

# Building Pathways in Irish Sport

Towards a plan for the sporting health  
and well-being of the nation



NATIONAL  
COACHING & TRAINING  
CENTRE

IONAD NÁISIÚNTA OILIÚNA AGUS TRAEÁLÁ



'The health and well-being of the nation and medals won at major games is a simple by-product of an effective sport system.'



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# Contents

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Glossary of Terms	2
Summary	3
1. Introduction	4
2. The need for a model of Long-Term Player/Athlete Development	6
3. The contribution of sport to the health and economy of Ireland	7
4. Gaps in the Irish sports system	10
5. The model of Long-Term Player/Athlete Development	13
6. The six-phase model of late specialisation sports	14
7. Player/athlete capacities along the pathway	18
8. Implications for coaching and coach education	19
9. Implications for NGBs	20
10. Cross-sport agreement	21
11. Building the Irish Long-Term Player/Athlete model and the coaching ladder	22
12. Long-Term Player/Athlete Development: The way forward	24
References and footnotes	26
Appendices	
1. Overview of the Long-Term Player/Athlete Development model	29
2. Statement of player/athlete capacities at each phase of the model	30
3. Bowls pathway: statement of bowler capacities	34
4. Long-Term Player/Athlete Development - Trainability	36
5. Long-Term Player/Athlete Development - Periodisation	37
6. Physical, mental/cognitive and emotional development in children	38

# Glossary of terms

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*Some key terms are used in the paper, and these are explained below.*

The terms **growth** and **maturation** are often used together, sometimes synonymously. However, each refers to specific biological activities. <sup>1</sup>

**Growth** refers to observable step-by-step changes in quantity, for example, height, weight and body fat. <sup>2</sup>

**Maturation** refers to “qualitative system changes, both structural and functional in nature, in the organism’s progress toward maturity, for example, the change of cartilage to bone in the skeleton.” <sup>3</sup>

**Development** refers to “the interrelationship between growth and maturation in relation to the passage of time. The concept of development also includes the social, emotional, intellectual and motor realms of the child.” <sup>4</sup>

**Skeletal age** refers to the maturity of the skeleton “determined by the degree of ossification of the bone structure.” <sup>5</sup> It is a “measure of age that takes into consideration how far given bones have progressed toward maturity, not in size but with respect to shape and position to one another”. <sup>6</sup>

**Chronological age** refers to “the number of years and days elapsed since birth” <sup>7</sup> “Growth, development and maturation operate in a time framework - that is, the child’s chronological age... children of the same chronological age can differ by several years in their level of biological maturation. The integrated nature of growth and maturation is achieved by the interaction of genes, hormones, nutrients, and the physical and psychosocial environments in which the individual lives. This complex interaction regulates the child’s growth, neuromuscular maturation, sexual maturation, and general physical metamorphosis during the first two decades of life.” <sup>8</sup>

**Postnatal growth** is commonly, although sometimes arbitrarily, divided into three or four age periods, including infancy, childhood, adolescence, and puberty.

**Childhood** ordinarily spans from the end of infancy (the first birthday) to the start of adolescence and is characterised by relatively steady progress in children’s growth and maturation and rapid progress in their neuromuscular or motor development. It is often divided into early childhood, which includes pre-school children aged one to five years, and middle childhood, which includes elementary school age children, aged six through to the onset of adolescence.

**Adolescence** is a more difficult period to define in terms of the time of its onset and termination. During this period, most bodily systems become adult both structurally and functionally. Structurally,

adolescence begins with an acceleration in the rate of growth in stature, which marks the onset of the adolescent growth spurt. The rate of statural growth reaches a peak, begins a slower or decelerative phase, and finally terminates with the attainment of adult stature. Functionally, adolescence is usually viewed in terms of sexual maturation, which begins with changes in the neuroendocrine system prior to overt physical changes and terminates with the attainment of mature reproductive function. <sup>1,9</sup>

**Puberty** refers to the point at which an individual is sexually mature and able to reproduce.

**Peak height velocity (PHV)** refers to the maximum rate of growth in stature during the growth spurt. The age of maximum velocity of growth is called the age at PHV. <sup>1</sup>

**Critical periods of development:** A critical period refers to a point in the development of a specific behaviour when experience or training has an optimal effect on development. <sup>1</sup>

**Readiness:** Refers to the child’s level of growth, maturity, and development which enables him/her to perform tasks and meet demands through training and competition. Researchers also referred to “readiness and critical periods” of trainability during growth and development of young athletes, as the stimuli have to be timed to achieve optimum adaptation with regard to motor skills, muscular and/or aerobic power. <sup>9</sup> These critical periods are referred to as ‘windows of trainability’ in this paper.

**Adaptation** refers to a stimulus or a series of stimuli which induces functional and/or morphological changes in the organism. Naturally, the level or degree of adaptation is dependent on the genetic endowment of an individual. However, the general trends or patterns of adaptation are identified by physiological research and the facts and guidelines concerning the different adaptation processes, such as adaptation to muscular endurance or maximum strength, are clearly delineated.

**Trainability** refers to the genetic endowment of players/athletes, as they respond individually to specific stimuli and adapt to it accordingly. It is also defined as “the responsiveness of developing individuals at different stages of growth and maturation to the training stimulus.” <sup>10</sup>

# Summary

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## “The health and well-being of the nation and medals won at major games is a simple by-product of an effective sport system”

*This consultation paper outlines a proposed Irish model of Long-Term Player/Athlete Development (LTPAD). A model which is based on the needs of our players/athletes and on international best practice will help to underpin the objectives of our sports organisations, the Irish Sports Council and of Government. The paper also signals a number of implications arising from the model for coaching and coach education within the National Coaching Development Programme (NCDP).*

The paper was developed by the Technical Advisory Group (TAG) of the National Coaching and Training Centre (NCTC) and is aimed at opening a period of consultation and debate on the most appropriate model for Long-Term Player/Athlete Development in Ireland. A number of gaps in the Irish sports system were identified in the areas of physical literacy; competition and participation; coaching; pathways and long-term player/athlete development; inclusion; sports science and medical support. Arising from this analysis, the need for a model to underpin policy and practice in the long-term development of players/athletes was identified. The proposed model for long-term player/athlete development includes six main phases:

1. **FUNDamental**
2. **Learning to Train**
3. **Training to Train**
4. **Training to Compete**
5. **Training to Win**
6. **Retirement / Retainment**

The objectives and main activities associated with each phase are outlined in the paper. Particular emphasis is placed on the significance of the first two phases; namely the *FUNDamental* and *Learning to Train* stages. Developing the fundamental skills of sport and movement represents a gilt-edged investment for Irish society and provides the foundation for long-term player/athlete development. Fundamental skills open up pathways for our children which will yield many positive returns in healthy lifestyles, participation in sport and international success.

Following a period of consultation to the end of 2003, NCTC will employ the findings to inform, guide and evaluate its work in coaching and player/athlete services. A series of recommendations for wider action is also outlined and it is envisaged that these actions will be communicated to the relevant agencies, following the formal consideration of the consultation paper by the Irish Sports Council.

# Building Pathways in Irish sport

Towards a plan for the sporting health and well-being of the nation

## 1 Introduction

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*Sport is an important part of Government policy. Through the establishment of the Department of Arts, Sport and Tourism and the Irish Sports Council, the Government has recognised the contribution that sport makes to the social and economic development of the nation. The Irish Sports Council strategy, Sport for Life states: "Sport strengthens our bodies, sharpens our minds, brings us together and gives us a sense of national identity." Maximising participation, performance and excellence are stated goals of the Council.* <sup>12</sup>

This paper has been developed by the Technical Advisory Group (TAG) of the National Coaching and Training Centre (NCTC). The membership of TAG is as follows:

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**Mr Stephen Aboud**

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**Mr Billy Kennedy**

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# ‘Developing the fundamental skills of sport and movement represents a gilt-edged investment for Irish society.’

**Mr Peter McCabe**

Sports Institute Northern Ireland

**Mr Patsy McGonagle**

Letterkenny Institute of Technology

**Mr Thor Nilsen**

Irish Amateur Rowing Union

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National Coaching and Training Centre

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**Mr Michael Whelan**

Dublin Institute of Technology

During the course of TAG meetings it became apparent that a consideration of long-term player/athlete development could not take place in isolation from the workings of the wider sport, education and health systems. Accordingly, as well as proposing a model of long-term player/athlete development, this paper will also address some of the key issues facing the Irish sport system, with special reference to life-long recreational physical activities and competitive sport. Social, technological and economic changes during the 1990’s in Irish society have highlighted the need for the establishment of an integrated sport system which is geared towards the well-being of the entire population in terms of, health, physical activity, fitness and performance.<sup>13</sup> A model of long-term player/athlete development which is specific to Irish needs and which is agreed by all key agencies will make an important contribution to the development of such a system.

## 2 The need for an Irish model of Long-Term Player/Athlete Development (LTPAD)

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**“It takes 10 years of extensive training to excel in anything.”**

HERBERT SIMON - NOBEL LAUREATE

*Scientific research has concluded that it takes eight-to-twelve years of training for a talented player/athlete to reach elite levels.<sup>14 15 16</sup> This is called the ten-year or 10,000 hour rule, which translates to slightly more than three hours of practice daily for ten years.<sup>17</sup> Unfortunately, parents and coaches in many sports still approach training with an attitude best characterised as "peaking by Friday", where a short term approach is taken to training and performance with an over-emphasis on immediate results.<sup>18</sup> We now know that a long-term commitment to practice and training is required to produce elite players/athletes in all sports.*

A specific and well-planned practice, training, competition and recovery regime will ensure optimum development throughout a player/athlete's career. Ultimately, sustained success comes from training and performing well over the long-term rather than winning in the short-term. There is no short-cut to success in athletic preparation. Rushing competition will always result in shortcomings in physical, technical, tactical, mental, personal and lifestyle capacities.

As Ireland moves towards the further development of its sports system, the need to clearly map out the phases along the player/athlete pathway has become evident.<sup>19</sup> The Irish Sports Council's three-pronged strategy of participation, performance and excellence has posed a challenge to all agencies within the sports system to consider their objectives, structures and strategies in pursuit of these goals.<sup>139</sup> In the case of NCTC, the need to map out the stages of player/athlete development in the form of a clear LTPAD model, has become a high priority for the following reasons:

- to develop a generic and empirically-based model which guides thinking, practice and the services provided by the Centre
- to provide a template for mapping sport-specific and long-term player/athlete models
- to define the technical, tactical, mental, physical, lifestyle and personal capacities required at each phase of the model, with a view to creating clear pathways for players/athletes within each sport
- to further evolve the structure and content of the NCDP, so that coaches are equipped with the necessary knowledge and skills to help maximise the potential of players and athletes at the appropriate stage(s) of their development.

This consultation paper is aimed at opening a period of consultation and debate to the end of 2003 on the most appropriate model for Long-Term Player/Athlete Development in Ireland, in the context of the policies of the Irish Sports Council. Once an agreed LTPAD model is adopted, it will guide NCTC work with its partner sports organisations in coaching and player/athlete services.



### 3 The contribution of sport to the health and economy of Ireland

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*The design of the LTPAD model has much wider implications than the work of NCTC. It is recognised that all agencies involved in sport delivery have a stake in such a model. The Irish Sports Council as the lead agency for Irish sport, the Department of Education and Science and the Department of Health and Children are likely to have a particular interest in the shape of the model which will emerge from the current process. In addition, National Governing Bodies (NGBs); Olympic Council of Ireland; Paralympic Council of Ireland; Local Sports Partnerships (LSPs); educational institutions and club/community agencies all have a key stake in the format and implementation of the LTPAD model.*

The Government's National Development Plan has stated that: "Improving the health of the population enhances individual and social capital and thus supports economic and human development at local community level and for the country as a whole".<sup>20</sup>

Recent technological and social changes have contributed to lifestyles in Ireland that are more and more characterised by a sedentary way of life. The population has become increasingly overweight and obese and the health care system is beginning to shoulder the burden of hypokinetic diseases (i.e. those relating to inactivity and unhealthy lifestyles).<sup>13e</sup>

Deaths due to coronary heart disease in Ireland are the highest in Europe,<sup>21</sup> while obesity has doubled among Irish men since 1990.<sup>22</sup> The present practice in many countries, including Ireland, is to "patch the gaps" of the existing systems. For example, significant evidence exists that provision for physical education and sport among primary-age children in this country is under-developed.<sup>13g 23 24 25</sup> A systematic approach is required which will provide the foundation for:

- physical education and school sports activities for young people
- recreational life-long physical activity and a positive approach to health
- high performance competitive sports

There are many benefits to be gained from a more comprehensive approach to building the sport system. For example:

**Reports from our laboratory and elsewhere have suggested that a number of important social and economic benefits are associated with an increase of physical activity. Gains are seen in the workplace (greater productivity and reduced absenteeism, turnover, and industrial injuries), in the health care system (fewer physician visits and less need for hospital utilisation and geriatric care) and in lifestyle (reduction of appraised age and a lesser incidence of cigarette and alcohol abuse). Each of the "western" nations might save billions of dollars if regular exercise were to be adopted by their entire population.**<sup>26</sup>

In a recent Irish study, it was concluded that: "...physically inactive adults are at increase risk of cardiovascular disease (CVD), hypertension, diabetes mellitus (Type 2), osteoporosis, various cancers, anxiety and depression. In addition, a sedentary lifestyle contributes to the development of obesity while participation in physical activity aids long term maintenance of weight reduction and slows down weight gain over time." The study further noted obesity levels among adults in Ireland which gave significant cause for concern.<sup>27</sup>

A recent Northern Ireland study has found that 29.3% of coronary heart disease; 44.3% of stroke deaths and 24.8% of colon cancer deaths were avoidable through increased levels of physical activity.<sup>28</sup> These findings are supported by the United States Surgeon General who concluded that, “Physical activity reduces the risk of premature mortality in general, and of coronary heart disease, hypertension, colon cancer and diabetes mellitus in particular. Physical activity also improves mental health and is important for the health of muscles, bones and joints”.<sup>29</sup>

The importance of physical activity to the health of the nation has been identified in a number of policy statements. The Department of Health and Children, in its strategy has recognised the role that physical activity can play in promoting a more positive approach to health.<sup>30</sup>

The 1995 Health Promotion Strategy found that:

- cardiovascular disease is the major cause of death in Ireland (35%)
- we have the highest death rate from heart disease in the under 65 age group in Europe
- the extent of alcohol misuse among young people in Ireland is a source of concern

The Strategy recommended “encouraging participation in physical exercise and where appropriate, co-operating with the Department of Education, the Department of the Environment and other agencies to achieve this”.<sup>31</sup>

In promoting a culture of healthy physical activity, the role of physical education, school sports, participation (recreative, preventative, rehabilitative) and performance (amateur and professional sports) are mutually interdependent. Change in one will induce changes in the others. To develop the three parts independently is expensive and ineffective.

