Integrate strength and conditioning into the PE curriculum at secondary school

By James Baker, St Peter’s RC High School, Gloucester

BACKGROUND

Sport has long played an important role in school life and competitive sporting fixtures have also been established for a long time. Indeed, in many institutions – especially in the private sector – traditional fixtures and events have always been seen as key dates in the school calendar. But although competitive success has always been seen as important, focus has normally been on technical and tactical practice, with far less attention paid to the athletic development of young people who wish to excel in sport and/or enjoy life-long physical activity.

However, all this is now slowly changing, with a greater understanding developing of the potential contribution that an effective athletic development programme can have on multiple layers of both physical health and sporting performance. Indeed, it can be argued that the need for a focus specifically on physical development with young people is greater than ever as we battle against increasing levels of physical inactivity, levels that are producing weaker, slower and less physically literate children.

In the world we live in today, just playing and practising a sport in itself is not enough to develop the modern athlete: a more rounded approach to such development is required. In schools we coaches have more contact time than anyone else with young people over a relatively long period of time throughout their school life. Therefore, a physical education curriculum provides an excellent opportunity to expose young people to high quality strength and conditioning.

Introduction

The benefits of a well-rounded athletic development programme are now widely documented by research, which has shown that such programmes can impact positively on physical health, performance and resistance to sports-related injuries, as well as on psychosocial factors. However, in many state schools, physical development is limited to ‘health and fitness’ schemes of work that last about 6-8 weeks and only take place once a year amidst a games-based curriculum covering traditional sports such as rugby, football, hockey, netball, athletics, cricket and rounders.

AUTHOR’S BIO

James is an accredited strength and conditioning coach and qualified PE teacher. He directs the Elite Performance Pathway programme at St Peter’s RC High School, Gloucester and is also the director of Proformance Strength & Conditioning, providing support to a range of junior athletes and educational workshops for coaches.
‘with effective insight and planning, a PE curriculum can be designed to provide a comprehensive athletic development programme’

Yet, with effective insight and planning a PE curriculum can be designed to provide a comprehensive athletic development programme. Different models of long-term athlete development (LTAD), such as the YPD model⁸ and The Quadrennial Plan for the High School Athlete,⁶ have provided us with guides of what physical qualities to focus on and when. The challenge to the practitioner, however, is how to translate this more theoretical work into a working model that can be applied into the school system in the UK.

At St Peter’s RC High School in Gloucester, we have developed and successfully implemented a year-round athletic development programme, which provides a comprehensive system to help pupils reach their athletic potential and to increase their chances of success within their chosen sports. The aim of this article is to provide an insight into how we have utilised the models mentioned above to provide a long-term athlete development pathway within a state school’s physical education curriculum.

The Elite Performance Pathway (EPP)

Schools provide the ideal environment in which to deliver effective athletic development. Here, athletes are in an environment for an extended period of time (up to seven years), during which time numerous approaches can be utilised to enhance the athletic development process.

Our approach has been to build our programme around an Elite Performance Pathway (EPP and see figure below). The EPP is a seven-year LTAD pathway that runs parallel to the PE curriculum from Year 7 to 13 (age 11-18) for pupils identified as ‘gifted and talented’ in sport.

There are four stages to the pathway, based on ‘Jeffreys’ (2008) model utilising his flexible objectives based system and the YPD model to determine what is required at each stage. These phases are:

• Athletic Foundation (year 7 & 8)
• Athletic Development (year 9 & 10)
• Athletic Performance (year 11 & 12)
• Athletic Peak (year 13)

Across the four phases, the training generally moves from simple to complex training methods across the key physical qualities outlined in the YPD model that are relevant to each age group. As with all models, they will adapt over time to reflect the findings of our environment. One example of how we have adapted our model is as follows: in the 11+ age group, we found that initially we had to commit a larger amount of time to developing flexibility, mobility and fundamental movement skills than the YPD model suggests, because the objectives for the pre-adolescent years had not typically been met at the primary school level. So our approach is to start with a clean canvas and to initiate the athletic development programme from the time the pupils enter the school.
The EPP is now moving into its third year and thus far has been delivered in the form of both extra-curricular and in-curriculum lessons delivered by myself and four intern coaches.

