# Recommendations for Developing the Game of Rugby Union

## (U7 – U18)

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# Contents

## 1. Executive Summary

- The two primary questions which should be considered by the RFU are:
    1. Where should the emphasis be for age-group rugby?
    2. How can this emphasis be guided by coaching and the rules and competition framework at U7 – U18?

- We propose that in order to maximise the opportunities for; player retention, player development, with an emphasis on the development of ball handling and decision-making skills, an increase in players movement and involvement,  the game needs to emphasise these elements (as opposed to structured skills and contact).

- The robust effects of the relative age effect and individual differences in body size and rate of change in size during childhood-adolescence produces inequalities in size and physical attributes (e.g. strength, speed) in children of the same age-group. Furthermore, we predict that these biological phenomena will directly impact upon a player's involvement, potential success, and enjoyment of the game in its current format. A game which promotes physical contact may inadvertently benefit the portion of the age group that has a relative age and/or a size advantage..

- The principles behind our recommendations are therefore based on the idea that *all* young rugby players should have possession of the ball more often, in competitive games in order that they might better develop their core skills, become more involved in the handling  and evasive aspects of the game and have more fun. This can be achieved by:
    1. Maintaining an emphasis on the distribution of individual possession, handling and involvement (as described above) which is evident in TAG, but less evident in contact games up to Under 12
    2. Reducing numbers on the pitch.
    3. Prioritising the coaching  and application of core handling skills which may require a reduction in the emphasis of contact.
    4. Reducing the structure associated with lots of rules and formal elements.

- This may require creative and 'tough' (unpopular) recommendations. The question to be asked are; Do we want children playing a game where their physical inequalities are exposed, or do we want them to enjoy the experience of rugby and learn skills which will benefit them whether they remain in rugby or move to another sport in later years?

- Literature search and review revealed that nearly all research and practical interventions have focused on the U7-U12 age-range, and our recommendations are therefore supported by the research we have previously reviewed on *deliberate play* activities (Appendix 2). However this paper and recommendations are directed at the development of rugby from U7 to U18.

- Our research suggests that the current form of the game for U12s provides limited focused opportunities for the development of ball handling and decision making skills.

- We have been able to find less evidence to support 12-18 year old competition structure, and have therefore extended our discussion in Appendix 2 to cover more coaching / practice related issues.
- Specific proposals are presented for each age group to provide a greater focus on skill learning.
- Proposals for continued work are provided, including funding opportunities

## 2. Background

There have been three previous briefing reports; identifying the current state of sport science research in the areas of talent development, motor control, psychology and physiology:

1. *Decision-making skills in rugby: How (and when) can they be developed?* (November, 2008). (Appendix 1)
2. *Challenging the Continuum: An evidence-based approach to developing rugby skills based on cognitive, technical and physical developmental factors.* (December, 2008). (Appendix 2)
3. *Challenging the Continuum: Recommendations for future work.* (May, 2009). (Appendix 3)

Rather than repeat that which has been stated in these previous reports, we will attempt to make more concrete suggestions based on our in-depth review of the literature and on some pilot research which has already been carried out by ourselves and by members of the Rugby Football Union Coaching Department. We will however direct the reader to pages from these previous documents to support recommendations made. We make some general recommendations for what rugby should look like for 7-18 year olds, which we feel provides a scientifically rigorous 'starting point' to the development of the rules of the game. It is more difficult to make specific recommendations across age-groups for ALL aspects of the game (decision-making, contact, technical skills introduction, etc.), but we have made some suggestions for consideration.

We start by considering some over-riding principles of the game of rugby for young players.
- What should it look like?
- Who should be the focus of the game (players, coaches, referees)?
- Is there an obligation to develop key skills for *all* players?
- What are these key skills?

It is difficult to consider every aspect of a multi-skill sport like rugby union, but, we hope that we do provide some suggestions to kick-start debate about the way in which the RFU wants age-group rugby to be played and where the emphasis should be placed. We appreciate that our recommendations do not address the impact these changes may have on coaching, although we have focused extensively on how Côtè's Developmental Model of Sport Participation (DMSP) may apply to coaching throughout the sampling to investment years (7-18 and beyond) (see Appendix 2, *Section 5, P39-49).* However, we feel that the RFU can influence coaching behaviour by addressing the rules of the game by which teams (and hence coaches) are judged. If the game rewards big players breaking through tackles, then this is what (many) coaches will place an emphasis on. Thus, as our brief, we are focusing on the environment in which rugby competition is structured, rather than the coaching sessions between games. There were few examples of best

practice in this regard *(see MUFC & RFL examples; Appendix 2; Section 6, P 50-57 – Appendix 2).* We recognise however, that the 'former' (the competitive environment) clearly has a considerable effect on the 'latter' (coaching behaviours). Indeed, in the coaching and education literature, such *operant conditioning* is a typically adopted strategy for creating learning conditions: reward behaviours you want to encourage and punish/ignore behaviours you don't want to encourage.

We see the role of the RFU as being primarily to set these ground rules for the behaviours it wants emphasised. The two key questions which need to be answered are therefore:

1. **What behaviours should be <u>emphasised</u> at the various age group levels?**
2. **How should the rules and structures be designed to help <u>encourage</u> these behaviours?**

The current structure of age-group rugby; based as it is on the senior game *(see Appendix 2 P25 for our comparison of a top-down vs bottom-up approach to designing junior rugby rules)* may be emphasising 'win at all cost' behaviours as opposed to encouraging rugby skill development during a child's optimal learning period. We stress that our recommendations do not reflect a belief that competition "is bad", but that any *emphasis* of competition should be aimed more at rewarding skilful play for child rugby players (based on Cote's DMSP model). We have also previously stated that a focus on structured skills like scrummaging may be 'wasted' as children will mature at various rates and the prop forward at U9 may be physiologically closer to a centre by U16 (*Appendix 2, P25)*. We therefore suggest that the responsibility for the RFU is to help develop core, key skills for all players during this 'window of trainability' that exists during their U7-U14 period.

# 3. Principles of (Children's) Rugby

One way to guide what the game for children should be like is to consider some principals of rugby for children. Where should the emphasis be in order to encourage more children to take up (and continue playing) the game? In discussion with the RFU Coaching Department we feel that the following principles provide a useful starting point:

1. Enjoyment
   - Sport is fun for many children, but why rugby compared to other sports?
2. Involvement
   - How often does each player get possession of the ball?
   - How much time do they spend standing around?
   - How often does each player support or tackle, ruck and maul, push or jump?
3. Skill development
   - What key (and transferable) skills does the game emphasise?
     a. Decision-making
     b. Ball handling
     c. Game understanding
     d. Running, agility, evasion and fitness
     e. Communication
4. Values of the game
5. How can the unique nature, core values and ethos of rugby be represented, promoted and instilled in young players
6. Child (not adult) centred
   - Currently the referee is critical as there are many (complex) rules imposed by the continuum, whereas children, when left to their own devices tend to play with limited rules (see Report 2; Section 4). Simplifying the rules may assist in reducing the influence of the referee whilst satisfying the expectations of parents.