Participation or life-long physical activity and performance cannot be fully developed without **physical literacy**. **Physical literacy** is the ability to perform fundamental and specialised movement skills and the “knowledge, understanding and ability to analyse sport and physical activity”.<sup>32</sup> It also includes a positive disposition to participation. **Literacy** is the ability to read and write. **Numeracy** is the ability to use the basic principles of mathematics and science.

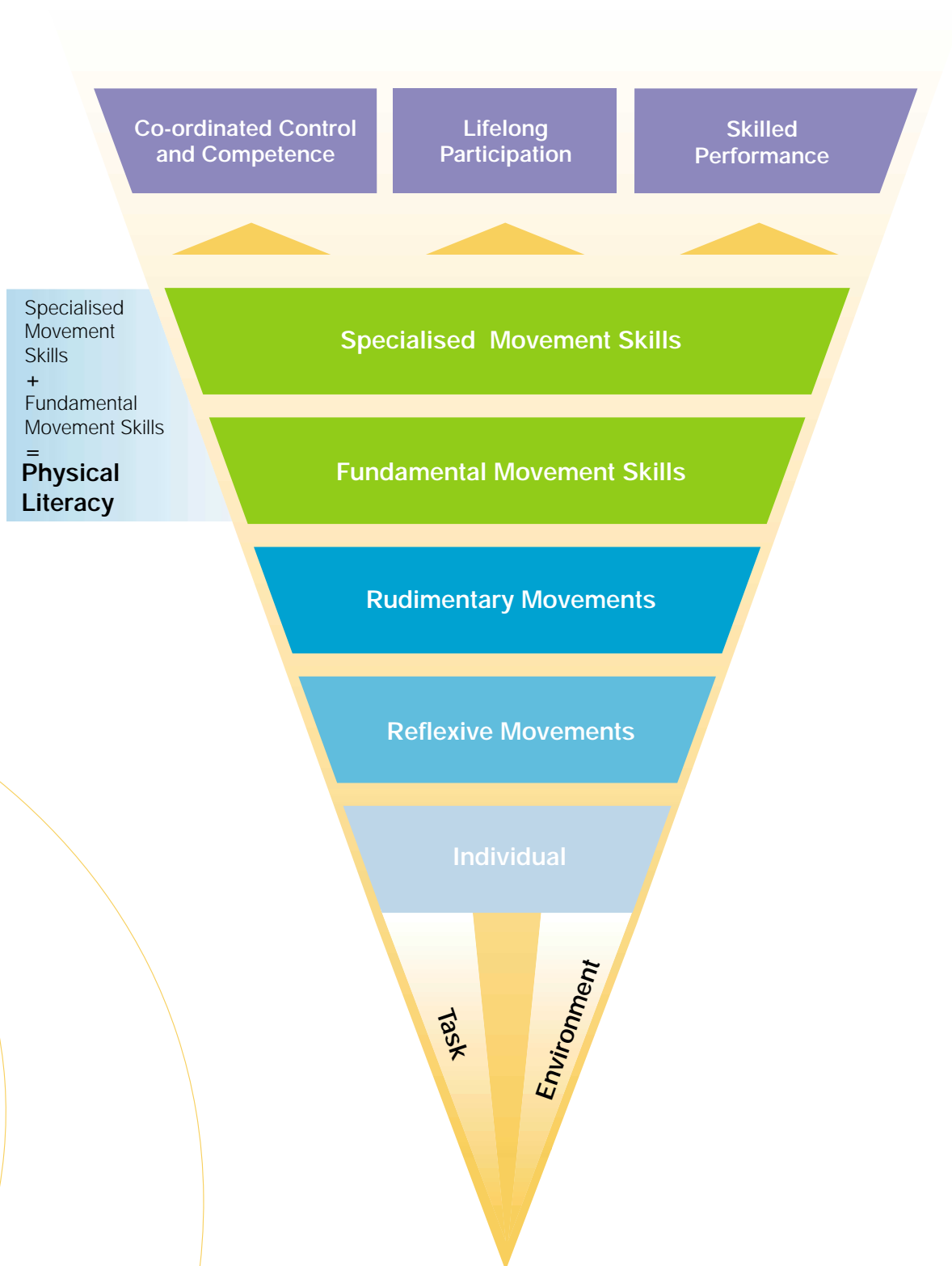
Within Ireland, while numeracy and literacy are highly valued, the development of physical literacy falls far short of what is necessary.<sup>33</sup> This imbalance needs to be addressed as a matter of priority. Every citizen should be provided with the opportunity to develop physical literacy in line with their choices and capabilities. There is a particular need to ensure that those with disabilities are afforded the opportunity to develop their physical literacy in an individualised way.

Physical literacy is the base for life-long physical activity and performance (see Figure 1). High performance (which includes medals at major games) through “role modelling” motivates involvement in recreational and competitive sport activity. Players/athletes retiring from competition will continue to compete at master’s competitions and will be involved in recreational and preventative sport activities, as well as administrating and coaching within sport.

Enhanced physical literacy can create a “win-win” situation for a very low cost by improving the health and well-being of the population through improved delivery of pre-school and school physical activities, and through participation in life-long physical and competitive sport activities.

Figure 1.

The relationship between physical literacy, lifelong physical activity participation and sport performance  
(Modified after Strattan, Ward and Smeeton, 2002) <sup>(32)</sup>



## 4 Gaps in the Irish sports system

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*There are a number of gaps within the Irish sports system which currently inhibit the development of physical literacy and of the foundation for lifelong participation and high performance. Evidence exists in most instances to highlight these gaps and is backed up by international trends and experiences.*

### A. PHYSICAL LITERACY

- The basic components of athletic preparation are not being implemented in a systemic manner, e.g. the ABC's of athleticism (agility, balance, co-ordination, speed) and the ABC's of athletics (running, jumping, throwing).<sup>34</sup>
- Exposure to basic motor skills, physical activity and physical education among primary-age Irish children is not adequate to promote the required levels of physical literacy to underpin participation, performance, excellence and health objectives.<sup>35</sup>
- There is an absence of a strong, well-implemented physical education curriculum at primary level.<sup>36</sup>
- Many primary school teachers lack the confidence to deliver a comprehensive physical education programme. The pre-service and in-service training of primary teachers needs to address this issue as a matter of priority.<sup>37</sup>
- There is a need for a concerted drive to implement a more comprehensive and relevant programme of physical education at second-level.<sup>38</sup>
- The inclusion of physical education in the education of students at primary and post-primary level is not guaranteed due to the current position as stated in Article 42.3.2 of the Irish constitution.<sup>39</sup>

### B. PRACTICE AND COMPETITION

- The nature and importance of practice in achieving excellence in sport is not widely understood. There tends to be an over-emphasis on competition to the detriment of practice at key phases of the development of children in sport.
- Competition, among the major team sports in particular, has led to the reduction of competition ages and an increased pressure on children to specialise sooner than necessary, resulting in early drop-out.<sup>40 41</sup>
- No clear guidelines exist for parents on the nature, level and number of sports activities that should be undertaken by their children in order to maximise their physical literacy and sporting potential.<sup>42</sup>
- The system of competition, or the non-existence of a rational system of competition, often inhibits optimal training and performance. Competitive calendar planning is not often based on technical knowledge, but on traditions and improvisations.<sup>43</sup>
- Adult competition schedules tend to be superimposed on young players/athletes. As a result, too much time is spent competing and not enough time is spent learning and mastering basic and sport specific skills (i.e. very low "contact" time in practicing and learning the basic skills of the sport).<sup>43</sup>
- An inappropriate focus on winning, rather than development, characterises the preparation of the developmental player/athlete.<sup>43</sup>

### C. COACHING

- In some cases, the most effective, experienced and/or professional coaches work at the elite level in the Irish sport system. Volunteers/Level 1 coaches coach the early phases dealing with physical literacy and skill development. However, this is ironic because it is these early phases that are the most critical to Long-Term Player/Athlete Development. Coaching at these levels requires knowledgeable and experienced coaches who can correctly organise and demonstrate age-appropriate skills and activities for the children.

Individuals coaching at these levels should also be well acquainted with the physiological, mental, cognitive and emotional development patterns of children and adolescents. The cognitive, emotional and physical development of children is not fully taken on board when training and competition programmes are being planned. The damage which might be done due to incompetent coaching during these early phases cannot be fully repaired later on. <sup>44</sup>

- Coach education programmes are often not designed with close enough reference to the phase of development at which the coaches will be operating. <sup>45</sup>
- Adult training programmes are often superimposed on children. This is detrimental because it means that coaching is conducted without sufficient regard to the principles of childhood development.
- The concept of “critical” or “sensitive” periods of accelerated adaptation to training is not widely perceived or understood by coaches. Too few coaches are in a position to capitalise on the “ windows of optimal trainability”. Therefore, children are not introduced to skill and fitness programmes at the time when they are developmentally ready to learn them. <sup>46</sup>
- Male training programmes are often superimposed on females and this is inappropriate, in light of the physiological and developmental differences between the two genders at critical phases of development. <sup>47</sup>
- In general, there is a need for a much stronger focus and investment on the early phases of development, including physical literacy, within coaching and coach education. <sup>48</sup>
- There is increasing pressure on volunteers and the recruitment, education and deployment of coaches and leaders remains a high priority. <sup>49</sup>

### D. PATHWAYS AND LONG-TERM PLAYER/ATHLETE DEVELOPMENT

- There is an absence of a clear model of Long-Term Player/Athlete Development.
- There is a need to clearly map out sport-specific pathways, based on a sound model of Long-Term Player/Athlete Development.
- Administration and coaching practice tends to focus on training and competition. Recruitment and talent development are largely neglected although retirement /retainment has received more attention recently. <sup>50</sup>
- Due to the shortcomings of player/athlete development during the early phases, many will never reach their optimal performance levels or genetic ceilings/potential. Regardless of the sophistication of the support programmes at the elite level, they do not compensate for the shortcomings in the system as listed above. <sup>51</sup> Thus, the recently established support systems (e.g. International Carding Scheme, Athens Enhancement Programme) will not be able to fulfil their full potential unless changes are made to the sport system to encourage preparation at early training ages. <sup>52</sup>

- The definition of ages for each phase requires further investigation for individuals with disabilities. The timeframes for each phase may vary depending on the nature, type and severity of disability. A further consideration is the age of occurrence of the disability – for instance is the disability congenital or as a result of post-natal trauma? One must remember that while children are learning the ABC's of physical literacy at the age of 6-9 years, a child with a disability may be learning life-coping skills such as mobility. <sup>53</sup>
- Although Ireland has made considerable progress in coach education, technical short and long-term periodisation programmes lack sophistication and integration. <sup>54</sup>
- The higher the performance level of the player/athlete, the better the support programmes are. Unfortunately, this means that the supports for the developmental player/athlete are at a lower level than required at this crucial phase of the pathway. <sup>55</sup>
- A high ratio of competition-to-training activities inhibits optimal athletic development, especially in team sports. <sup>56</sup>

## **E. INCLUSION**

- Mainstream coaches are reluctant to engage with players/athletes with disabilities. Coaches need guidance on the nature, type and severity of the varying disabilities. The provision of this knowledge can assist in the development of co-ordinated coaching plans with adapted skills where necessary, centred on the player/athlete with the disability, and then administered with competence by the mainstream coach.
- Mainstream NGBs, in general, need to be encouraged to be more proactive in providing opportunities for individuals with disabilities to participate.
- Lack of access to facilities, transport difficulties and remoteness from sports centre locations are significant barriers to participation among players/athletes with disabilities.
- There is evidence to suggest that socio-economic circumstances and gender act as barriers to players/athletes wishing to reach high levels. <sup>52</sup>

## **F. SPORTS SCIENCE AND MEDICAL SUPPORT**

- The effective integration of sports science and medical support into sport-specific programmes is still at a very early stage of development. The existing Irish sport science and sport medicine programmes are not fully integrated and sequenced with sport-specific technical-tactical activities. <sup>57</sup>
- There is a need to introduce basic sports science principles and practice at an early phase in the development of young players/athletes and at club level.
- There is a need to maximise access to existing resources, including training facilities. <sup>52</sup>

These gaps could be eliminated by the progressive development of integrated pathways in each sport, with national co-ordination and local implementation. They also suggest the need for a much stronger emphasis on the early phases of player/athlete development, including the development of physical literacy in school and community settings. A number of actions are proposed, the primary one being the development of a model for Long-Term Player/Athlete Development which can be applied in a sport-specific way to the Irish context.