Up to now, the Key Stage 3 programme has been running after school with a 40-minute session for Year 7 & 8 (ages 11-13) and a 50-minute session for Year 9 (ages 13-14), supporting up to 35 athletes across the two groups.

At Key Stage 4 (Year 10 & 11: ages 14-16), the programme has been running in curriculum time, with S&C sessions added into the pupils’ timetables, providing us with five lessons across a two-week timetable: a double lesson (2 x 55 mins each) on a Wednesday afternoon in both weeks of the timetable and one single lesson (55 mins) on a Thursday morning in one of the weeks. This year there were 19 athletes included in this part of the programme.

At Key Stage 5 (Year 12 & 13: ages 16-18) the programme is also in curriculum time and the athletes get two single 55-minute lessons per week, one on a Monday and one on a Friday.

In addition to the strength and conditioning components of the programme, we are also aiming to provide a complete performance programme for our athletes: this involves incorporating psychological preparation as well as nutritional and lifestyle management elements alongside the physical training programme as we continue to develop.

An exciting addition to the Key Stage 4 programme during 2014-2015 was a series of psychological preparation workshops delivered by the University of Gloucestershire. Dr Denise Hill and two of her post-graduate students gave a series of seminars across the year covering key topics including: mental toughness, coping with stress, emotional control and confidence. These seminars were very positively received by the athletes.

A year-round approach

One of the key factors in developing physical skills is the quantity of quality practice the pupils can undertake. By integrating S&C into the school curriculum, we have been able to take a year-round approach to developing the physical attributes of the athletes alongside the technical and tactical development that takes place in the core PE and extra-curricular sport programmes. This has significantly increased the amount of time we can dedicate to the EPP, which in turn is increasing the quality of results we are seeing.

Another extremely positive effect of having S&C within the curriculum is that adherence has improved enormously, when compared to extra-curricular (lunchtimes and after-school) programmes we have been running. With S&C in the school day, there is less conflict with sports fixtures, there are no issues associated with pupils getting to or from the sessions and there is a reduction in extra-curricular load on the athlete and parents, thus allowing more time for study. As a result of the greater consistency in attendance, we have seen much better progress across the group.

‘a key factor in developing physical skills is the quantity of quality practice the pupils can undertake’
For each group we have an annual plan outlined. Unlike traditional models of periodisation, we build this around the natural confines of the school year, with holiday and exam periods and so on built into the planning process. We use the structure of the terms within the academic year as opportunities to shift the emphasis across different methods of training, thus ensuring we are developing well-rounded athletes. Also, as befits the educational environment, we work within the structure of curricula and lesson plans to build the overall structure of the programme.

In the earlier stages of the pathway, the primary emphasis of the programme all year is on developing movement capacities, learning the correct exercise techniques and developing relative strength. We find that this combination works symbiotically, with the strength training helping to develop the stability and motor control required for effective movement, while the movement capacities ensure that optimal technique can be achieved and that strength is developed through full and effective ranges of motion. Additionally, strength training has been shown to be a better use of time with relatively weak and novice athletes due to its positive impact on strength and power, compared to power training, which only impacted positively on power alone. In this way, the power training of the later phases can be built upon sound bases of strength, mobility and technique.

Alongside the strength training, we then expose the athletes to other training methods (eg, speed, agility and plyometrics) as the secondary emphasis within the sessions. The content for the secondary emphasis for each half term is planned around the facilities and space available. For

---

**Table 1a: Annual plan for athletic foundation**

<table>
<thead>
<tr>
<th>EMPHASIS</th>
<th>HALF TERM 1</th>
<th>HALF TERM 2</th>
<th>HALF TERM 3</th>
<th>HALF TERM 4</th>
<th>HALF TERM 5</th>
<th>HALF TERM 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>Strength</td>
<td>Strength</td>
<td>Strength</td>
<td>Strength</td>
<td>Strength</td>
<td>Strength</td>
</tr>
<tr>
<td>Secondary</td>
<td>Mobility</td>
<td>Jump training/plyometrics</td>
<td>Acceleration</td>
<td>Change of direction/agility</td>
<td>Absolute speed</td>
<td>Energy system development</td>
</tr>
</tbody>
</table>