This list is not exhaustive but it might start to highlight how the emphasis of the junior game may need to switch to maximise some of these key principles. These are also key considerations in Côté's DMSP model (Appendix 2, P41-42) as he argues that the coach's role is to ensure appropriate developmental outcomes in athletes, based on the 4 C's (Competence, Confidence, Connection and Character). Coaching effectiveness should therefore be defined in terms of how coaches meets their athletes' needs and help them fulfil their goals.

## 4. Where is the (current) emphasis in rugby?

While it is recognised that rugby is a multi-faceted game, there is a clear emphasis on 'contact' and 'bigger is better' in the senior game, with less emphasis on skill. The comments below from Dr James Robson (the Lion's doctor for the last five tours) after the recent Lion's tour appear to offer a warning to where this will lead in terms of players' health and well-being.

*"I hope, at some point, that welfare will become a bigger part of player management. There's a lot of talk and rhetoric but, for the players' sake, I hope more action is taken…We're reaching a level where <u>players have gotten too big for their skill levels.</u> They've become too muscle-bound and too bulky and I think you may see changes in their physical nature in order to speed up the game and introduce a higher level of skill." (July, 2009)*

The expressed concern is that the emphasis on contact has filtered down to other age-group levels, where less-conditioned and less physically mature players will be seriously injured in increasingly frequent numbers. Evidence already exists of this culture of 'bigger is better' filtering down to the U18 level in international rugby. The current South African U18 elite group of 500 players attending the annual Craven Week weigh on average 83kg (compared to an average of 73kg twenty years ago). Amazingly, the South African U18 schools squad of 21 selected from these players weigh on average 96kg! In England, the current U18 team are on average heavier than the England World Cup winning team of 2003. Research from Australia suggests that the number of injuries in child rugby spikes dramatically at U12 at the start of 15-a-side rugby. This is something with which they are concerned.

While contact is important at the senior level, skill level improvements could be instigated at the lower age group levels through an emphasis on skilled-behaviours like ball-handling, running in support and decision-making. We propose that the game needs to be more *ball-focused* (as opposed to contact-focused) at the younger ages. Support for our position comes from:

1. Research on the benefits of *deliberate play* activities *(Appendix 2, Sections 3, 4 and 5)*.
2. Research on injury rates in Australian youth rugby.
3. The findings from the research we have already undertaken and assimilated on the state of the game as it is at present.

# 5. Research on the 'State of the Game'

The following research data are limited in their sample size and therefore their ability to reflect the national situation; however the results found have been 'validated' by the views of experienced coaches from within the RFU (and from similar pilot data in Australia). Our intention is to collect and assess more data from age-group rugby teams in extended versions of this project (see section 8), but we make our tentative recommendations based on what we have been able to determine thus far. We provide some data taken from three different sources between May and July of this year:

1. The National 17s held at Worcester Warriors' ground, involving 8 teams and four finals (from Shield to National Cup and35 minutes each way).
2. An U12 rugby festival held in Oakhampton, Devon (7 minutes each way).
3. The National TAG festival at Rugby School (8-a-side and(4 minutes each way) and a one off Tag game as part of a County Event in Oxfordshire (7-a-side and 6 minutes each way)

## 5.1. U17 data: Collected from Four Finals

This data (next page) was collected by a professional game analyst across four games of 70 minutes duration at Worcester Warriors' Six Ways stadium. The level of detail of the data reflects the typical game analysis factors considered by professional rugby teams. The interesting data from our perspective is the relative paucity of 'ball in hand' experience from most of the positions involved in this level of rugby (see highlighted data).

From the Table below (Table 1) it can be seen that

- Numbers, 8, 9 and 10 got 86 touches per game between them – The remainder of the team received 83 touches between them; with a winger expecting to touch the ball only 5 times a game. Even the outside centres may only expect 8 touches a game.
- Excluding 8, 9 & 10, every position, bar the inside centre, make more tackle attempts than they have the ball in hand.
- There were on average 12 scrums (1 every 5.9 mins), 11 lines-out (1 every,6.3 mins), 7 mauls (1 every 10 mins), 48 rucks (1 every 1.4 mins). (78 incidents = 1 per 56 seconds) Ball in play on average 32 minutes per game.
- The data from these four U17 games also revealed that the average number of tries in these games was two; and the average number of passes leading to a try was also two.
- What does this suggest about the emphasis for an individual in playing rugby at U17 level?
- If we consider that U12s and U14s play a similar game, although shorter in duration (which may further limit handling opportunities) are 5 touches a game enough opportunity to learn decision-making and ball handling skills in a 'real', competitive environment?