# 5 The Model of Long-Term Player/Athlete Development

*In principle, sports can be classified as either early specialisation or late specialisation sports.<sup>58</sup> Early specialisation refers to the fact that some sports, such as diving, figure skating, golf, gymnastics, rhythmic gymnastics, and table tennis require early sport-specific specialisation in training.*

Late specialisation sports, such as athletics, combative sports, cycling, racquet sports, rowing and all team sports require a generalised approach to early training. In these sports, the emphasis of training should be on the development of general, fundamental motor and technical-tactical skills. Reviewing the existing literature helped us to conclude that early specialisation sports require a four-phase model, while late specialisation sports require a six-phase model:

Early Specialisation Model	Late Specialisation Model
1. Training to Train	1. FUNdamental
2. Training to Compete	2. Learning to Train
3. Training to Win	3. Training to Train
4. Retirement / Retainment	4. Training to Compete
	5. Training to Win
	6. Retirement / Retainment

These models are generic in nature and will require adjustment on a sport-specific basis.

Since there are few sports that can be categorised as early specialisation sports, this document will focus on late specialisation sports. It is intended to address the issue of early specialisation sports in more detail at a later stage. Each of the early specialisation sports should develop a sport-specific model: a generic model would lead to serious oversimplifications. The challenge for early specialisation sports is either to combine the FUNdamental and Learning to Train phases or to amalgamate them into a single phase, such as the Training to Train phase. For late specialisation sports, specialisation prior to age ten is not recommended since it contributes to early burn-out, drop-out and retirement from training and competition.<sup>32 59</sup>

# 6 The six-phase model of late specialisation sports

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*A five-phase model of late specialisation sports was presented to the National Coaching Forum in 2001 by Istvan Balyi, and this has been subsequently adapted to a six-phase model (Appendix 1). This model has been further refined by NCTC, based on consultation with NGBs and following further research (Appendix 2). A number of sport-specific examples have also been developed (Appendix 3 includes one such example), and it is suggested that each sport develop a model suited to its own needs, structure and pathway phases. It is also intended that the model will be re-worked to suit the needs of players/athletes with a disability, to take into account the phases which are most applicable to such players/athletes. The main elements of the Balyi-Hamilton model of Long-Term Player/Athlete Development are presented here, in a modified form to suit Irish circumstances.*

## 6.1 Phase 1 – The FUNdamental phase™

AGE: Males 6 to 9 / Females 6 to 8 years<sup>60</sup>

*Objective: Learn all fundamental movement skills (build overall motor skills)*

Fundamental movement skills should be practised and mastered before sport-specific skills are introduced. The development of these skills, using a positive and fun approach, will contribute significantly to future athletic achievements. Participation in a wide range of sports is also encouraged. This emphasis on motor development will produce players/athletes who have a better trainability for long-term sport-specific development.

Fundamental movement skills are observable as locomotor, manipulative and stability skills. There are three stages of fundamental movement skill development: initial (2-3 years), elementary (4-5 years) and mature (6-7 years).<sup>61</sup>

The FUNdamental phase should be well structured and fun! The emphasis is on the overall development of the child's physical capacities and fundamental movement skills. The ABC's of athleticism - agility, balance, coordination and speed are very important elements of this phase. Participation in as many sports as possible is encouraged. Speed, power and endurance are developed using basic and enjoyable games. Appropriate and correct running, jumping and throwing techniques are taught (the ABC's of athletics).

The first '**window of accelerated adaptation to speed**' or 'critical period of speed development' will occur during this phase, age 6-8 for girls and 7-9 for boys respectively.

Linear, lateral and multi-directional speed should be developed and the duration of the repetitions should be less than 5 seconds. This is often called the '**agility, quickness, change of direction**' window. Again, fun and games should be used for speed training and the volume of training should be lower.

Strength training during this phase should include exercises using the child's own body weight; medicine ball and Swiss ball exercises. Children should be introduced to the simple rules and ethics of sports. No periodisation takes place, but all programmes are structured and monitored. Activities revolve around the school year, and during summer and winter holidays multi-sport camps are recommended. If children and parents have a preferred sport, participation once or twice per week is recommended, but participation in other sports three or four times per week is essential for future excellence. If children later decide to leave the competitive stream, the skills they have acquired during the FUNdamental phase will still benefit them when they engage in recreational activities, which will enhance their quality of life and health.<sup>62</sup>



## 6.2 Phase 2 – The Learning to Train phase

AGE: Males 9 – 12 / Females 8 - 11

*Objective: Learn all fundamental sports skills (build overall sports skills)*

Specialised movement skills are developed from age 7 to 11, and are specialised sports skills. By-passing the fundamental and specialised skill development phase is likely to be detrimental to the child's future engagement in physical activity and sport. Early specialisation in late specialisation sports can also be detrimental to the preceding phases of skill development.<sup>11 32</sup>

One of the most important periods of motor development for children is between the ages of 9 to 12.<sup>63 64 65</sup> During this time children are developmentally ready to acquire general overall sports skills that are the cornerstones of all athletic development.

This is the **'window of accelerated adaptation to motor coordination'**. All fundamental movement skills should be further developed and general overall sports skills should be learnt during this phase.

If fundamental motor skill training is not developed between the ages of 8 to 11 (females) and 9 to 12 (males), a significant window of opportunity has been lost, compromising the ability of the young player/athlete to reach his/her full potential.

Strength should be developed by medicine ball, Swiss ball and own body-weight exercises, as well as hopping-bounding exercises (or routines). Endurance should be developed further by games and relays. Basic flexibility exercises should be introduced during this phase, while speed can be developed further with specific activities during the warm-up, such as agility, quickness and change of direction. Competition should be well structured. The most suitable framework is single periodisation for this phase, however for a few sports, sport-specific needs will warrant double periodisation (e.g. swimming, tennis). A 70:30 training-to-competition-ratio is recommended.

## 6.3 Phase 3 – The Training to Train phase <sup>TM</sup>

AGE: Males 12 to 16 / Females 11 to 15 years

*Objectives: Build the aerobic base, build strength towards the end of the phase and further develop sport-specific skills (build the "engine" and consolidate sport-specific skills)*

During the Training to Train phase young players/athletes consolidate basic sport-specific skills and tactics. The **'window of accelerated adaptation to aerobic and strength training'** occurs during this phase. Optimal aerobic trainability begins with the onset of Peak Height Velocity (PHV) or the major growth spurt during maturation. Aerobic training should be prioritised after the onset of PHV, while skill, speed and strength should be maintained or developed further. Special emphasis is also required for flexibility training, due to the sudden growth of bones, tendons, ligaments and muscles.

There are two windows of accelerated adaptation to strength training for females. Window one is immediately after PHV and window two begins with the onset of menarche. This window for males begins 12-18 months after PHV.

It should be noted that both aerobic and strength trainability is dependent on maturation levels, thus early, average or late maturers need a different emphasis placed on these components at different times. At present most of these decisions are made on chronological age (age groups) and not on individual needs/maturation level.

Single, double and occasionally (depending on sport-specific demands) triple periodisation is the optimal framework of preparation during this phase. During competitions players/athletes play to win and to do their best, but the major focus of training is on learning the basics as opposed to competing. Training and competition ratios are optimised because too many competitions waste valuable training time and conversely, not enough competition inhibits the practice of technical/tactical skills and learning how to cope with the physical and mental challenges presented during competition.

A 60:40 training-to-competition ratio is recommended by experts during the Training to Train phase and

the 40 percent competition ratio includes competition and competition-specific training. However, these percentages vary according to sport and individual specific needs. Players/athletes undertaking this type of preparation will be better prepared for competition in both the short and long-term, than those who focus solely on winning. During this phase, players/athletes train in competitive situations daily, in the form of practice matches or competitive games and drills.

The Training to Train phase addresses two of the critical or sensitive periods of physical development. Players/athletes who miss this phase of training will not reach their full potential, as these critical periods have been missed. The reason why so many players/athletes plateau during the later stage of their careers is primarily because of an over-emphasis on competition instead of on training during this important period in their athletic development.

The Learn to Train and Training to Train phases are the most important phases of athletic preparation. During these phases we 'make or break' a player/athlete!

#### **6.4 Phase 4 – The Training to Compete phase™**

AGE: Males 16 to 18 / Females 15 to 17 years

*Objectives: Optimise fitness preparation and sport, individual and position specific skills as well as performance (fine-tune “engine”, skills and performance)*

This phase of development is introduced after the goals and objectives of the Training to Train stage have been achieved. The training-to-competition and competition-specific training ratio now changes to 50:50. Fifty percent of available time is devoted to the development of technical and tactical skills and fitness improvements, and fifty percent is devoted to competition and competition-specific training.

During the Training to Compete phase, high intensity individual-event and position-specific training is provided to players/athletes year round. Players/athletes, who are now proficient at performing both basic and sport-specific skills, learn to perform these skills under a variety of competitive conditions during training. Special emphasis is placed on optimum preparation by modelling training and competition. Fitness programmes, recovery programmes, psychological preparation and technical development are now individually tailored to a greater degree. This emphasis on individual preparation addresses each player/athlete's individual strengths and weaknesses. Double and multiple periodisation is the optimal framework of preparation.

#### **6.5 Phase 5 – The Training to Win phase™**

AGE: Males 18 years and older / Females 17 years and older

*Objectives: Maximise fitness preparation and sport, individual and position specific skills as well as performance (maximise “engine”, skills and performance)*

This is the final phase of athletic preparation. All of the player/athlete's physical, technical, tactical, mental, personal and lifestyle capacities are now fully established and the focus of training has shifted to the maximisation of performance. Players/athletes are trained to peak for major competitions. Training is characterised by high intensity and relatively high volume. Frequent “prophylactic” (preventative) breaks help to prevent physical and mental burnouts. Training-to-competition ratio in this phase is 25:75, with the competition percentage including competition-specific training activities.

## 6.6 Phase 6 – The Retirement / Retention phase

*Objectives: Adjustment/Retain players/athletes for coaching, administration, officials, etc.*

This phase refers to the activities performed after a player/athlete has retired from competition permanently. During this final phase, some ex-players/athletes move into sport-related careers that may include coaching, officiating, sport administration, small business enterprises, master's competition, media, etc. It also involves an important period of adjustment for ex-players/athletes.

The possible positioning of the six phases of LTPAD within the Irish sports system is outlined in Figure 2. The model proposes a framework within which individuals progress along the pathway, based on their choices and capabilities. As wide a range of options as possible, in participation or performance, should be made available.

Figure 2.