**Table 1b: Annual plan for athletic development**

<table>
<thead>
<tr>
<th>EMPHASIS</th>
<th>HALF TERM 1</th>
<th>HALF TERM 2</th>
<th>HALF TERM 3</th>
<th>HALF TERM 4</th>
<th>HALF TERM 5</th>
<th>HALF TERM 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>Strength</td>
<td>Strength</td>
<td>Strength</td>
<td>Strength</td>
<td>Strength</td>
<td>Strength</td>
</tr>
<tr>
<td>Secondary</td>
<td>Mobility</td>
<td>Jump training/plyometrics</td>
<td>Acceleration</td>
<td>Change of direction/agility</td>
<td>Absolute speed</td>
<td>Energy system development</td>
</tr>
</tbody>
</table>
The Elite Performance Pathway

Example, through the winter we make use of the sports hall for shorter distance sprinting and change of direction/agility work as the field space is not available.

Then during the summer term – when we have access to all facilities and field space – we focus on absolute speed and energy system development. This ties in with the athletics scheme of work in the core PE programme, meaning we can achieve a higher frequency of speed training. As we aim to make the most efficient use of our resources, this is an important consideration; we also plan around deliverable objectives rather than around ideal scenarios which are then often not applicable given logistical constraints.

**Typical progressions across the pathway**

In an ideal situation, all of our athletes would begin the programme in year 7 and progress through completing all levels of the pathway. The reality is that we end up with athletes joining the programme – for example in Year 10 – with little training history. In these cases, we still start them at the foundation level and progress them from there as they demonstrate competence against the key objectives.

This can be challenging when athletes are working on basic exercises and they see their peers doing more advanced forms of training. For this reason, it is important as a coach to be able to explain why this is happening in order to prevent it negatively impacting on their motivation and engagement.

The methods of resistance training used progress along the pathway from bodyweight exercises to low load strength training using bands, kettlebells, powerbags and 8kg Olympic training bars at the Athletic Foundation. We then progress to more traditional barbell and dumbbell strength training throughout the athletic development stage and beyond.

All this is accompanied by basic technical speed (eg, wall drills, marching, skipping, and free sprints) and predominantly simple closed agility work learning a broad range of target movements, that can be built in to more sport-specific movement patterns further into the pathway.

Although we predominantly use closed drills in the early stages, we do also use a smaller percentage of open/reactive drills, as well as simple tag/generic games (eg, bull dogs) to engage the athletes and allow us to enhance learning by putting the movements into context within a sport.

In the later stages of the pathway – athletic performance and athletic peak – once an athlete has developed the capacity to produce large forces, the primary emphasis shifts to the rate at which that force can be produced through more ballistic training/

---

### Table 3a: Example Session Structures – Key Stage 4

<table>
<thead>
<tr>
<th><strong>ATHLETIC DEVELOPMENT (YEAR 10) – SESSION PLAN</strong></th>
<th><strong>TIME AVAILABLE: 2 X 55 MINUTE LESSONS ON WEDNESDAY AFTERNOONS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRIMARY OBJECTIVE: RELATIVE STRENGTH DEVELOPMENT / SECONDARY OBJECTIVE: ENHANCING ACCELERATION</strong></td>
<td><strong>TABLE 3A: EXAMPLE SESSION STRUCTURES – KEY STAGE 4</strong></td>
</tr>
<tr>
<td><strong>Raise (5 mins)</strong></td>
<td>Change of direction/sports generic movements or tag/movement-based games</td>
</tr>
<tr>
<td><strong>Activation (3 mins)</strong></td>
<td>Glute bridge x 12 / Shoulder tap planks x 15 / Prone AW (scapula retraction) x 20</td>
</tr>
<tr>
<td><strong>Dynamic mobilisation x 10 reps each (6 mins)</strong></td>
<td>Hip roll / Squat / Full spiderman (with a press-up) / Forward lunge / Side lunge 1 leg RDL / 1 leg squat</td>
</tr>
<tr>
<td><strong>Potential (6 mins)</strong></td>
<td>Jump to box into altitude landing 2 x 5 / Pogo jump 2 x 8</td>
</tr>
<tr>
<td><strong>Linear speed (acceleration) (30 mins)</strong></td>
<td>Single exchange wall drills 2 x 5-10/leg March and skip drills 2 x 10m / Resisted sprinting 3 x 5-15m / Free sprinting 3 x 5-20m</td>
</tr>
<tr>
<td><strong>Strength development (45 minutes)</strong></td>
<td>Front squat / Pull up / Rear foot elevated split squat / Bench press / Plank variations</td>
</tr>
<tr>
<td><strong>3 sets x 10 reps 1-2 min rest</strong></td>
<td><strong>3 Sets x 10 Reps</strong></td>
</tr>
<tr>
<td><strong>Flexibility and mobility (10 minutes)</strong></td>
<td>Target problem areas for individual athletes</td>
</tr>
</tbody>
</table>
Olympic lifting, as well as more advanced plyometrics, while retaining strength levels.