# 1. U17 data: Collected from Four

| | 1 | 1 Average (N=8) | 2 | 2 Average (N=8) | 3 | 3 Average (N=8) | 4 | 4 Average (N=8) | 5 | 5 Average (N=8) | 6 | 6 Average (N=8) | 7 | 7 Average (N=8) | 8 | 8 Average (N=8) | 9 | 9 Average (N=8) | 10 | 10 Average (N=8) | 11 | 11 Average (N=8) | 12 | 12 Average (N=8) | 13 | 13 Average (N=8) | 14 | 14 Average (N=8) | 15 | 15 Average (N=8) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Defensive Stats** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Tackles Attempted | 52 | 7 | 58 | 7 | 49 | 6 | 57 | 7 | 63 | 8 | 97 | 12 | 119 | 15 | 84 | 11 | 76 | 10 | 99 | 12 | 33 | 4 | 90 | 11 | 61 | 8 | 63 | 8 | 35 | 4 |
| Completed - Effective | 29 | 4 | 34 | 4 | 24 | 3 | 41 | 5 | 40 | 5 | 52 | 7 | 69 | 9 | 44 | 6 | 48 | 6 | 50 | 6 | 12 | 2 | 47 | 6 | 29 | 4 | 30 | 4 | 14 | 2 |
| Completed - Ineffective | 2 | 0 | 5 | 1 | 9 | 1 | 6 | 1 | 6 | 1 | 10 | 1 | 12 | 2 | 16 | 2 | 16 | 2 | 24 | 3 | 6 | 1 | 12 | 2 | 9 | 1 | 14 | 2 | 7 | 1 |
| Missed | 8 | 1 | 13 | 2 | 10 | 1 | 7 | 1 | 10 | 1 | 18 | 2 | 22 | 3 | 11 | 1 | 8 | 1 | 18 | 2 | 10 | 1 | 22 | 3 | 15 | 2 | 16 | 2 | 10 | 1 |
| Assist | 13 | 2 | 6 | 1 | 6 | 1 | 3 | 0 | 7 | 1 | 17 | 2 | 16 | 2 | 13 | 2 | 4 | 1 | 7 | 1 | 5 | 1 | 9 | 1 | 8 | 1 | 3 | 0 | 4 | 1 |
| % Tackles Effective | 56% | 56% | 59% | 59% | 49% | 49% | 72% | 72% | 63% | 63% | 54% | 54% | 58% | 58% | 52% | 52% | 63% | 63% | 51% | 51% | 36% | 36% | 52% | 52% | 48% | 48% | 48% | 48% | 40% | 40% |
| % Tackles Ineffective | 4% | 4% | 9% | 9% | 18% | 18% | 11% | 11% | 10% | 10% | 10% | 10% | 10% | 10% | 19% | 19% | 21% | 21% | 24% | 24% | 18% | 18% | 13% | 13% | 15% | 15% | 22% | 22% | 20% | 20% |
| % Tackles Missed | 15% | 15% | 22% | 22% | 20% | 20% | 12% | 12% | 16% | 16% | 19% | 19% | 18% | 18% | 13% | 13% | 11% | 11% | 18% | 18% | 30% | 30% | 24% | 24% | 25% | 25% | 25% | 25% | 29% | 29% |
| % Tackles Assist | 25% | 25% | 10% | 10% | 12% | 12% | 5% | 5% | 11% | 11% | 18% | 18% | 13% | 13% | 15% | 15% | 5% | 5% | 7% | 7% | 15% | 15% | 10% | 10% | 13% | 13% | 5% | 5% | 11% | 11% |
| **Attacking Stats** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ball in Hand | 33 | ④ | 39 | ⑤ | 30 | ④ | 50 | ⑥ | 38 | ⑤ | 40 | ⑤ | 78 | ⑩ | 118 | ⑮ | 354 | ㊹ | 213 | ㉗ | 46 | ⑥ | 94 | ⑫ | 67 | ⑧ | 40 | ⑤ | 93 | ⑫ |
| Pass Before Contact | 10 | 1 | 10 | 1 | 8 | 1 | 7 | 1 | 7 | 1 | 9 | 1 | 20 | 3 | 29 | 4 | 271 | 34 | 129 | 16 | 8 | 1 | 42 | 5 | 22 | 3 | 6 | 1 | 33 | 4 |
| Open Play Kick | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 3 | 43 | 5 | 3 | 0 | 9 | 1 | 10 | 1 | 3 | 0 | 24 | 3 |
| Ball Into Contact | 23 | 3 | 28 | 4 | 22 | 3 | 43 | 5 | 31 | 4 | 31 | 4 | 58 | 7 | 89 | 11 | 57 | 7 | 41 | 5 | 35 | 4 | 43 | 5 | 35 | 4 | 31 | 4 | 36 | 5 |
| Recycle | 17 | 2 | 14 | 2 | 17 | 2 | 30 | 4 | 19 | 2 | 23 | 3 | 38 | 5 | 53 | 7 | 28 | 4 | 17 | 2 | 21 | 3 | 25 | 3 | 22 | 3 | 15 | 2 | 15 | 2 |
| Offload | 2 | 0 | 7 | 1 | 4 | 1 | 7 | 1 | 7 | 1 | 5 | 1 | 14 | 2 | 29 | 4 | 15 | 2 | 10 | 1 | 5 | 1 | 10 | 1 | 8 | 1 | 9 | 1 | 9 | 1 |
| Lost In Contact | 4 | 1 | 7 | 1 | 1 | 0 | 6 | 1 | 5 | 1 | 3 | 0 | 6 | 1 | 7 | 1 | 14 | 2 | 14 | 2 | 9 | 1 | 8 | 1 | 5 | 1 | 7 | 1 | 12 | 2 |
| Recycle (%) | 83% | 83% | 75% | 75% | 95% | 95% | 86% | 86% | 84% | 84% | 90% | 90% | 90% | 90% | 92% | 92% | 75% | 75% | 66% | 66% | 74% | 74% | 81% | 81% | 86% | 86% | 77% | 77% | 67% | 67% |
| Lost (%) | 17% | 17% | 25% | 25% | 5% | 5% | 14% | 14% | 16% | 16% | 10% | 10% | 10% | 10% | 8% | 8% | 25% | 25% | 34% | 34% | 26% | 26% | 19% | 19% | 14% | 14% | 23% | 23% | 33% | 33% |
| Handling Error | 2 | 0 | 4 | 1 | 2 | 0 | 9 | 1 | 11 | 1 | 5 | 1 | 6 | 1 | 13 | 2 | 8 | 1 | 10 | 1 | 8 | 1 | 4 | 1 | 7 | 1 | 9 | 1 | 7 | 1 |
| Total Turnovers Conceded | 2 | 0 | 7 | 1 | 2 | 0 | 12 | 2 | 9 | 1 | 8 | 1 | 8 | 1 | 15 | 2 | 16 | 2 | 13 | 2 | 8 | 1 | 10 | 1 | 8 | 1 | 12 | 2 | 11 | 1 |
| Pen / Free Kick Conceded | 11 | 1 | 3 | 0 | 3 | 0 | 4 | 1 | 3 | 0 | 6 | 1 | 11 | 1 | 6 | 1 | 1 | 0 | 3 | 0 | 2 | 0 | 4 | 1 | 3 | 0 | 1 | 0 | 0 | 0 |

**Finals**

Table 1

## 5.2. U12 data collected from a rugby festival

We can compare this U17 data to some data collected during five games at an U12 rugby festival, in which the games were 7 minutes each way and where the team being followed got to the semi-finals and lost out on a final place by missing a conversion. There was not the possibility of coding data to the level of detail as with the U17 data, but we considered 'number of passes' to reflect the degree that more players might be involved.