### The LTPAD Model within the Irish Sport System

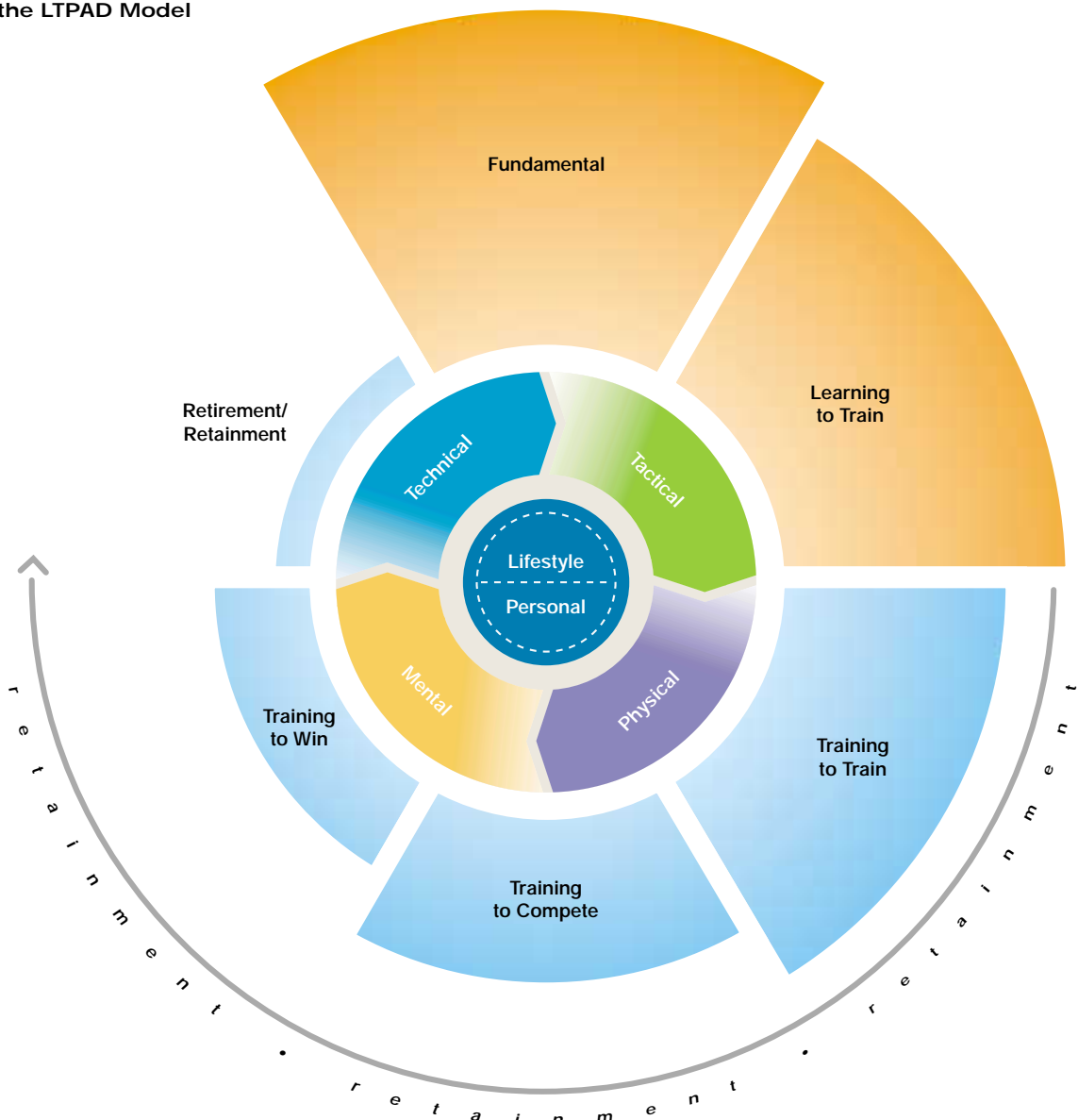


# 7 Player/Athlete capacities along the pathway

*“One of the key principles of the model for Long-Term Player/Athlete Development is that the player/athlete faces different demands at each phase of his/her development. The model outlines these demands and provides an indication of the capacities that need to be developed by players/athletes if they are to successfully negotiate each phase. A classification of the capacities required is outlined in Figure 3. This classification takes a holistic view of player/athlete development and includes technical, tactical, mental, physical, personal and lifestyle capacities.”<sup>66</sup>*

Figure 3.

**Player/Athlete capacities at each phase of the LTPAD Model**



# 8 Implications for coaching and coach education

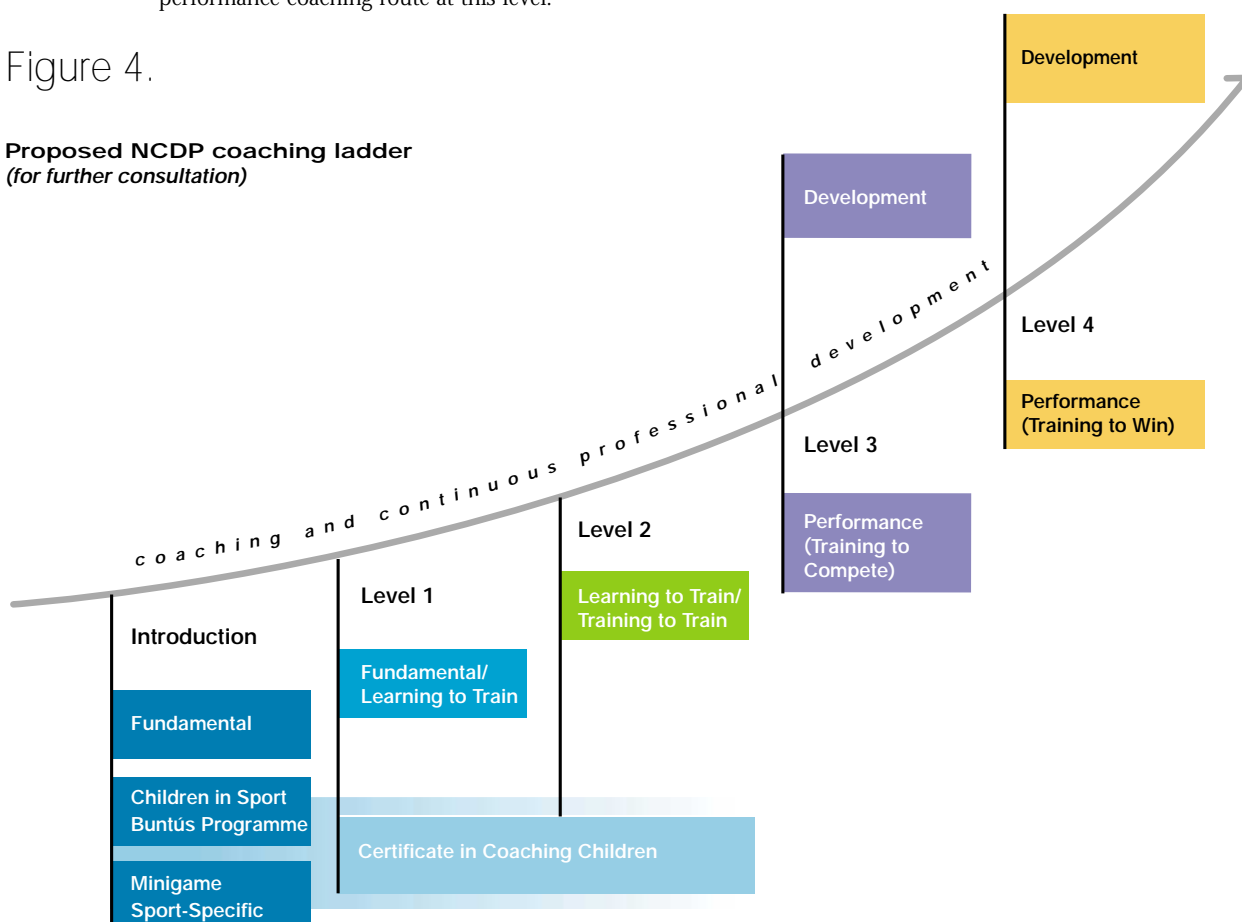
*It is essential that the education and deployment of coaches be closely matched to the needs of the appropriate phase(s) of the Long-Term Player/Athlete Development model. A proposed diversification of the NCDP coaching ladder is outlined in Figure 4.*

A key feature of the proposed new structure will be a greater emphasis on training coaches to deal with the Fundamental, Learning to Train and Training to Train phases. This emphasis will commence at Introduction to Coaching and Level 1, with appropriate links to the ISC Buntús Programme. Coaches at all levels will be provided with the opportunity to undertake courses/modules dealing with child development in sport. It is envisaged that coaches at Level 1 and Level 2 will be entitled to accumulate such courses, leading to a Certificate in Coaching Children. Continuous professional development opportunities will be available to keep coaches up-to-date.

A new Developmental Coach qualification will be put in place at Level 3, while maintaining the performance coaching route at this level.

Figure 4.

**Proposed NCDP coaching ladder**  
(for further consultation)



There will be a need to fully equip coaches to understand and implement the LTPAD model. This should include an in-depth knowledge of developmental principles, with particular reference to the phase(s) of player/athlete development at which they work. Coaches will need to become more skilled at profiling their players/athletes and assessing readiness and windows of optimal trainability

The detail of the revised coaching ladder will now be subject to further analysis, with a view to finalising the framework for inclusion in the Third Cycle of the National Coaching Development Programme (2004-8). A working group has been established between NCTC and the Irish Sports Council to make recommendations on the relationship between the coaching ladder and the sport for young people policies and initiatives of the Council.

It is essential that the broad principles of the model for LTPAD be translated into effective practice. A number of examples of how this will occur are provided in appendices 4-6. Appendix 4 provides a practical guide to how 'windows of trainability' can be interpreted at different phases of LTPAD. Appendix 5 addresses the implications of LTPAD for the periodisation of training and competition. Appendix 6 outlines the practical coaching implications of the physical, mental/cognitive and emotional development of children.

## 9 Implications for NGBs

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*The implementation of LTPAD within Irish sport will be largely dependent on the willingness of NGBs to adopt the model in a sport-specific way and on their effectiveness in implementing the model within the context of their overall strategic plans.*

Effective LTPAD models will help sports to:

- *Attract more children to play the sport*
- *Provide clear pathways for progression*
- *Attain higher and more sustained levels of success*
- *Retain more participants in the sport*
- *Provide a player/athlete-centred basis for planning and decision-making*
- *Provide a basis on which to evaluate the structure and effectiveness of competition programmes*
- *Provide a framework for the audit of programmes at each phase of the pathway*

It is proposed that NGBs will be provided with the opportunity to undertake in-depth workshops on the LTPAD model and its application to their sport.

# 1 ○ Cross-sport agreement

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*In order to implement the principles outlined in the LTPAD model, the following actions are recommended for cross-sport agreement:*

1. The LTPAD model should be accepted as the basis on which the development of players/athletes is planned and implemented.
2. A sport-specific LTPAD model should be put in place in each sport.
3. A review of coaching, coach education and competition structures should occur in each sport, based on the principles and objectives of the LTPAD.
4. The development of the full range of motor skills at the Fundamental and Learning to Train phases should be promoted by all sports. This should include the adaptation of their programmes to include such activities; the encouragement of involvement by children in a range of sports and the advocacy of the importance of comprehensive physical education programmes in schools.
5. A Fundamentals manual should be developed for use across all sports. Fundamental activities should be incorporated into sport-specific sessions for younger children, especially during warm-up and fun activities.
6. A 3-2-1 model should be advocated to parents concerning the involvement of their children in sport. (3 sports in the primary school years, two in the early secondary school years and 1 by junior certificate). The sports undertaken in the primary school years should provide a broad range of movement experiences (e.g. gymnastics; athletics; team sports; swimming). By the time one sport is chosen during the second-level years, the young adult should be equipped to pursue a competitive and/or recreational pathway.
7. Greater co-operation in the scheduling of sessions and competitions should occur, with the objective of having cross-sport, planned and periodised years up to the age of 15.
8. Consideration will be given to the formulation of a cross-sport charter on the implementation of LTPAD.

# 1 1 Building the Irish Long-Term Player/Athlete Model and the coaching ladder

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*Within NCTC, it is proposed to further develop the Long-Term Player/Athlete Development model in the context of Irish Sports Council policies and in partnership with the sports organisations. This model will provide the basis for the refinement and diversification of the NCDP coaching ladder. It will also underpin the sports science and medical services provided to players/athletes at the different stages of their development. The NCTC Medical Panel and the Co-ordinating Group of the Sports Science and Medical Network will be asked to consider the implications of the model for service delivery.*

The implications for individual NGBs and the further implementation of the model will need to be considered within the wider context of the policies and programmes of the Irish Sports Council, Department of Education and Science and the Department of Health and Children. ISC and NCTC should give detailed consideration to the ways in which NGBs can be facilitated in the implementation of the model. Discussions should occur with the Physical Education and Sports Science Department at the University of Limerick, with the University of Ulster, the primary teacher training colleges and the other third-level institutions involved in sport/recreation studies to ensure maximum integration of the LTPAD model into their programmes and practice.

A number of actions are proposed to address the issues outlined in this paper. These actions are outlined in Table 1.



