BWF

BADMINTON COACH EDUCATION
COACHES' MANUAL

LEVEL 3

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CONTINENTAL CONFEDERATIONS

- Badminton Africa www.badmintonafrica.com
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- Badminton Europe www.badmintoneurope.com
- Badminton Pan Am www.badmintonpanam.org
- Badminton Oceania www.badmintonoceania.org

MORE INFORMATION

The resources for BWF Coach Education Level 3 are available in different languages. The materials can be downloaded from the BWF website.

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SECTION ONE

INTRODUCTION TO THE BWF COACH EDUCATION PROGRAMME

SECTION INTRODUCTION

The Level 3 course is situated within the overall BWF Coach Education Framework. This introductory section explains the aims of this course, while also providing an overview of the complete framework and how this course fits into the bigger picture.

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MODULE 1
BWF COACH EDUCATION FRAMEWORK AND PHILOSOPHY

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01. BWF COACH EDUCATION FRAMEWORK

This Level 3 Coaches' Manual is part of the BWF Coach Education Framework, summarised below.

COURSE / AWARD	TARGET GROUP	FORMAT	CONTENT	OUTCOMES / ASSESSMENT
SCHOOLS BADMINTON TEACHING CERTIFICATE (*SHUTTLE TIME*)	Current or training teachers (physical education or classroom)	8-hour course: • One-day format, or • 8 one-hour modules, or • blended learning (online component plus four-hour face-to-face session)	Basic badminton skills and knowledge - technical, physical and tactical elements – and how to deliver safe and fun badminton sessions for children	Ability to plan and deliver safe, structured and fun badminton activities and sessions. Assessed by course tutor
COACH LEVEL 1	Motivated candidates with basic badminton experience / knowledge; PE teachers with badminton teaching certificate	• Four-day course, or • 2 x two-day course with guided coaching practice in between, or • blended learning (online prerequisite plus two-and-a-half-day face-to-face session) Can also be adapted to Olympic Solidarity Technical Course format	Basic coaching principles How to coach - Level 1 – basic coaching methodology What to coach - Level 1 - technical, tactical, physical and psychological elements Planning and delivery of progressive coaching sessions (for badminton and/ or Para badminton)	Demonstration of basic coaching competencies through effective planning, delivery, review and evaluation of linked coaching sessions Safe management of group activities Assessed by course tutor
COACH LEVEL 2	Level 1 coaches or equivalent (approved by BWF) Players with national / international badminton experience (Fast-Track Course)	Minimum six days of tutored activities, plus tasked and guided coaching practice, and planning Can also be adapted to Olympic Solidarity Technical Course format	Coaching principles How to coach - Level 2 coaching techniques What to coach - Level 2 - technical, tactical, physical, and psychological elements with underpinning scientific principles and knowledge Planning and delivery of annual training and competition programmes for individual badminton players	Ability to construct and deliver annual training and competition plans Design of individual training plans and programmes underpinned by sports science principles Effective management of groups of players up to elite performance level Assessed by course tutor
COACH LEVEL 3	Level 2 coaches or equivalent (approved by BWF) with minimum of 3 years' coaching experience	Six days of highly interactive applied sessions, involving discussion, debate, and reflection on practice Significant post-course follow-up work with tutor applied to coach's professional context	Player development pathways – what they are and why they are important Advanced planning and delivery for a specialised audience within the pathway, including: • youth development • elite performance	Demonstration of how to work within and/or implement a player development pathway Effective management of player development for target group (youth development or elite athletes) Assessed by a panel of relevant coaching experts
COACH LEVEL 4	Highly experienced coaches with experience of managing programmes	University-level study of approved specialist subject Long study of an agreed area of research to demonstrate competence	Advanced-level long-term planning, delivery, and management in chosen area of expertise Application of sports science research, innovative and best practice	Demonstration of long-term developmental programmes and planning in specialist area, including research and innovative practice Long study of an agreed area of research to demonstrate competence Assessed by external panel of relevant coaches / sports scientists with badminton experience
COACH EDUCATORS (TUTORS / TRAINERS)	Coaches with existing experience in coach development, or very experienced coaches with relevant competences	Course length appropriate to the level of award	Relevant to the level of award – such as: • *Shuttle Time* Tutor • *Shuttle Time* Trainer • Level 1 Coach Education Tutor • Level 2 Coach Education Tutor	Ability to deliver to adult coaches and PE teachers, catering to various learning styles and incorporating various teaching / learning techniques Ability to provide timely and honest feedback and appropriate follow up High level of communication skills Assessed by external assessor

02. PROGRESSION FROM LEVEL 1 THROUGH LEVEL 3

The BWF Coach Education resources seek to progressively help coaches, whether aspiring or experienced, acquire the knowledge and tools to work in increasingly professional and higher-level training situations. Coaches will find that the same underlying principles are stressed throughout the resources, but these will take slightly different forms depending on the level of player with which the coach is working, as well as the system in which training is taking place and the level of experience of the coach. The foundations of good coaching introduced in Level 1 still apply in Level 2 and Level 3, but coaches will notice the increasing sophistication of how the principles and techniques are applied and what that looks like in practice. The aspects of coaching practice and underlying sports science explored in Level 2 (including different methods of coaching, the use of questions, and the different body systems involved in training) are still an integral part of the work that is done here in Level 3, and coaches will see that frequent reference is made to the concepts addressed in previous levels.