- We found that that two thirds of contact situations occurred off either no pass (pick up and go) or after one pass, and only 16% of plays involved more than 2 passes.
- Furthermore, 19 tries were scored across the five games; none of which were scored directly off more than 2 passes (mirroring the data from the U17 game).
- There were also on average 5 scrums (1 every 2.8mins), 5 line-outs (1 every 2.8 mins), 4 mauls (1 every 3.5 mins) and 13 rucks ( 1 every 1.1 mins) a game. (27 incidents = 1 every 30 seconds)
- See charts below.
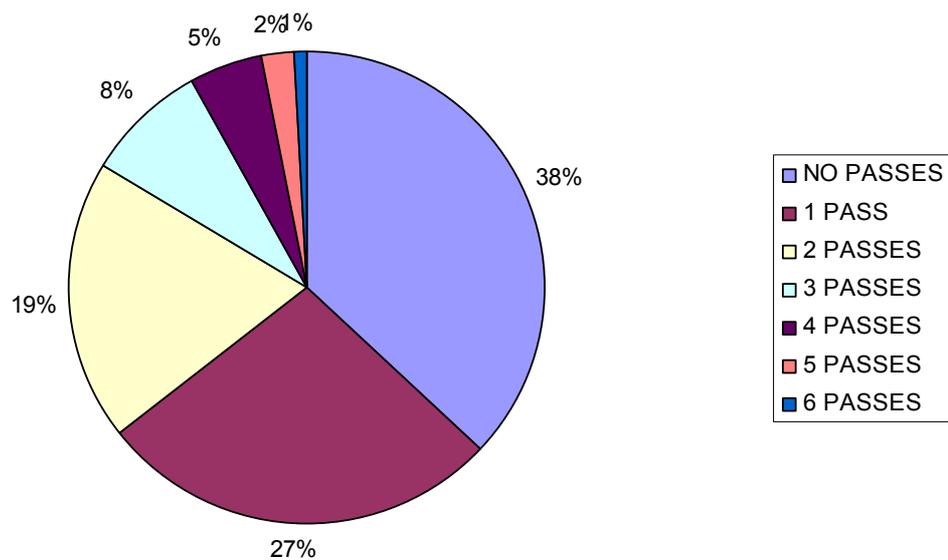


*Number of passes before contact*
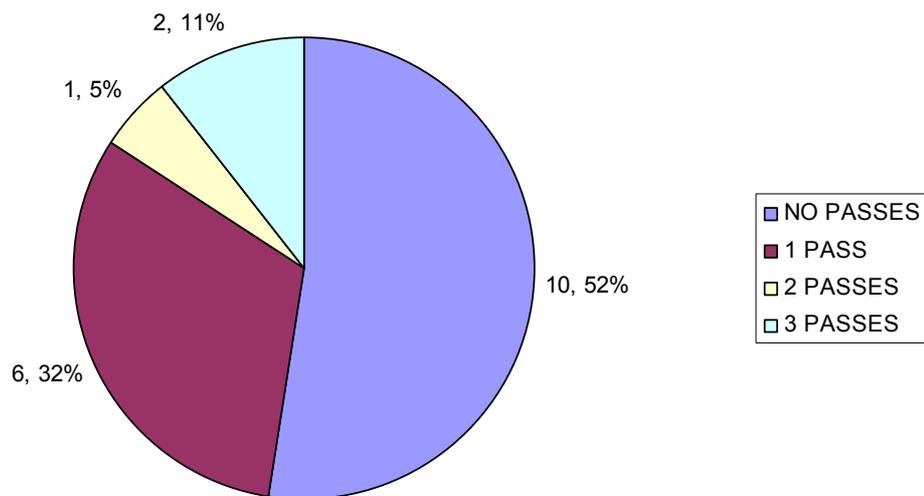
*Number of passes before a try*

## 5.3. U11 Tag Festival

Again, slightly different measures were collected for this analysis, reflecting availability of equipment etc. Two interesting findings are relevant:

1. Across the seven games analysed (8-a-side, 4 minute halves) there were on average six passes made before a try (the highest was 15!)
2. In a further 6 minute halves, 7 a side Tag game there were 124 times when the ball was in hand (an average of 9 per person: Range 3-19).

Both these results compare favourably to the data collected in the U12 and U17 games. The game clearly emphasises a 'pass and support' form of rugby as opposed to a 'look for contact' form. An individual in a TAG game is likely to get more opportunities to experience 2v1 situations, or decide when to change the direction of attack etc. than would be the case in a traditionally structured game.

# 6. Recommendations

## 6.1. Maintain an emphasis on TAG beyond U9

The results are very clear that TAG creates more opportunities for all players to get their hands on the ball (be involved) and to get experience at making passes under pressure. This is critical for three reasons:

1.  *Involvement = fun / participation*
2.  *Involvement = aerobic exercise / health benefits for all*
3.  *Opportunities to make decisions in game settings = development of decision-making skills*

We therefore suggest that TAG, and/or incremental variants of it, should have a larger role in participation in junior rugby. While TAG may not be exactly the same as the senior game, we are suggesting here that at the junior age levels it is more important to focus on ball handling, spatial awareness, aerobic fitness and decision making than driving into contact, scrums, line-outs etc. *(see previous reports).*

However it is recognised that the "set piece" (scrum/line-out) and the "break-down" (ruck/maul) do bring space to a game and introduces a further tactical element to the game Aspects of set piece/break down might be introduced within the TAG game to further increase game understanding. However. emphasis should be placed on all players participating in all positions throughout a game to increase understanding, experience and opportunity to play the ball. This is in line with rugby as a late specialisation and evasion sport (Appendix 2) and ensures that players who want to specialise as they progress in the game have a foundation of good basic skills.

### Support for a TAG-focus at U12

1.  *Deliberate play literature*: We reviewed research from a variety of sports that have demonstrated that for children under the age of 12 (*sampling*), there should be limited focus on structure and drills (Appendix 2; Sections 3 and 4). Children learn best by doing and pick up most of their skills by playing small sided games with limited rules and regulations (e.g., park football and rugby). Most of our second report dealt with the concept of deliberate play and the use of small-sided games (e.g., the MUFC and RFL games) so we will not labour it here. However, it is clear that the relatively unstructured nature of TAG provides an opportunity for children to get their hands on the ball and learn the key skills of passing, catching, support running, evasion, defensive tactics, etc. in a 'live' situation; similar to what children themselves would choose to play if given a rugby ball.  Even if some form of contact is introduced to TAG, it still remains more of a 'game' with less need for adult activities (structured rules, referees, etc.) than formal rugby.

2.  *Decision-making*: Research has shown that important building blocks of decision-making (e.g., pattern recognition, situational probabilities, perceptual skills) can be developed from the age of 7 onwards,

and expertise differences have been shown in sport from this age *(Appendix 1)*. The key is to simplify the number of stimuli (as young brains have limited working memory capacity) but to maintain a realistic setting. By being placed in more 2v1 and 3v2 situations decision making is likely to be improved in competitive settings. TAG again seems to provide more of these opportunities, as the idea is to search for space, not contact.

3. *Player Size*: The profound inequalities in body size and physical performance attributes during 7-18 years of age mean that a game focused on contact and set-pieces encourages a "bigger is better" mentality from a very young age, rather than skilled play and decision-making. TAG rewards ball skills and decision making which need to be emphasised during this critical period of development *(Report 1 – Appendix 1)*. Better skilled (in terms of decision-making) younger players should be better equipped to thrive once increased structure and contact is introduced to the game during the specialising and investment years (even if they are naturally smaller). Otherwise, rugby runs the risk of moving away from its maxim of being a game for all shapes and sizes and penalising small players.