**Table 1 :**  
**Long-Term Player/Athlete Development: proposed actions**

ISSUE	ACTION	AGENCIES	OUTCOMES
<b>A. PHYSICAL LITERACY</b> 1. Physical literacy / FUNDamentals	- An Inter-Departmental initiative to produce an action plan for the development of the Fundamentals is required	ISC, Dept. Ed. and Science, Dept. Health and Children - Dept Arts, Sport and Tourism - Third-level agencies	- Action plan on FUNDamentals, physical literacy - Physical education programmes in schools strengthened
2. FUNDamentals manual	- Develop a comprehensive manual for coaches and teachers operating at fundamental level	- ISC, NCTC in cooperation with NGBs, LSPs - PE professionals, Third-level agencies	- Comprehensive FUNDamentals manual
3. Multi-sport activity / summer camps	- Initiate a pilot project on multi-sport activity / Q-mark for summer camps	- ISC, LSPs, NCTC, UL, NGBs, primary school and PE professionals - Camp Service Providers	- Wide range of multi-sport experiences - Q-mark for summer programmes
<b>B. PRACTICE AND COMPETITION</b> 4. Practice and competition model	- Identify key principles of practice and training  - Seek consensus on (a) 3/2/1 model, (b) periodisation of the year up to under 15 (3 phases) and (c) cross-sport charter	- ISC, NGBs - NCTC - OCI - PCI	- Key principles of practice and training in place - Consensus on 3/2/1 model - Periodised year up to under 15 - Cross-sport charter
<b>C. COACHING</b> 5. Coaching ladder	- Align coaching ladder with LTPAD model - Align coaching ladder and ISC initiatives on sport for young people	- NCTC, NGBs - NCTC/ISC working group	- Coaching ladder and LTPAD model aligned, including alignment to ISC sport for young people initiatives
6. Coaching children	- Specific training for coaches of children	- ISC - NCTC - NGBs - 3rd Level (targeted)	- Modules developed, leading to certificate in coaching children - Level 3 (Dev.) in place
<b>D. PATHWAYS AND LTPAD</b> 7. LTPAD Model	- Agree model with all relevant agencies following a period of consultation - Conduct further empirical research on team and individual players/athletes	- ISC, NCTC, NGBs, OCI, PCI, Dept Arts, Sport and Tourism, Dept Ed., Dept Health and Children, Third-level agencies	- Agreed LTPAD model - Research conducted with Irish players/athletes
8. Sport-specific LTPAD models	- NGBs to define and implement sport-specific LTPAD models	- NGBs, ISC, NCTC, LSPs	- Clear sport-specific LTPAD models and action plans in each sport
<b>E. INCLUSION</b> 9. Inclusion	- Define LTPAD for players/athletes with a disability - Promote integration through coach education and grant schemes	- PCI, NGBs - NCTC, ISC	- LTPAD defined for players/athletes with a disability
<b>F. SPORTS SCIENCE AND MEDICAL SUPPORT</b> 10. Sports Science and Medical Support	- Tailor services to pathway phase - Introduce measures to monitor growth and development - Stronger integration of sports science into coach education	- NCTC and Sports Science and Medical Support Network - NCTC Medical Panel - NGBs	- Targeted services - Growth and development measures in place - Key sports science / principles more strongly embedded into NCDP

## 1 2 LTPAD: The way forward

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*This paper has outlined a proposed Long-Term Player/Athlete Development model for Ireland (see Figure 5). Some key areas for action have also been identified. The Long-Term Player/Athlete Development model, consisting of the Fundamental, Learning to Train, Training to Train, Training to Compete, Training to Win and Retirement/Retention phases, has also become the foundation for many sports and sport systems, including British Columbia, Canada, England and Scotland. The first two phases of the model provide the foundations for life-long physical activity and for competitive sport performances, highlighting the significance of physical literacy and comprehensive physical education and school sport programmes in the early school years.*

Physical education should provide the knowledge base of general movement skills and technical/tactical skills for an active life style. If the knowledge base is not provided, it is certain that participation in competitive and recreational sports will be inhibited.

All children should take part in the Fundamental and Learning to Train phases of development to ensure that physical literacy is accomplished. If this is neglected participation in later life will be minimised. It would be beneficial from a societal point of view to ensure that all children would have the opportunity to have the best possible formation during these two stages, in the same way that we provide for literacy and numeracy.

After the Fundamental and Learning to Train phases children and parents can decide to continue with competitive or recreational activities. Investing into a healthy population by providing the knowledge base is a social responsibility and a politically correct and necessary move. It is imperative to understand this process – if physical literacy and basic fitness are not provided during the Fundamental and Learning to Train phases (by the age 11-12 for girls and age 12-13 for boys, approximately) they may never reach their true potential and in many cases, will drop out of physical activities in the recreational stream.

By providing the knowledge base and positive experiences physical literacy will positively contribute to life-long physical activity. The health (physical, mental, emotional) and economic benefits of such a preventative approach are likely to far outweigh the costs of such investments.

In addition to these benefits, a clearly mapped out model of Long-Term Player/Athlete Development provides the basis for the sports system, and each sport, to chart the phases and opportunities they wish to create for players and athletes. As a result, coaching, coach education, competition and training structures, sports science and medical support can be more effectively targeted in line with the demands of each phase. This approach will provide a clear and cost effective way of preparing our players/athletes for performance, in a holistic way and which recognises the demands along the road to excellence.

Figure 5.

**The Long-Term Player/Athlete Development Model (LTPAD)**



**The six phases of LTPAD**

1. FUNdamental - *build overall motor skills*
2. Learning to Train - *learn all fundamental sports skills*
3. Training to Train - *build 'the engine' and consolidate sport-specific skills*
4. Training to Compete - *fine-tune 'the engine', skills and performance*
5. Training to Win - *maximise performance, skills and 'engine'*
6. Retirement / Retainment - *adjustment/retain players/athletes for coaching/ administration*

# References and Footnotes

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- 13 The significance of these changes for Irish Society and the potential role for sport and physical activity have been highlighted in a number of documents in recent years including:
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- <sup>29</sup> U.S. Department of Health and Human Services. *Physical Activity and Health: A Report of the Surgeon General*. Atlanta, GA: 1996
- <sup>30</sup> Department of Health and Children. *A Health System for You*. Dublin, 2001.
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- <sup>32</sup> Strattan, G., Ward, P and Smeeton, N. *Foundation sport skills*. Top Line Report, Sport England, 2002.
- <sup>33</sup> See references under footnote 13 above, which highlight the need to further enhance the role played by physical activity in Irish society. While the issue of physical literacy is not specifically addressed in these documents, the concept is central to achieving the aspirations set out in such reports.
- <sup>34</sup> Evidence from the National Coaching Development Programme suggests that there are few, if any, NGBs which have fully comprehensive programmes which deal with physical literacy issues.
- <sup>35</sup> The consensus statement from the 6th National Coaching Forum (2001) highlighted the deficiencies which currently exist in the development of these capacities among primary age children.
- <sup>36</sup> This issue has been highlighted by many writers and reports, including Deenihan, J. *Physical Education Survey 1991*; Department of Education, *Report of the Review Body on the primary curriculum*, 1990. McGuinness S. & Shelly, B. Physical education in the primary school: an evaluation of programme implementation. *Oideas*, 1996, pp. 44, 46-65. Duffy, P. *State policy on school physical education in Ireland, with special reference to the period 1960-1996*. Unpublished PhD thesis, St Patricks College, Maynooth, 1997.
- <sup>37</sup> The confidence and competence of teachers to implement the primary school syllabus has been noted by many writers and reports including Deenihan, 1991; Department of Education, 1990; McGuinness and Shelly, 1996; Duffy, 1997.
- <sup>38</sup> This issue was clearly outlined in the Report of the National Council for Curriculum and Assessment – *Physical Education: at a critical crossroads, Report of the Physical Education Working Party*, 1991. Despite the recent revisions which have been made to junior and senior cycle physical education curricula, concerns relating to implementation persist.
- <sup>39</sup> Duffy, P and Coolahan J. (2003 in draft) have written on the effects of the exclusion of the word 'physical' from article 42.3.2 of the Irish Constitution in a paper entitled 'The effects of the exclusion of the word 'physical' from Article 42.3.2 of the Irish constitution'.
- <sup>40</sup> The consensus statements of the 2nd (1994) and 6th National Coaching Forum (2001) have highlighted this issue.
- <sup>41</sup> Connor (2003) has studied the effects of competition on the adolescent participation levels of adolescent boys and girls in Waterford city.
- <sup>42</sup> *The Code of ethics and good practice for children's sport in Ireland*, published jointly by the Irish Sports Council and Sports Council for Northern Ireland, (1999), identifies the principles of good practice which should underpin children's sport. Specific guidelines for coaches, parents and administrators on practice and competition for children need to be developed in both a generic and sport-specific way.
- <sup>43</sup> In its work, the National Coaching and Training Centre has encountered many models of competition which do not appear to be based on any clear rationale for the development of the young player/athlete.
- <sup>44</sup> During the course of the negotiation of the NCDP in 1992/3, the case was made by NGBs that volunteers could not be asked to undergo extensive coach education programmes because of their volunteer status and time limitations. There is now a growing recognition that coaches at these early phases should be equipped in a more comprehensive way to deal with children and to further develop their basic coaching and sport-specific skills.
- <sup>45</sup> Much progress has been made by many NGBs in developing their coaching syllabi. In many cases, however, the absence of clear pathway phases and the associated capacities for players/athletes has inhibited the effectiveness of coach education programmes.
- <sup>46</sup> Balyi has identified the importance of these windows of trainability at the 6th National Coaching Forum, 2001.
- <sup>47</sup> The need for a greater focus on the needs of girls and women was highlighted in the *Women and Sport Forum* (2003) and in *Targeting sporting change in Ireland* (1997).
- <sup>48</sup> See the consensus statement from the 6th National Coaching Forum (2001), where the participants strongly articulated the importance of the early, foundational experiences for children in sport.
- <sup>49</sup> The National College of Ireland found that between 5,000 and 7,000 hours was invested by volunteers in sport. Despite this contribution, NGBs consistently report difficulties in recruiting volunteer coaches. Donoghue, F., Anheier, H. and Salamon, R. *Uncovering the non-profit sector in Ireland: Its economic value and significance*. National College of Ireland/ John Hopkins University, Dublin, 1999
- <sup>50</sup> The NCTC position paper 'Supporting performance and excellence in Irish Sport' highlighted the absence of a long-term and player/athlete centred approach (3rd National Coaching Forum, 1995).
- <sup>51</sup> Balyi has written extensively on this issue. Also, Ericsson, K.A. (ed). *The road to excellence*, New Jersey: Lawrence Erlbaum, 1996 and Bloom, B.S. (ed.) *Developing talent in young people*. New York: Ballantine, 1985, have pointed to the significance of the early phases of athletic development.
- <sup>52</sup> A study by Duffy, P; Lyons, D; Moran, A; Warrington, G MacManus, C. on success factors among Irish athletes (2003 in draft review) has shown that there are many factors which support/inhibit the long-term development of players/athletes in Ireland. The study highlighted the absence of clear pathways and support systems. The significance of family and coach support at the early phases of development was also highlighted.

<sup>53</sup> Ross, W. D. and Green, H. J. (Eds.) *Physiological testing of the elite athletes*. Ithaca, N.Y., Movement Publications, 1983, pp 76-115

<sup>54</sup> This is an issue which was recognised in the Irish Sports Council's *High Performance Strategy* (2001).

<sup>55</sup> This contention is supported by the findings of Duffy, Lyons et al (2003 in review).

<sup>56</sup> Recent work by NCTC with NGBs has highlighted this issue. The sports of basketball and soccer have signalled the need for competition reviews to identify more appropriate levels and types of competition. (Irish Basketball Association. *Connecting Basketball*, Dublin, 2003; Football Association of Ireland. *Technical Development Plan (Draft)*, 2003).

<sup>57</sup> A formal National Sports Science and Medical Network was not established until 1998. In 2002/3 integrated performance planning began under the co-ordination of the Irish Sports Council.

<sup>58</sup> Balyi, I. and Hamilton, A. "The FUNdamentals in long-term preparation of tennis players". In *Bollettieri Classic Tennis Handbook*, Tennis Week, NY, 1999. pp. 258-280.

<sup>59</sup> Harsanyi, L. "A 10-18 éves atletak felkészítésének modellje". Budapest: Utanpötlésnevelés, No. 10, 1983.

<sup>60</sup> It should be noted that the ages described in this paper are general guidelines. The individual tempo of development / maturation will influence how players/athletes will reach the various phases of long-term development. However, the phases described here are sequential and it is suggested that all players/athletes should go through the same phases. The timing and duration of the phases will vary from individual to individual. Some early maturing athletes may have as much as a four-year physiological advantage over their late maturing peers. (Ross et al. 1983) A detailed table outlining the relationship between chronological age, biological age and training phases is outlined in Appendices 4 and 5. The physical, mental/cognitive and emotional development issues associated with the different stages of childhood and adolescence are outlined in Appendix 6.

<sup>61</sup> Gallahue, D.L. and Ozum, J.C. *Understanding Motor Development – infants, children, adolescents, adults*. (3rd ed.) Madison, Wis: Brown & Benchmark Publishers, 1994.

<sup>62</sup> The Fundamental stage is preceded by a Rudimentary stage, which is beyond the scope of this paper.

<sup>63</sup> Balyi I. and Hamilton, A. The concept of long-term athlete development. *Strength and Conditioning Coach*, The official magazine of the Australian Strength and Conditioning Association., 1995: Volume 3, No. 2 pp. 5-6.

<sup>64</sup> Russhall, B. The growth of physical characteristics in male and female children. *Sports Coach*, Vol. 20, No. 4. Summer, 1998, pp. 25-27.

<sup>65</sup> Viru, A, Loko, J., Volver, A., Laaneots, L., Karlesom, K and Viru, M. Age periods of accelerated improvements of muscle strength, power, speed and endurance in age interval 6-18 years. In *Biology of Sport*, Warsaw, V., 15 (4) 1998, pp. 211-227.