Similarly, the speed and agility training progressively changes to become more sport-specific and the intensity and complexity increases (eg, a higher percentage of open and reactive training compared to closed drills).

Throughout all stages of the programme, all athletes work on maintaining and improving their mobility.

**The impact: testing protocol**

One of the key elements in our ability to assess the impact of the programme is our testing regime. Currently with our Key Stage 4 group we test at four points during the year: when the athletes start back in September and then at the end of each term in December, March/April and July.

Our testing battery has evolved quite quickly from very basic testing (standing broad jump, ‘chalk on the wall’ vertical jump) to a more advanced and robust protocol: this became possible as the school invested in an electronic timing system and jump mat, and also a partnership with Hartpury College, through which the S&C lecturers, Ben Drury and James McCarron, have supported the development of our testing procedures, providing valuable advice and allowing us to use their equipment.

The data we are presenting here is from a group of Year 10 athletes monitored between March 2015 and July 2015 as the equipment available by this time was much more accurate. What we have measured consistently are the following tests:

- Height
- Sitting height
- Weight
- Squat jump
- Countermovement jump
- 12” depth jump
- 10m sprint
- Squat or deadlift 5 rep max and bench press 5 rep max

Towards the end of the year we also incorporated a 1500m run to calculate maximum aerobic speed and a 5-0-5 change of direction test, both of which will become permanent fixtures in the testing battery for 2015/2016.

**Group case study**

Effective athletic development is based upon delivering sequential and tangible changes in performance. With our testing procedures in place, we can quantifiably assess the impact we are making on specific
aspects of performance. This supplements the qualitative changes we are seeing in terms of enhanced on field performance and technical proficiency. The following are case studies of group and individual progress that highlight the potential that an athletic development programme has in terms of enhancing player potential.

**Key Stage 4 athletic development: Year 10 group**

This group followed programmes as outlined in the previous section, with the major focus being relative strength development. The session was made up of two year groups – Year 10 and 11 – so for the majority of the year we were working with a group of 19 athletes, until the older group left for study leave.

One of the major challenges for us was managing this number of athletes and still producing results, because we began the year with only one coach and one intern coach giving us a coach-to-athlete ratio of approximately 1:10, which was far from ideal. As the year progressed, we recruited another two interns, which reduced the coach to athlete ratio to approximately 1:5 and had a really positive impact on engagement on the tasks and behaviour.

**Group averages: 10m sprint**

Across the group (N=8; seven males and one female) we have seen improvements in all of the athletes’ sprint times. Improvements ranged from -0.03 sec to -0.26 sec for 10m sprint times across the year (sprints were timed via Witty MicroGate Timing System).