4. *Involvement*: Our initial studies have demonstrated that there are more opportunities to get *involved* in the less structured game of TAG, than mini rugby. We intend to carry out more research to look at physiological markers of involvement by employing player worn GPS technology (e.g. running speed achieved, distance covered, frequency of sprints, movement patterns, impact forces etc) to determine if there may be differences in the total amount and distribution of movement between both games.

5. *Transitional Activities/Games* It is not within the scope and range of this research to suggest games which offer a transition from tag to tackle, and indeed that is better decided by those with expertise and experience in this area. However the recommendations should offer guidelines on how those games might be structured dependent on the key focus skills. However the impact on those key focus skills, decision-making and involvement (including retention) should be piloted and monitored prior to implementation.

## 6.2. Reduce numbers

Reducing numbers is a way to increase involvement and provide more opportunities for each individual to be involved in decision-making scenarios. We reviewed research in football (Appendix 2, P38-39; 57-58 and 68-69) highlighting the benefits of reduced numbers. Indeed it was demonstrated in football that by reducing numbers from 7v7 to 3v3, there was a threefold increase in ball touches over a 20-minute game. The structure of mini rugby (and as has also been evidenced by the U17 data we collected) means that only the half-backs really get this opportunity on a regular basis. With an emphasis on skill development (not competition) in the junior years, more players should be getting this opportunity. The MUFC experiment, (discussed in Appendix 2; P51-54) is a useful example of how reducing the number of children on a team increased the number of 'learning opportunities' (e.g., 1v1 scenarios in football).

Pilot research in rugby in Australia also recommends reducing numbers to allow more 'activities' to be performed by each player. However, the limited data available from rugby league and union (Appendix 2 P54-58) suggests that the RFU are adopting a similar structure to other federations in the northern hemisphere. We would suggest that this needs careful consideration if development opportunities are to be maximised. Smaller teams with more games on smaller pitches could ensure that all children get a game at the weekend if that is deemed necessary; however it may be limiting to think that larger teams means that more children get involved (see our data from the games we analysed – very few players are actually getting *involved*).

## 6.3. De-emphasise contact focus

We are cognizant that contact skills are a vital and characteristic feature of the sport and the acquisition and practice of these skills is essential if rugby is to maintain its integrity. While contact is a key component of rugby and part of what differentiates it from other ball sports, we argue that in order to emphasise ball handling at younger ages, contact will need to be de-emphasised. We do not suggest that contact should be eliminated, but that children should be looking for spaces and not contact; allowing a more in-depth grounding in the evasion and ball handling aspects of the game, which appears fundamentally lacking in the current structure. However it is recognised that coaching has a responsibility to establish the balance between evasion and contact, and Coach Education can make a significant contribution towards this end.

## 6.4. Reduce structure

Part of the deliberate play mindset is that children do not need the sort of structures, rules and rituals associated with adult games being applied to their games. Younger children should have limited structure imposed upon them and learn skills within these constraints. More structure needs to be added as children develop into adult forms of the game, but we need to ask whether this needs to be as early as it currently is. Could key skills not be developed from less structured; less rule-driven forms of the game? There are clearly implications for coaches here as coaching needs to move from a 'technical instruction coordinator' to more of a facilitator of learning opportunities.  One interesting aspect of the GUBOG approaches (Appendix 2: P 51-57) is that even these 'gold standard' projects really were only focused on the very young (U9s in football and U7s in rugby league). We would ask whether or not children up to the age of 12 would not benefit from such game-based learning opportunities. Do these young children really benefit from playing very specialised games while still in primary school? {See  quote from Eddie Jones in Appendix 2 P40}.

## 6.5. Manage competitive focus

Sport is inherently competitive which may often result in "winners and losers". However, the value of early involvement in competition is not well supported in the literature. First, there is increasing support for the ideas of Cote and colleagues that children in the sampling years (6-12) do not need competition beyond that

which will happen when a group of children get together to 'play games'. Second recent research examining the practice and competition profiles of Olympic champions suggests that many do not start early in one sport and develop their expertise through exposure to early competition. Third, the limited research in team sports suggests that the amount of competition is not a discriminatory factor in future success. Research in football (Appendix 2, P46-50) has demonstrated that the amount of team practice and sport specific play activities discriminated between Premier League Academy footballers and Recreational footballers aged 8-18. The amount of organised match-play encountered did not.

Competition does not have to only mean structured competition, and can include an emphasis on important considerations such as skill learning. The MUFC project de-emphasised the importance of goals scored (by not counting them and not even having goals in some of the sub-games). Children should be allowed to compete, but the focus of this should be beyond 'tries scored'. Points could be awarded for passes made (>5 might accrue points); skilled manoeuvres, etc. Clearly this is not straightforward, however the scoring system will determine the form of game played. If the RFU desire a game focusing on skill, then the game will have to provide the opportunity for skilled behaviours to be rewarded, and not just those which reward size. This should be aligned with Coach Education programmes and coaching resources which further promote that desire.