<sup>66</sup> These capacities are defined as follows:

**Technical** Skills and techniques of the sport

**Tactical** Game related capacities including skills in context; decision-making; tactics; match performance

**Mental** Capacities associated with the psychological demands of the sport (e.g. goal setting; concentration; anxiety control; visualisation)

**Physical** Capacities associated with the physiological and biomechanical demands of the sport (e.g. speed, strength, stamina, flexibility)

**Personal** Capacities that underpin the individual's ability to function happily and effectively

**Lifestyle** Capacities associated with the holistic management of lifestyle (e.g. nutrition, hydration, rest)

# Appendix 1

## Overview of the Long-Term Player/Athlete Development Model

<b>FUNDamental Phase</b> Chronological age Males: 6 – 9 Females: 6-8	<b>Learning to Train Phase</b> Chronological age Males: 9-12 Females: 8-11	<b>Training to Train Phase</b> Chronological- Biological age Males: 12-16 Females: 11-15	<b>Training to Compete Phase</b> Chronological-Biological age Males: 16-18 Females: 15-17	<b>Training to Win Phase</b> Chronological age Males: 18 + Females: 17 +
<ul style="list-style-type: none"> <li>• FUN and participation</li> <li>• General, overall development</li> <li>• ABC's of Athletics Running, Jumping, Throwing</li> <li>• ABC's of Athleticism Agility, Balance, Coordination, Speed</li> <li>• Medicine ball, Swiss ball, own body strength exercises</li> <li>• Introduction to simple rules of ethics of sport</li> <li>• <b>Screening</b></li> <li>• <b>NO periodisation</b>, but well structured programmes</li> <li>• Physical activity 5-6 time per week</li> </ul>	<ul style="list-style-type: none"> <li>• Overall sports skills</li> <li>• Major skill learning phase, all basic sports skills should be learnt before entering next phase</li> <li>• Mental -cognitive and emotional development</li> <li>• Introduction to mental preparation</li> <li>• Medicine ball, Swiss ball, own body strength exercises</li> <li>• Introduce ancillary capacities</li> <li>• <b>Talent ID</b></li> <li>• <b>Single Periodisation</b> (Very few sports: Double periodisation)</li> <li>• Sport-specific training 3 times per week, participation in other sports 3 time per week</li> </ul>	<ul style="list-style-type: none"> <li>• Sport specific skill</li> <li>• Major fitness development phase (aerobic and strength, PHV is the reference point)</li> <li>• Mental -cognitive and emotional development</li> <li>• Develop further mental preparation</li> <li>• Introduce free weights</li> <li>• Develop further ancillary capacities</li> <li>• Frequent musculoskeletal evaluations during PHV</li> <li>• <b>Selection</b></li> <li>• <b>Single or Double Periodisation</b></li> <li>• Sport-specific training 6 – 9 time per week</li> </ul>	<ul style="list-style-type: none"> <li>• Event, position-specific physical conditioning</li> <li>• Event, position-specific technical tactical preparation</li> <li>• Sport, event, position-specific technical and playing skills under competitive conditions</li> <li>• Advanced mental preparation</li> <li>• Optimise ancillary capacities</li> <li>• <b>Specialisation</b></li> <li>• <b>Double or Triple Periodisation</b></li> <li>• Sport-specific technical, tactical and fitness training 9 – 12 times per week</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance or improvement of physical capacities</li> <li>• Further development of technical, tactical and playing skills</li> <li>• Modelling all possible aspects of training and performance</li> <li>• Frequent prophylactic breaks</li> <li>• Maximise ancillary capacities</li> <li>• <b>High Performance</b></li> <li>• <b>Double, Triple or Multiple Periodisation</b></li> <li>• Sport-specific technical, tactical and fitness training 9 – 15 times per week</li> </ul>
Training / Competition Ratios 50 : 50	Training / Competition Ratios 70 : 30	Training / Competition Ratios 60 : 40	Training / Competition Ratios 50 : 50	Training / Competition Ratios 25 : 75

Note: Competition ratio includes competition and competition-specific training

# Appendix 2 – Statement of player/athlete capacities at each phase of the model

(for further review and rating by Irish coaches and other experts)

<b>FUNdamental</b> Aim : Fun and Participation. Learn all fundamental motor skills	<b>Learning to Train</b> Aim: Fun and participation. Learn all fundamental sports skills.	<b>Training to Train</b> Aim: Optimise fitness preparation and sport, individual and position-specific training
<b>Physical</b> <ul style="list-style-type: none"> <li>• General overall development and mobility</li> <li>• Running, jumping, throwing</li> <li>• Agility, Balance, Co-ordination, Speed (ABC's)</li> <li>• Develop speed, power and endurance through FUN games</li> <li>• Develop linear, lateral and multi-directional speed</li> <li>• Medicine ball, Swiss ball and own-body exercises for strength</li> </ul>	<b>Physical</b> <ul style="list-style-type: none"> <li>• Continue to develop Agility, Balance, Co-ordination, Speed</li> <li>• Continue to develop speed, power and endurance through fun games</li> <li>• Medicine ball, Swiss ball and own-body exercises for strength as well as hopping-bounding exercises</li> <li>• Basic flexibility exercises</li> <li>• Warm-up and stretching</li> </ul>	<b>Physical</b> <ul style="list-style-type: none"> <li>• Emphasis on general and balanced physical conditioning</li> <li>• Aerobic training prioritised after onset of Peak Height Velocity (PHV)</li> <li>• Strength training prioritised in females after PHV and with the onset of menarche</li> <li>• Strength training prioritised in males 12-18 months after PHV</li> <li>• Flexibility training</li> <li>• Shoulder, elbow, core, spine and ankle stability</li> <li>• Frequent musculoskeletal evaluations during PHV</li> </ul>
<b>Mental</b> <ul style="list-style-type: none"> <li>• Positive attitude to sport</li> <li>• Confidence</li> <li>• Concentration</li> <li>• Achieve success and receive positive re-enforcement</li> </ul>	<b>Mental</b> <ul style="list-style-type: none"> <li>• Introduction to mental preparation</li> <li>• Understanding of the role of practice</li> <li>• Perseverance</li> <li>• Confidence</li> <li>• Concentration</li> <li>• Achieve success and receive positive re-enforcement</li> </ul>	<b>Mental</b> <ul style="list-style-type: none"> <li>• Goal setting (short and medium term)</li> <li>• Imagery (practising and improving technique and self-confidence)</li> <li>• Relaxation (deep breathing)</li> <li>• Patience and control</li> <li>• Concentration</li> <li>• Continue positive re-enforcement</li> </ul>
<b>Technical</b> <ul style="list-style-type: none"> <li>• Basic motor skills: proper running, jumping and throwing technique</li> <li>• Modified skills of different sports</li> <li>• Use of appropriate footwear and clothing</li> <li>• Knowledge of the basics of equipment</li> </ul>	<b>Technical</b> <ul style="list-style-type: none"> <li>• Strong emphasis on skill development</li> <li>• Fundamental skills progressively refined, combined and elaborated upon to more sport specific skills</li> <li>• Practice skills</li> </ul>	<b>Technical</b> <ul style="list-style-type: none"> <li>• Further develop and consolidate sport specific skills</li> <li>• Individualisation to address strengths and weaknesses</li> </ul>
<b>Tactical</b> <ul style="list-style-type: none"> <li>• Introduction to simple rules and ethics of sport</li> <li>• Basic game and movement concepts</li> </ul>	<b>Tactical</b> <ul style="list-style-type: none"> <li>• Modified and small-sided games</li> <li>• Key game principles</li> </ul>	<b>Tactical</b> <ul style="list-style-type: none"> <li>• Early stages of tactical preparation</li> <li>• Basic and intermediate team/individual tactics</li> </ul>



### Training to Compete

Aim: Optimise fitness preparation and sport, individual and position specific training

#### Physical

- Sport, position and individual specific intensive physical conditioning
- Shoulder, elbow, core, spine and ankle stability
- Optimum preparation: tapering and peaking

#### Mental

- Focus and thought control – self talk/verbal cues (dealing with distractions and negative thoughts)
- Goal setting (long term)
- Performance routines and precompetition preparation
- Imagery (competition, different situations/problems, practicing strategies)
- Anxiety control and relaxation (Progressive Muscle Relaxation, hypnosis)
- Personal responsibility and involvement in decision-making

#### Technical

- Proficiency in basic sports skills
- Sport specific technical and playing skills under competitive conditions and at high intensity
- Individualisation of skills : 'personal style'
- Consistency and control
- Competition-simulation training

#### Tactical

- Event and position-specific tactical preparation
- Principles of attack and defence
- Ability to plan and assess competition
- Adaptation to different situations
- Observe and adapt to opponents

### Training to Win

Aim: Maximise fitness preparation and sport, individual and position-specific skills as well as performance

#### Physical

- Maintenance and possible improvement of physical capacities with a view to maximising performance
- Shoulder, elbow, core, spine and ankle stability
- All aspects individualised
- Frequent "prophylactic" (preventative) breaks

#### Mental

- Well-developed, refined and individualised mental skills and routines
- Refocusing plans/coping strategies
- Will-to-win/drive
- Concentration/focus
- Independent decision-making,
- Capable of teamwork and taking advice

#### Technical

- Complete the refinement of sport-specific skills
- Event/competition-specific training skills are 'automatic'/'second nature'
- Ability to improvise with skills

#### Tactical

- Develop effective race strategies
- Adapt strategies to situations
- Model all possible aspects of performance in training
- Play to strengths, exploit weaknesses of opponents

### Retirement/ Retention

Aim: To enjoy a healthy, active lifestyle and retain players/athletes for coaching, administration roles etc.

#### Physical

- Keep active through sports participation
- Endurance training
- Strength training
- Flexibility training

#### Mental

- Relaxation
- Readjustment to non-competitive environment

#### Technical

- Retain skills or develop new ones

#### Tactical

- Retain recreational involvement

# Appendix 2 cont. - Statement of player/athlete capacities at each phase of the model

(for further review and rating by Irish coaches and other experts)

<b>FUNDamental</b> Aim : Fun and Participation. Learn all fundamental motor skills	<b>Learning to Train</b> Aim: Fun and participation. Learn all fundamental sports skills.	<b>Training to Train</b> Aim: Optimise fitness preparation and sport, individual and position-specific training
<b>Lifestyle</b> <ul style="list-style-type: none"> <li>• Involvement in multi-sports</li> <li>• Learn safety</li> </ul>	<b>Lifestyle</b> <ul style="list-style-type: none"> <li>• Involvement in multi-sports</li> <li>• Inclusion of sport in lifestyle</li> <li>• Participation in complementary sports</li> </ul>	<b>Lifestyle</b> <ul style="list-style-type: none"> <li>• Rest and recovery</li> <li>• Nutrition/hydration</li> <li>• Training and performance diary/log</li> <li>• Time management</li> <li>• Introduction to planning and periodisation</li> </ul>
<b>Personal</b> <ul style="list-style-type: none"> <li>• Enjoyment/fun</li> <li>• Fair play</li> <li>• Positive attitude</li> <li>• Teamwork/Interaction skills</li> </ul>	<b>Personal</b> <ul style="list-style-type: none"> <li>• Understanding of changes which puberty will bring</li> <li>• Accepts discipline and structure</li> <li>• Understands the relationship between effort and outcome</li> <li>• Teamwork/interaction skills</li> </ul>	<b>Personal</b> <ul style="list-style-type: none"> <li>• Interpersonal skills and learning to work in team environment</li> <li>• Positive communication</li> <li>• Discipline and personal responsibility</li> <li>• Awareness of Peak Height Velocity and windows of trainability</li> </ul>
Physical activity 5-6 times per week	Sport-specific training 3 times per week, participation in other sports 3 times per week	Sport-specific training 6-9 times per week

### Training to Compete

Aim: Optimise fitness preparation and sport, individual and position specific training

#### Lifestyle

- Individualisation of ancillary supports
- Refined self-monitoring
- Plan career/sport options
- Increased knowledge on hydration and nutrition
- Preparation for different environments e.g. heat/cold/rain/altitude
- Injury prevention and recovery

#### Personal

- Continued personal development
- Integration of sport, career and life goals
- Economic and independence issues addressed

Sport-specific technical, tactical and fitness training 9-12 times per week

### Training to Win

Aim: Maximise fitness preparation and sport, individual and position-specific skills as well as performance

#### Lifestyle

- Increased knowledge on all areas
- Rest and relaxation. Frequent breaks
- Well-developed self-monitoring
- Well developed and integrated support network/structure.
- Career/sport planning sustained

#### Personal

- Full integration of sport, career and life goals

Sport-specific technical, tactical and fitness training 9-15 times per week

### Retirement/ Retainment

Aim: To enjoy a healthy, active lifestyle and retain players/athletes for coaching, administration roles etc.

