minute run