## Proposed Model: Windows of Learning for Key Rugby Attributes
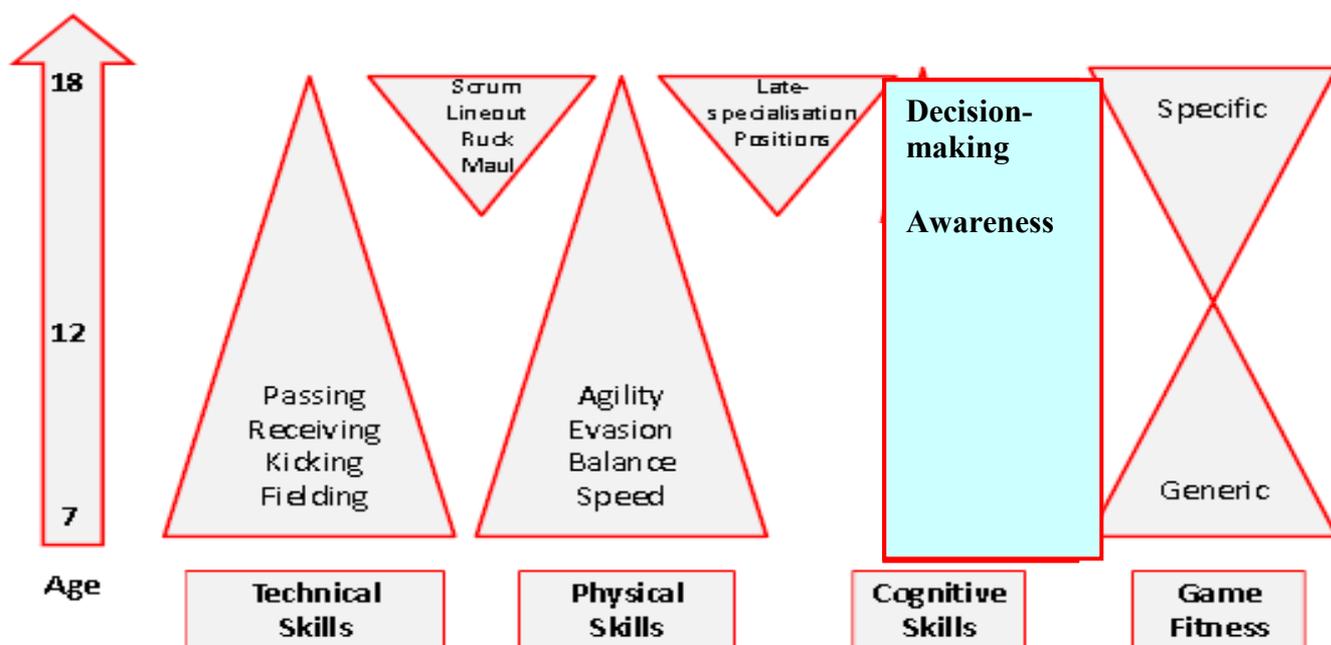
*A summary of the proposed model emphasising a focus on non-contact and non-specialisation during the early years of a rugby player's development. {See Appendix 4}*

# 7. Age-Group Recommendations

What follows are some tentative specific recommendations for some of the age-groups, outlining the scientific considerations underpinning our decisions and some issues to consider in designing laws of the game (based on our literature reviews; Appendices 1 and 2). These recommendations will hopefully stimulate thought on the development of new rules (see section 8).

## 7.1 U7/U8s

**Scientific considerations:**

- Genetic, maturational, and relative-age related differences in body size and physical performance already apparent.
- Steady increases in body size and performance capabilities expected during this period with inequalities relatively constant.
- Adolescent growth spurt occurs in girls from 8 years onwards resulting in accelerated growth in height and weight
- Potential for body size advantages of girls over boys to emerge during the under 8 season.
- Potential for an increased inequality in body size and performance capabilities in girls due to individual differences in maturation status from age 8 onwards.
- Critical cognitive development period (working memory etc.)
- Learn through 'doing' and have limited concentration levels for technical instruction (especially involving standing around)

**Considerations for RFU:**

- 5-a-side TAG on smaller pitch (e.g., 22x15 as FFR, 5 minutes each way). It is possible to play 'quarters' in order to get the overall aerobic stimulus; or to 'sub' on more players.
- Small numbers simplify environment for decision-making but allow players to get experience of passing under pressure
- Limited structure (no positions required).
- Limited refereeing required – no knock-on or forward pass rules (see RFL example for this age-group {Appendix 2 P55]. Take some of the constraints away from younger children to maintain the game as a non stop-start, rule-driven experience. Picking up balls from the floor (or pouncing upon them) is a useful core skill, important for senior rugby, so it might as well be practiced. Indeed learning opportunities may be developed from examples of children who 'break the rules' creatively.
- Any technical focus should be on fundamental movement and decision-making skills; perhaps via small-sided games (see MUFC and RFL examples, appendix 2; P51-57).

## 7.2 U9s/U10s

**<u>Scientific considerations:</u>**

- Genetic, maturational, and relative-age related differences in body size and physical performance apparent.
- Majority of girls to have initiated adolescent growth spurt by 10 years of age.
- Girls likely to display a height and weight advantage over boys at under 9 and 10.
- Potential for an increased inequality in body size and performance capabilities in girls due to individual differences in maturation status from age 8-10 years.
- Accelerated growth in height followed by body weight due to initiation of the adolescent growth spurt can be expected in early maturing boys from age 10 onwards.
- Potential for an increased inequality in body size and performance capabilities due to individual differences in maturation status particularly from age 10 onwards in boys.
- The body size advantage of girls over boys begins to diminish due to boys initiating their adolescent growth spurt.
- Cognitive development is still immature (especially in terms of developing situational probabilities and perceptual skills), so maintain a simplified environment, which still allows key decision-making parameters to be worked on. For example, kicking could be introduced as a potential solution to the problem of "how to get behind a defence".
- Children are still in sampling (deliberate play) age range so should be involved in game-like situations as often as possible – limited rules, limited (expert) supervision required.


**<u>Considerations for RFU:</u>**

- Maintain small numbers and smaller pitch sizes (e.g. 7-a-side TAG on a 35x25 pitch with 10-minute halves)
- Introduce a transitional contact game to be played <u>in addition</u>  to tag – i.e back to back, to accommodate needs and skills of all players
- Specific positions should, as far as possible be avoided in line with a late specialisation, however some form of 'shaping' of positions might be required (e.g., play quarters with positions changing every quarter, first three form the scrum).
- Scrum could be added as tactical device to create more space to attack, but again this should not, as far as possible, be at the expense of play-time..
- Other specific elements can be added (e.g. kicking) but the primary focus should be on ball handling, evasion and decision-making.

## 7.3 U11s/U12s

### Scientific considerations:

- All players expected to have initiated the accelerated growth in height and body weight by the twelfth year.
- On average girls will be achieving their peak rate of growth at age 12 with average yearly gains in height and body weight of 8.6 cm and 8.7 kg, respectively.
- Early maturing adolescent boys will attain peak rates of growth in height at age 12, increasing their height by approximately 10 cm in the year with peak weight velocity occurring slightly later.
- Peak height and weight velocity will occur in later years for average and late maturing boys.
- Large potential for increased inequality in body size and performance capabilities due to individual differences in maturation status.
- Still in the sampling age range (i.e. U12) so it is important that the children should be allowed to 'play' sport and benefit from increases in intrinsic motivation and perceptions of competence. This period (U7-U12) is absolutely critical in determining if children will stay involved in organised sport. The emphasis should therefore not be on organised, structured competitive situations where (de)selection is necessary.

### Considerations for RFU:

- Retention of reduced numbers and small pitch sizes is important to ensure that attacking play is focused on finding space (e.g. 9/10-a-side TAG on a larger pitch, 40x22, game time between 6 minutes (FFR, 2008-09) to 15 minutes (RFU) depending on physiological considerations - fatigue vs aerobic stimulus).
- Develop a transitional contact game to be played <u>in addition</u> to tag – i.e back to back, to accommodate needs and skills of all players
- As this age-group is still in the sampling period of development, there should be resistance to increase structure too quickly (Currently U12s play 'adult rugby' on a smaller pitch but with no flankers).
- Contact could be introduced in a form least likely to cause injuries.