#### Lifestyle

- Pursue personal and family goals more strongly
- Pursue further education/career development
- Possible engagement in administration, coaching, media/PR
- Seek transition support, if required

#### Personal

- Re-set goals

Physical activity 3-6 times per week

# Appendix 3

## Bowls Pathway - Statement of Bowler capacities

(Draft, prepared by the Irish Bowls Coaches Association)

### INTRODUCTION

**AIM : Fun & Participation.  
Social & Recreational**

#### Physical

- Warmup and stretching
- Balance, co-ordination
- Flexibility/mobility
- Strength

#### Mental

- Confidence (thought stopping, positive self-talk)
- Concentration (trigger words, delivery routine)

#### Technical

- Equipment e.g. rink/green, mat, bowls/jack, measure
- Dress
- Technicalities of mat, bowls, jack e.g. use of mat, bias of bowl and delivery of jack.
- Method of scoring
- Outline of the Laws
- Types of grip
- Types of stance
- Delivery
- Shots in the game
- Introduction to line
- Introduction to weight

#### Tactical

- Types of play (Singles, Pairs, Triples, 4s)
- Intro. to duties of rink members (Lead, Second, Third, Skip)

#### Lifestyle

- Involvement in multi-sports
- Learn safety

#### Personal

- Etiquette of Bowls
- Enjoyment and Fun
- Fair Play

### SOCIAL/CLUB COMPETITION

**AIM: Learn basic skills  
and how to train for club  
competition**

#### Physical

- Continued development of physical capacities
- Endurance/stamina
- Individualisation of physical capacities to address player's strengths and weaknesses

#### Mental

- Goal setting (short and medium term)
- Imagery (practising and improving technique and self confidence)
- Relaxation (deep breathing)
- Patience and control

#### Technical

- Continue developing basic skills and different types of shots
- 'Line' and 'weight'
- Backhand and Forehand

#### Tactical

- Position of mat
- Jack delivery
- Side to play; back/forehand?
- Shot choice (type and timing)
- Duties of rink members (lead, second, third, skip)

#### Lifestyle

- Nutrition/Hydration
- Training and Performance Diary/Log
- Time management
- Introduction to Planning and Periodisation
- Rest and Recovery

#### Personal

- Interpersonal skills and learning to work in team environment
- Positive communication

**IDENTIFY  
POTENTIAL**

FUNDAMENTAL

LEARNING TO TRAIN/TRAINING TO TRAIN

## INTER ASSOCIATION/ REGIONAL STAGE (SPECIALISATION)

AIM: More specific, individual and intensive training. Effective in regional competition

### Physical

- Optimum preparation: Taper and peak
- Individual and intensive training

### Mental

- Focus and thought control – Self talk/verbal cues (dealing with distractions and negative thoughts)
- Goal setting (long term)
- Performance routines and Precompetition Preparation.
- Imagery (competition, different situations/problems, practicing strategies)
- Relaxation (PMR, hypnosis)

### Technical

- Smooth, controlled delivery (Line and length accuracy)
- Consistency
- Individualisation/'style'
- Skills performed under competition situations in training
- Specifics of all shots
- Fine tune basics i.e. mat, shot, speed and control

### Tactical

- Reading Green (SWOT analysis)
- Selection of shot
- Team tactics and position specialisation
- Principles of attack and defence
- Adaptation to situation e.g. fast/heavy/wet greens, time of day, indoor/outdoor green
- Observe/adapt to opponents
- Building a head and drawing to save

### Lifestyle

- Planning and periodisation
- Plan career/sport options
- Increased knowledge on hydration and nutrition
- Preparation for different environments e.g. wind
- Injury prevention and recovery

## INTERNATIONAL

AIM: Optimise performance for Home Country competition

### Physical

- Maintenance and possible improvement of physical capacities
- High volume, high intensity training
- Stamina/endurance

### Mental

- Well developed and individualised mental skills and routines
- Refocusing plans/coping strategies

### Technical

- Complete refinement of sports specific skills
- 'Automatic' and Consistent
- Improvise

### Tactical

- Plan 'Risks' and advanced head building patterns/strategies
- Adapt strategies to situation
- Maximise on international competition opportunities

## WORLD CLASS

AIM: Optimise performance for Commonwealth and World competition

### Physical

- Maintenance of physical capacities

### Mental

- Refinement of mental strategies and routines
- Will to win/drive
- Concentration/focus

### Technical

- 'Second nature'/'without fault'

### Tactical

- Respond to opposition
- Play to strengths, exploit weaknesses
- Successful head-building strategies

### Lifestyle

(International and World Class)

- Increased knowledge on all areas
- Rest and Relaxation. Frequent breaks
- Self-monitoring
- Well-developed and integrated support network/structure.
- Career planning sustained

## RETIREMENT and RETAINMENT

AIM: To enjoy a healthy, active lifestyle

### Physical

- Keep active. Sports participation
- Endurance training
- Strength training
- Flexibility training

### Mental

- Relaxation

### Lifestyle

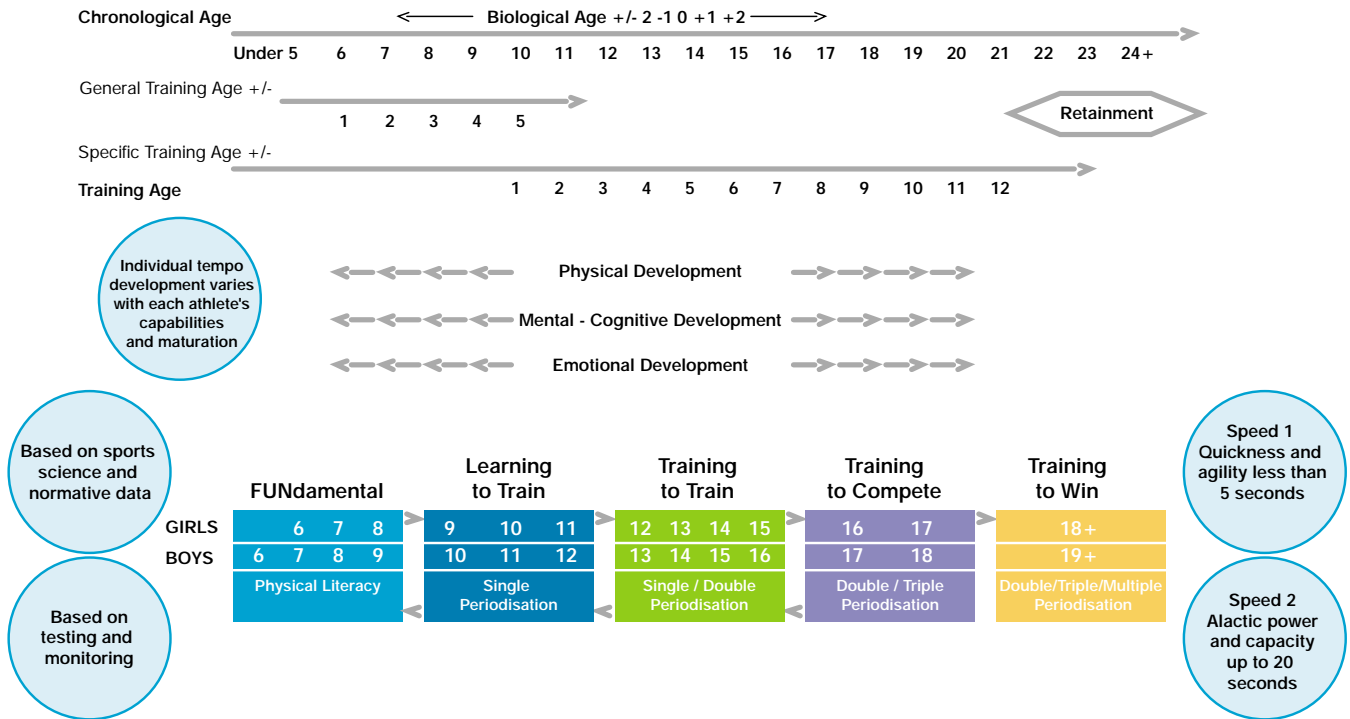
- Family
- Further education
- Administration
- Coaching
- Media and PR
- Transition support

TRAINING TO COMPETE

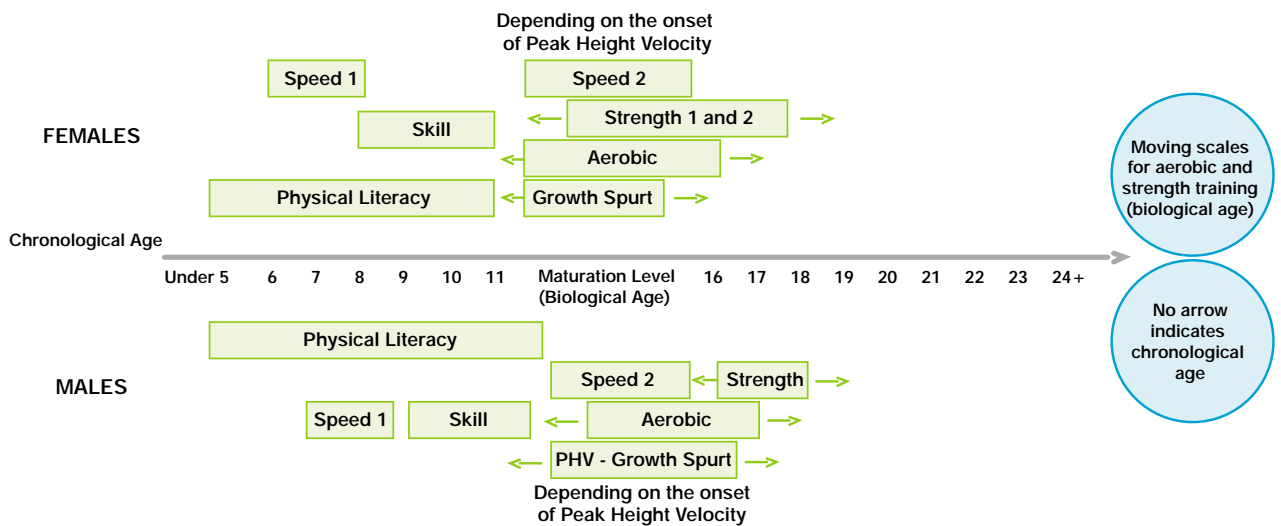
TRAINING TO COMPETE/WIN

# Appendix 4

## Long-Term Player/Athlete Development -Trainability

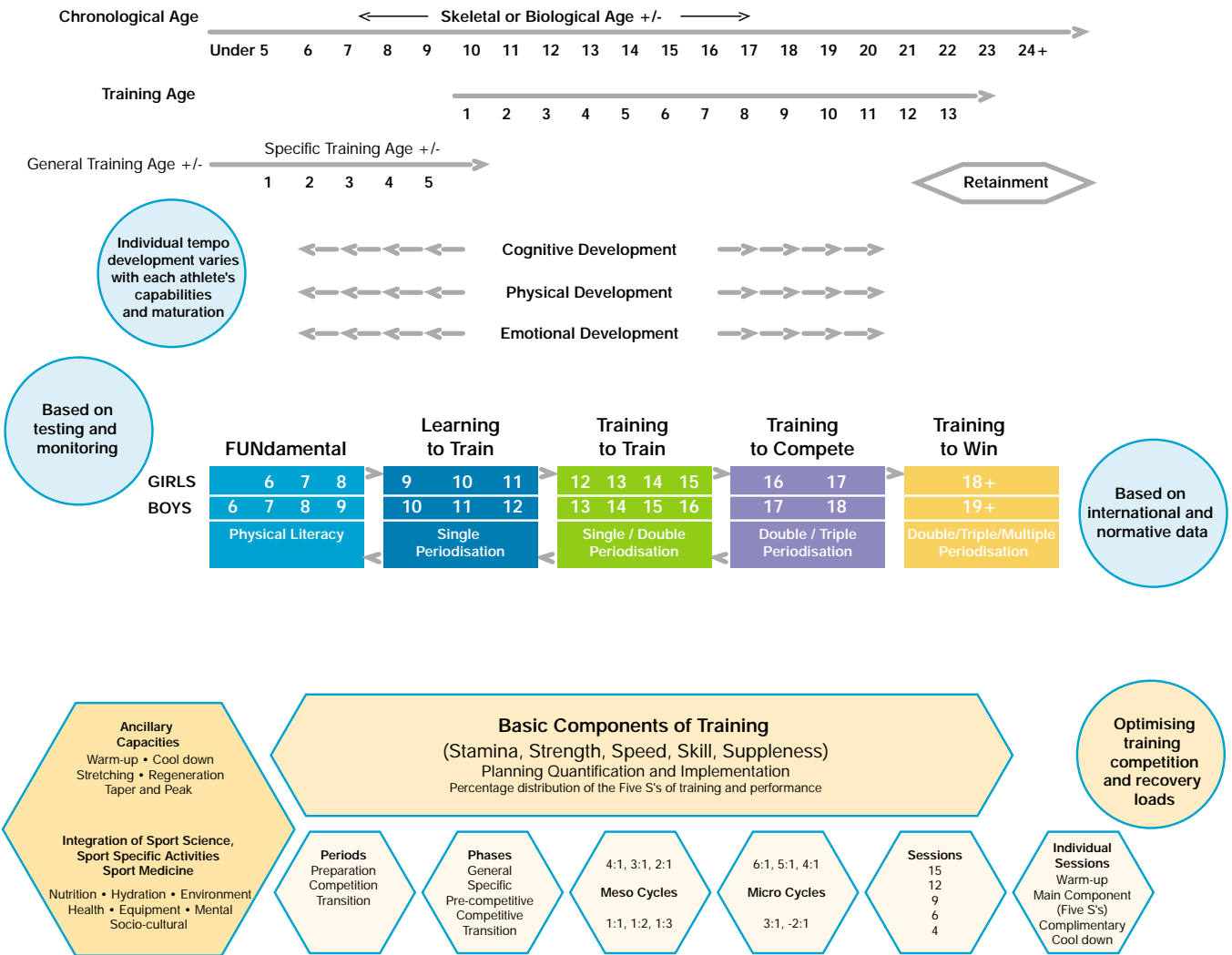


### Windows of Optimal Trainability



# Appendix 5

## Long-Term Player/Athlete Development -Periodisation



# Appendix 6

## Physical, mental/cognitive and emotional development in children

### 1. Middle Childhood (age 6 to onset of puberty)

**Table 1: Characteristics of physical, mental/cognitive and emotional development**

Table 1 a:

**Middle Childhood (age 6 to onset of puberty) – Physical development characteristics and implications**

Basic characteristics	General consequences, performance capabilities and limitations	Implications for the coach
Larger muscle groups are more developed than smaller ones	The child is more skilful in gross movements involving large muscle groups, rather than precise coordinated movements involving the interaction of many smaller muscles	General basic skill should be developed during this phase
The size of the heart is increasing in relation to the rest of the body. The cardiovascular system is still developing	Endurance capacity of the young participants, however, is more than adequate for most activities (little aerobic machines)	Short duration anaerobic activities to be planned (alactic), endurance must be developed through play and games (lack of attention span for continuous work)
Ligamentous structures are becoming stronger, but the ends of the bones are still cartilaginous and continue to calcify	The body is very susceptible to injuries through excessive stress or heavy pressure	Slow progression in hopping, bounding, own body weight, medicine ball exercises (neural recruitment)
Basic motor patterns become more refined towards the end of phase and the balance mechanism in the inner ear is gradually maturing	There is great improvement in speed, agility, balance, coordination and flexibility toward the end of this phase	Specific activities and games should emphasise coordination and kinesthetic sense, gymnastics, diving, athletics field events
During this phase, girls develop coordination skills faster than boys, but generally there are no differences between boys and girls	Sex differences are not of any great consequences at this phase in development	Training and playing together should be emphasised at this age and phase

Table 1 b:

**Middle Childhood – Mental/cognitive development characteristics and implications**

Basic characteristics	General consequences, performance capabilities and limitations	Implications for the coach
Attention span is short and children are very much action-oriented. Memory is developing in a progressive way	Young players cannot sit and listen for long periods of time	Use short, clear and simple instructions. Children want to move and participate in action
Children in this phase have very limited reasoning ability. Later in the phase there is a growing capacity for more abstract thought	Children are generally leader oriented - love to be lead!	Coaches should adopt a “follow me” or “follow the leader” approach and ensure that all activities are fun and well planned
The repetition of activities is greatly enjoyed. Young players improve their abilities through experience	Children do not learn the skills correctly just by trial and error	Coaches must be able to provide a correct demonstration of the basic skills required at this level
Imagination is blossoming	Experimentation and creativity should be encouraged	While playing and practicing encourage input (opinion) from the children. They love to try new things and ready to try almost anything



Table 1 c:

**Middle childhood – Emotional development characteristics and consequences**

Basic characteristics	General consequences, performance capabilities and limitations	Implications for the coach
The child's self concept is developing at this phase by experiences and comments from others	Youngsters perceive these experiences as a form of self evaluation. "I am a good person if I do well/ I'm a bad person I do poorly".	On a regular basis they need positive reinforcement from the coach. This will provide strong motivation to continue with the activity.
Children like to be the centre of focus and attention	When the situation becomes threatening, they quickly lose confidence	Select technical and tactical activities in which success is virtually guaranteed, Gradually progress from simple to complex.
The influence of peers becomes a very strong driving force behind all activities	Acceptance into the peer group often depends upon one's abilities in physical skills and activities.	At this phase the coach must be capable of properly assessing the basic skills and providing a varied repertoire of practical opportunities for technical and tactical development and improvement.
The child begins to understand the need for rules and structure	They can understand and play simple games with simple rules and will tend to question rules and expect thoughtful answers.	Participation and fun to be emphasised versus winning. Focus on the processes not on the outcome (and have lots of FUN)!

## 2. EARLY PUBERTY

**Table 2: Characteristics of physical, mental/cognitive and emotional development**

Table 2a:

**Early Puberty - Physical development characteristics and implications**

Basic characteristics	General consequences, performance capabilities and limitations	Implications for the coach
Significant proportional changes occur in bone, muscle and fat tissue.	During growth spurt adaptation is influenced by sudden changes of body proportions	Monitor training carefully and individualise the content of training to ensure adaptation.
Girls begin their growth spurt between the ages of 12.5-14 years, boys between 12.5-15 years. Girls attain a maximum rate of growth at an average age of 13, boys at an average age of 14 years.	Early in this phase, girls are faster and stronger than boys, later in the phase boys are becoming faster and stronger than girls.	Chronological age may not be the most appropriate way to group players/athletes.
Primary and secondary sex characteristics manifest themselves during this period. The normal range for onset of menarche for girls can be anywhere from 10-16 years.	After the onset of menarche iron levels of girls should be monitored regularly.	Situations which might induce fear, guilt or anxiety brought about by sexual development should be avoided.
Smaller muscle groups are becoming more developed	Speed, agility and coordination are still improving rapidly during this stage.	With the improvement of fine motor movement all basic technical skills to be mastered. Players/athletes should learn how to train, during this phase, including physical, technical, tactical, mental, personal and lifestyle.
During this developmental phase the various parts of the body do not grow at the same rate. The growth rate of the legs and arms will reach a peak prior to that of the trunk.	A change in the centre of gravity, length of limbs and core strength will determine the content of training.	Some of the already learned skills have to be refined (re-learned) again, since the growth of limbs will impact the technique.
A significant increase in red blood cells occurs during this phase, especially in boys due to the male hormone testosterone.	The oxygen transportation system is still developing and aerobic endurance is continuing to increase.	The increase in body mass requires more structured aerobic training. Only short duration of anaerobic activities are recommended.
The central nervous system is almost fully developed.	Agility, balance and coordination are fully trainable.	Use the warm-up to further develop Central Nervous System (CNS) activities.

Table 2b:

**Early Puberty - Physical development characteristics and implications**

Basic characteristics	General consequences, performance capabilities and limitations	Implications for the coach
Abstract thinking becomes more firmly established.	Decision-making through more complex technical training should be introduced.	Decision-making on tactical and strategic solutions should be based upon the skill level of the player.
Young players/athletes develop a new form of egocentric thought. Much emphasis is placed upon self-identity.	This may result in a strong fear of failure.	Create optimum learning environment, match skill and drill levels. Introduce simple coping strategies, concentration skills and mental imagery.
Young players/athletes are eager to perfect their skills.	Individual specific direction and structure in the learning process is required. A variety of methods to measure success are important to maintain motivation.	Positive reinforcement is imperative. The difference between the physical and mental development can vary to a great extent, the coach must be particularly careful not to pick the early developers and neglect or de-select the late developers. The coach's ability to demonstrate specific skills is important. Audiovisual material and video feedback will help to create a mental image.

Table 2c:

**Early Puberty - Emotional development and implications**

Basic characteristics	General consequences, performance capabilities and limitations	Implications for the coach
There is a tremendous influence on behaviour from peer groups.	Values and attitudes are being created and reinforced by the group.	The coach should exercise strong direction and supervision. A role model for young players/athletes at this phase is very important.
During this phase players/athletes are capable of cooperating and accepting some responsibility. Tension generally exists between adults and adolescent.	Some players/athletes may be less responsible mainly due to a fear of failure.	Coach must have an open communication with the players/athletes.
It is important that young players/athletes at this developmental level be able to display tenderness, admiration and appreciation.	Communication channels should be kept open by the adult, as all teenagers need help even though they do not recognise the need, or seem grateful for the help.	Coach is usually better accepted than other adults and should always attempt to foster two-way communication. Young players/athletes should have an input into decision-making processes.
Physical, mental and emotional maturity do not necessarily develop at the same rate.	Deprivation of these qualities often leads to exaggerated and/or unacceptable behaviour. Feelings of confusion or anxiety may exist as a result.	Early maturers often become leaders and excel in physical performance. Coaches must not play favourites as this can have negative effects on other participants' development.
There is a desire to have friends of the opposite sex.	Social activities are important events for this age group.	The coach's communication skills and understanding are important in these regards. Co-educational activities are recommended.

**3. LATE PUBERTY**

**Table 3: Characteristics of physical, mental/cognitive and emotional development**

Table 3a:

**Late Puberty - Physical development characteristics and implications**

Basic characteristics	General consequences, performance capabilities and limitations	Implications for the coach
The circulatory and respiratory system reach maturity	These systems are generally capable of giving maximum output.	Aerobic and anaerobic systems can be trained for maximum output. Full sport-specific energy system training should be implemented.
Increase in height and weight gradually lessen. Stabilisation occurs in the muscular system.	Muscles have grown to their mature size but muscular strength continues to increase, reaching its peak in the late twenties.	Strength training can be maximised to improve overall strength development. Neuromuscular training should be optimised during this phase.
Skeletal maturation continues in males and females.	Connective tissues are still strengthening.	Progressive overloading in training should be continued.
By age 17, girls have generally reached adult proportions, whereas boys do not reach such proportions until several years later.	Proportionally girls gain more weight than boys during this phase.	Aerobic training for girls to be optimised, as well coaches should be aware how to deal with weight gain and its impact on figure. Players should learn how to compete including all technical, tactical, physical, mental, personal and lifestyle capacities.

Table 3b:

**Late Puberty - Mental/cognitive development characteristics and implications**

Basic characteristics	General consequences, performance capabilities and limitations	Implications for the coach
Generally, by age 16, the brain has reached its adult size but continues to mature neurologically for several more years.	Players/athletes can cope with multiple strategies and tactics, particularly near the end of the phase.	Coaches should ensure the refinement of all technical and tactical skills.
Critical thinking is developing well during this phase.	The capacity of self-analysis and correction is developing.	Decision-making should be developed further through technical, tactical development.

Table 3c:

**Late Puberty - Emotional development characteristics and implications**

Basic characteristics	General consequences, performance capabilities and limitations	Implications for the coach
Peer group influence is still a powerful force.	Independent decision-making and leadership skills are becoming more developed.	Players should be given the opportunity to develop through participation in appropriate leadership or responsible role, (i.e. team captain, player/athlete representative, etc.), but strong direction and discipline must be maintained.
Players/athletes are searching for a stable, balanced self-image.	Self is still very susceptible to successes and failures. Coping techniques are useful.	Positive evaluation of performances and positive reinforcement are imperative.
Activities and interaction with the opposite sex play strong roles during this phase.	Male players/athletes must be aware that female players/athletes now face a problem of femininity versus sport development. Female players/athletes must be aware that male players/athletes now face a problem of relating performance to masculinity.	Facilitate the recognition of these issues through education and club programmes.

**4. EARLY ADULTHOOD**

**Table 4: Characteristics of physical, mental/cognitive and emotional development**

Table 4a:

**Early adulthood - Physical development characteristics and implications**

Basic characteristics	General consequences, performance capabilities and limitations	Implications for the coach
Physiologically the body reaches maturity during this phase.	All physiological systems are fully trainable	Physical training programmes should employ the most advanced techniques and sport science information to facilitate maximum adaptation and minimise injuries.  Ensure that all muscle groups and body alignments are well-balanced, complemented with optimum flexibility ranges.  State-of-the-art testing and monitoring programme to used.  Overtraining and overstress should be carefully monitored.
Final skeletal maturation in females occurs at about 19-20 years and in males about three years later.		Regular medical monitoring should be organised with additional blood tests for female players (anemia).

Table 4b:

**Early adulthood - Mental/cognitive development characteristics and implications**

Basic characteristics	General consequences, performance capabilities and limitations	Implications for the coach
Neurologically the brain matures about 19-20 years of age.	Players/athletes are capable of self-analysing and correcting and refining skills. Players/athletes can analyse and conceptualise all facets of their sport.	Winning becomes the major objective.
	Well-developed information processing skills improve the player/athlete ability to visualise verbal instructions.	Principles of adult learning should be implemented at this level.
There is a complete understanding and acceptance of the need for rules, regulations and structure.	However, the young adult must perceive the rules and structure as being clearly defined and fair.	Involve the players/athletes in decision-making and planning of team or group activities.

Table 4b:

**Early adulthood - Emotional development characteristics and implications**

Basic characteristics	General consequences, performance capabilities and limitations	Implications for the coach
There is a need to be self-directed and independent.	The players/athletes are ready to assume responsibility and accept the consequences of their actions.	Goal setting should be strongly emphasised to give definite direction and purpose to the player/athletes' overall programme.
Self-actualisation and self-expression are important.	Major changes in interests, hobbies and physical activities occur during this phase.	The players/athletes need to be treated as adults, with respect. Direction and structure provided by the coach is still important.
Major decisions on career, education and lifestyle are priority at some point in this phase.		Professional guidance should be made available considering off-season and educational pursuits.
Interactions with the opposite sex continue to be strong priority with lasting relationships developing.		Players/athletes must have ample opportunities for independent social interaction.







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