The regression in average sprint times between December and March has been attributed to a reduction in maximal sprinting volume in the programme. In term 2, we shifted the focus to developing multi-directional speed technique, with particular focus on deceleration and cutting movements, and made the mistake of completely removing the 10-20m sprint work that had been present from...
‘for each group we have an annual plan outlined, built along the natural confines of the school year’

Table 4a: Athlete case study – 15-year-old male
Main sport: Rugby union/athletics

<table>
<thead>
<tr>
<th></th>
<th>MARCH 2015</th>
<th>JULY 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (cm)</td>
<td>180.7</td>
<td>182.5</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>66.1 kg</td>
<td>67.5 kg</td>
</tr>
<tr>
<td>Squat jump</td>
<td>43.94 cm</td>
<td>61.21 cm</td>
</tr>
<tr>
<td>Vertical jump</td>
<td>49.28 cm</td>
<td>66.8 cm</td>
</tr>
<tr>
<td>12” depth jump</td>
<td>45.21 cm</td>
<td>59.94 cm</td>
</tr>
<tr>
<td>Deadlift 5RM</td>
<td>65kg</td>
<td>110kg</td>
</tr>
<tr>
<td>Bench 5RM</td>
<td>35kg</td>
<td>55kg</td>
</tr>
<tr>
<td>10m Sprint (sec)</td>
<td>1.85 sec</td>
<td>1.70 sec</td>
</tr>
</tbody>
</table>

Table 4b: Athlete case study – 15-year-old male
Main sport: Rugby union/athletics

<table>
<thead>
<tr>
<th></th>
<th>MARCH 2015</th>
<th>JULY 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (cm)</td>
<td>162</td>
<td>162.4</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>64.1</td>
<td>64.5</td>
</tr>
<tr>
<td>Squat jump</td>
<td>35.8 cm</td>
<td>46.9 cm</td>
</tr>
<tr>
<td>Vertical jump</td>
<td>46.9 cm</td>
<td>52.1 cm</td>
</tr>
<tr>
<td>12” depth jump</td>
<td>39.4 cm</td>
<td>46.7 cm</td>
</tr>
<tr>
<td>Deadlift 5RM</td>
<td>60kg</td>
<td>95kg</td>
</tr>
<tr>
<td>Bench 5RM</td>
<td>60kg</td>
<td>55kg</td>
</tr>
<tr>
<td>10m Sprint (sec)</td>
<td>1.95 sec</td>
<td>1.82 sec</td>
</tr>
</tbody>
</table>
September to December. For us, this has highlighted the importance of retaining an element of maximal sprinting every week to provide the necessary stimulus at the very least to maintain speed. For next year we have programmed a low volume of sprinting in all phases to try and prevent this happening again.

**Year 10 Group averages: jump testing**

The results for the three jump tests (measured via Just Jump system) also improved for all the athletes in the group, again with some being more significant than others.

Squat jumps improvement ranged from 3.8 cm to 17.3 cm, counter movement jump improvements ranged from 2.03 cm to 17.5 cm and depth jumps improvements ranged from a decrease of -0.25 cm to an increase of 14.7 cm.

These results have highlighted a need for us to progress to more reactive plyometric work to further develop the stretch-shortening cycle capabilities of our athletes; this is because across the group at present there is a drop-off in jump height in the depth jump where we would want to see an increase above both the squat and countermovement jumps.

Both of these observations emphasise the further importance of testing, as it allows us to assess objectively the success of the programme and make appropriate changes over time.

**Individual athlete case studies**

Detailed on the previous page are testing profiles for two of our male athletes who have made good progress in their levels of strength, power and speed across the year. These athletes engaged in a progressively loaded strength programme using an adapted version of the 10RM APRE protocol between March and July.

During this period the two athletes were also working on maximal velocity sprinting technique drills and sprinting maximally over distances from 20-40m prior to their strength work.

**Future developments**

A clear aim of the programme is that we wish it to evolve and grow year by year. To achieve this, we aim to initiate a number of developments each year. For example:

- In September 2015, the identified gifted and talented Year 7 pupils will receive two lessons of S&C in their timetables in addition to their core physical education lessons.
- In addition, athletic development will also become a scheme of work within the core PE curriculum, running for 6-8 weeks for all pupils focused on strength development through progressive resistance training.
- Nutrition and lifestyle management sessions will become a key part of the Key Stage 4 programme, with athletes learning how to cook, what foods to eat and where to source good ingredients.
- We will implement a new testing procedure for Key Stage 3, providing a better assessment of progress using movement competency and bodyweight strength assessments.

**References**