## 7.4 U13s/U14s

**<u>Scientific considerations:</u>**

- On average, girls will display a reduced but steady rate of growth in body size.
- Late maturing girls will display peak growth rates in height and weight at age 13-14 years.
- On average, boys achieve their peak rate of growth in height from 13 years of age onwards, increasing height by an average of 10 cm during the year.
- On average, boys achieve their peak rate of growth in body weight around 14 years of age, increasing body weight by 10 kg during the year.
- Late maturing boys will only achieve peak height and weight velocity in later years (i.e. under 15-17).
- Greatest potential for body size and performance inequality exists at this age range due to the profound impact of individual differences in maturation status.
- Greatest potential for micro traumatic injury to the rapidly growing and maturing musculoskeletal system through overuse. Volume of high-intensity training should be monitored.
- Danger of 'pigeon-holing' players in set positions due to maturational status. Greater fluidity and exposure to various playing positions would appear sensible strategies to protect against an individual outgrowing their position or their position outgrowing them without the required skill-set to manage a successful position transition in later years.
- Children have now reached the *specialising* years so will need greater emphasis on instruction and on technical and role specific coaching.

**<u>Considerations for RFU:</u>**

- Rather than lose the benefits of TAG totally, we would recommend maintaining it in some form, due to the evasion nature and 'space searching' nature of the game. High profile TAG events might be used to promote this form of the game (it is not just a game for children who aren't 'tough' enough to play *real* rugby).
- Reduce numbers e.g 10 a-side rugby on a reduced sized pitch , 56x40 FFR 2008-09, 20 minutes per half).
- Potential to maintain an emphasis on playing quarters and swap positions every quarter (to ensure that all skills get practiced).
- It is important that an element of fun is maintained from the sampling years (despite the need to now focus on more technical aspects of the game and drill-like instruction). As the game starts to look more like senior rugby, coaching and practice time become more important in developing key long term skill development.

## 7.5 U15s/U16s

**Scientific considerations:**

- The large inequalities in body size and physical performance established up to age 15 may begin to diminish as late maturing adolescents reach peak height and weight velocity.
- A pronounced deceleration in the growth of early maturing players in contrast to the continued growth of late maturing players will impact on an individual's suitability to a given playing position.
- The game needs to consider both the adolescents who intend to play rugby at higher levels (investment phase) and those that want to play rugby from a recreational perspective. Individuals in the investment phase need to be specialising in the particular skills required for the positions they are investing in and recreational players need to feel that the game offers them the opportunity to get what they want out of a recreational pursuit.
- This is clearly the time to build upon the basic building blocks from the deliberate play years; adolescents have the required cognitive functioning to respond to technical instruction and the physical capabilities to learn physically demanding and specialist roles (e.g., front-row scrummaging).
- The scientific evidence is much sparser for the over 14s age-group and beyond in terms of skill development – the expectation is that if the groundwork is done in the earlier years then this is a period of consolidation and extension of capabilities (e.g. specialist roles).
- Training should still emphasise ball work and decision-making (not all 'tackle shield' just because contact is included) to build upon perceptual-cognitive skill learning.
- Competition and (de)selection should still not be over-emphasised.

**Considerations for RFU:**

- The rules of the game should now more closely reflect the senior game, although pitches may not be full sized and regulations for child safety may be maintained (lifting in lineouts / collapsing scrums etc.) Game duration might be maintained at current timings (30 minutes each half).
- There are major implications for coaches at this stage as the RFU will find it more difficult to emphasise desired behaviours through rules changes. Coach Education Programmes will further emphasise that coaches act in a manner appropriate for child welfare and long term skill development (See Appendix 2, P40-46 for some comments from Côté and colleagues).

## 7.6 U17s/U18s

**Scientific considerations:**

- Continued growth and development of physical performance in the late maturing player has the potential to impact playing position.
- Late maturing players generally display less weight for height and greater height than their early maturing peers.

**Considerations for RFU:**

- Our data showed that the game has a focus on defence, rather than ball movement which becomes a coaching issue if the rules of the game cannot 'direct' emphasis.

## 8. Recommendations for Continuing Work

We are currently carrying out two research projects as part of our initial proposal, which will hope to have preliminary findings by Easter 2010. This work includes an eye-tracking study of experienced player decision making in the 2v1 situation and game analysis of U12 mini rugby (including pass analysis, physiology data and self-report accounts). However, these studies will only tell us more about the state of the game in its present state, whereas we really need to test some of our recommendations in situ, before definitive recommendations can be made. To this end, we recently made some suggestions for future work to test our recommendations which we felt could be carried out with funding from Sport England's 'Innovation Fund' (Outline Proposal, June 2009; Appendix 4).

We appreciate that the RFU has other priorities and chose to champion an alternative submission for this funding. Fortunately, the extended research projects which we have put forward (as summarised below) could now be part-funded through the School's membership of the Centre for Sport, Leisure and Tourism at the University of Exeter, on behalf of the Economic and Social Research Council (ESRC). The ESRC is interested in how research can act as a driver for excellence in elite sports and greater basic engagement among young people towards greater public health. These objectives are driven by the need to demonstrate policy changes based on a 2012 legacy, but also clearly match the RFU's own objectives of greater participation in rugby and increased success at the highest level (including subsequent Olympics for 7's rugby). For an investment of £8k per year (over 3 years) the RFU would get 2 PhD students to work on these projects and the ESRC would pay £38k per year to cover the rest of the costs. In other words, for an investment of £24k across three years from the RFU, the ESRC (through the University of Exeter) would contribute £114k.

The general plan for the two PhD projects would be to collect further data on the game as it is played now and then set-up tournaments running variations of the game so we could collect objective and subjective data to support our findings. At least one iteration will be required as we fine-tune some of the rules to create the emphasis most desire by the RFU. This data could be compared to what we find for the current laws and provide scientifically rigorous data to base recommendations on.

*{NOTE: We have been discussing this research with the RFU since this initial proposal so some of what is written in the proceeding sections may be out of date. A specific project proposal will be drafted early in the New Year}*
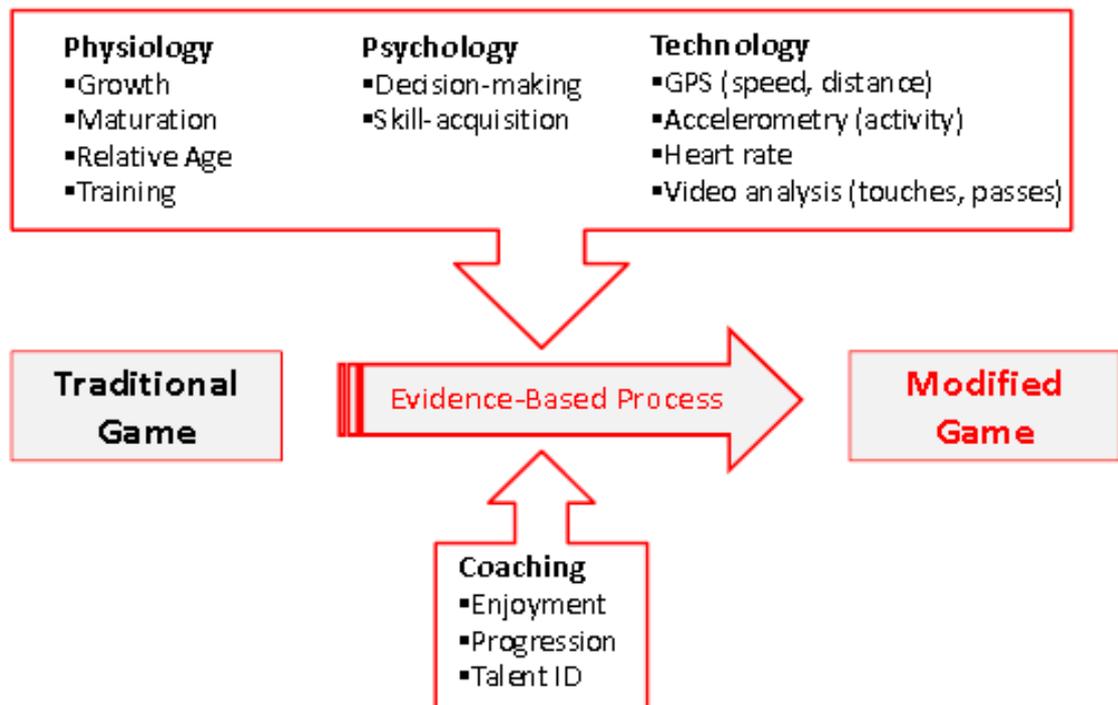
## 8.1 PhD Proposals

The aims of the PhD projects are to manipulate the laws of the game (as suggested in this paper) and to collect a variety of measures which can be used to base scientifically rigorous recommendations. The objectives will have a participation and performance focus and are specifically:

1. To encourage increased participation in children (boys and girls) and maintain the key aim of rugby for a game which is suitable for all shapes and sizes;
2. To deliver a game which results in higher levels of individual involvement;
3. To deliver a game which is matched to children's psychological and physiological development;
4. To develop a game which supports talent development through key skills of hand-eye coordination, decision-making, etc;
5. To develop a game that provides a level of involvement and activity intensity that will support the health improvement agenda.

It is expected that the adapted game will be more fun to play and will encourage more invasion / evasion scenarios and general activity. We would suggest that this will impact upon the take-up of rugby in primary schools and should reduce the drop-out from rugby clubs within this age-group and later in adolescence (as everyone should have a good base in key skills; rather than being pigeon-holed as a specialist). The performance impact can also be measured over time in subsequent longitudinal studies.

## Creatively Adapting Junior Rugby Union

*Informed by scientific knowledge, technological innovation, and coaching*

**Physiology**
- Growth
- Maturation
- Relative Age
- Training

**Psychology**
- Decision-making
- Skill-acquisition

**Technology**
- GPS (speed, distance)
- Accelerometry (activity)
- Heart rate
- Video analysis (touches, passes)

**Traditional Game** → Evidence-Based Process → **Modified Game**

**Coaching**
- Enjoyment
- Progression
- Talent ID

*The proposed evidence-based process of incorporating scientific knowledge, technological innovation, and coaching science to creatively adapt existing junior rugby to create a new modified game.*

We will work closely with the RFU Coaching Department to develop the specific rules and age-groups which we will work with initially (probably U8-U14) and the specific law variations we will test. We will utilise a variety of measures to help us make comparisons between the current game and the iterations which we propose and these will be done in a coordinated fashion (something that has been difficult with the piecemeal research being carried out currently). This is a significant undertaking involving considerable planning, testing and analyses which is why we feel it will need two post graduate students to work on it. Generally it can be expected that the PhD students will do two years of data collection and one year (in total) for additional analysis and thesis write-up. We suggest a timeline as follows:

**1-10 months:**
1. Organise tournaments across age groups (utilising current laws) in order that a consistent 'snap shot' of the game at present can be determined using a variety of objective and subjective measures of activity, performance, and enjoyment.
2. Write report for RFU.
3. Develop new laws of the game based on our tentative recommendations across at least three age groups.

**10-18 months:**
4. Test these laws across specially planned tournaments.
5. Analyse results and develop iterations dependent upon the impact of initial law variations.
6. Write report for RFU.

**18-28 months:**
7. Organise subsequent tournaments and analyse findings.
8. Write report for RFU

**28-36 months:**
9. Thesis write-up and overall position paper to RFU

The two students will need to work closely with colleagues in the RFU Coaching Department to organise the testing tournaments. We suggest that they plan and organise testing together but that they have separate areas of focus: one on the physiological data and one on the psychological/game analysis data. This will provide focus to their literature reviews and analyses.

## Measures

The impact of this programme of work on the youth game will be assessed by a range of skill-based, physiological, psychological and participation measures.

**1. Baseline measures** (assessed at start and end of pilot trial period for both control and adapted game cohorts)

1. Basic anthropometric measures (height, weight, BMI, skinfolds)
2. Basic physiological measures (flexibility, aerobic fitness, etc.)
3. Basic hand-eye coordination (catching task)
4. Basic decision-making (2v1 task)

**2. Rugby performance** (assessed using performance analysis software (Dartfish) and video data of all games from each cohort). The specific measures may vary for each age-group but will likely include:

1. Number of passes per phase (Is the ball going through the hands?)
2. Number of line breaks (is space being exploited?)
3. Number of 2v1s created
4. Number of times each player has the ball, and subsequent outcome (contact, pass, kick)
5. Time that the ball is in play (not standing around, waiting for structured 'events')./
6. etc.

**3. Physiological data** (activity measures)

1. GPS tracking (distance covered; speed data)
2. Heart rate profiling
3. Accelerometer data (rate of activity)
4. Video analysis (relating activity to phases of play)

**4. Subjective data** (perceptions of the game)

1. Perception of fun / involvement surveys
2. Interviews with a sub-section of the cohort (across various positions) to understand what is good about rugby and what could be improved
3. Parental perceptions of 'rugby' and their views on their children's' involvement.

**5. Additional data**

1. Percentage drop-out from teams (and from which position?)
2. Demographic data
3. Try-scoring data (who and how?)

etc.