In general terms, Level 1 focussed on the planning of linked sessions. Learning objectives at this level were designed to help coaches understand the needs of a wide range of incoming athletes, plan a series of relevant sessions in accordance with those needs, and implement their plans in a way that allowed them to provide meaningful and enjoyable experiences based on fun activities and positive interaction.

Level 2 looked at a longer-term training cycle, aimed at helping coaches prepare their athletes for competitions over the course of a yearly plan. This is aimed at a higher level of coaching for athletes in the context of a competition programme. Along with the emphasis on yearly planning, there is a more in-depth look at coaching methods and techniques, as well as a detailed examination of the different body systems and how they relate to and impact on training.

This Level 3 manual will, on one hand, go broader to consider badminton training within the context of a player pathway. This goes beyond the work of the coach with groups of players or individual players and examines the process of talent development, from detection and identification through presentation at different level events. All of these processes involve other people and organisations, and in order to work effectively, coaches should have a good understanding of this overall context.

At the same time, however, Level 3 also goes deeper into specific aspects of player development. There is an examination of the characteristics of youth players, along with considerations on how to foster their physical, social, and psychological development through participation in badminton/sport. On the other end of the spectrum, the unique qualities of elite players are analysed in the interest of understanding what makes them different and how coaches can support their ongoing development. Some of the challenges inherent in working with elite players are addressed, along with ways in which coaches can tap into players' particular strengths, experience, and knowledge.

Finally, building on the Level 2 examination of the different body systems, Level 3 looks to illustrate how an understanding of biomechanics and motor learning can provide coaches with a richer perspective on the application of these principles to on-court sessions.

Photo credit: BWF/BadmintonPhoto

03. LINKING INTO NATIONAL/REGIONAL SYSTEMS

As mentioned above, the focus from planning linked sessions in Level 1, through working with annual planning in Level 2, and on to looking at development as a long-term pathway from youth talent to elite performance in Level 3, takes on a gradually larger context, involving more people and decisions at each level. While linked sessions (Level 1) may be thought of within a club or school team, for example, the annual plan context (Level 2) will start to involve other supporting structures, including administrative and/or political bodies. In order to implement an effective player pathway, capable of taking a player from talent detection or identification through to elite-level performance, this pathway (Level 3), and therefore the coach, must be linked to the appropriate structures and systems for the particular context.

Coaches cannot do this kind of work in isolation, so they need to be aware of what administrative and political structures exist in their areas (regional and/or national). If they are not already working within these systems, they should look to fully understand what structures or bodies are involved, and how to work with them as needed. Within a player pathway, coaches are obviously a crucial factor in players' success, but in order to ensure optimum results and return on investment, they must be able to take full advantage of all possible collaboration within the system.

For coaches to be able to participate effectively within the policies and decisions regarding the pathway, or even try to influence or shape these, it is important that they keep in close contact with their national and/or regional badminton association. They should also be aware of the role their National Olympic Committee (NOC) plays in the process, and of the relationship between their national badminton association and their NOC. Finally, they should have a clear understanding of the national association's programme philosophy, expectations, and requirements. This will ensure they are not spending unnecessary time and energy working towards goals and visions that are not aligned with those of their national bodies.

04. TOWARDS AN EFFECTIVE PLAYER PATHWAY

As mentioned in the previous section, the most effective efforts on the part of coaches should ideally form part of an integrated player pathway which involves all the different stakeholders in athlete success. These may include administrative and political personnel from national sports bodies, coaches at different levels (school, club, regional and national), parents, and of course, the athletes themselves. While the pathways may look quite different depending on the particular context, in general, the most successful pathways include:

- **A player-centred approach.** This sounds obvious, but without the player, there is no need for a pathway. The end goal is to help players develop their potential to the fullest.
- **Appropriate coaching structures.** How do players get into the system and continue to progress optimally? Do the structures in place meet the needs of the players?
- **Adequate competition structures.** What kinds of competitions are available to players at different stages? How does the competition structure support the developmental needs of players through their journey?

There will be more discussion around the details of player pathways in the next section, but the main focus here is that coaches can work most effectively when they form part of the relevant player pathway.

The BWF, together with the World Academy of Sport, also runs a Player Pathway Programme (PPP). This is an intensive face-to-face course aimed at relevant stakeholders involved in establishing or improving player pathways in their countries. This may include presidents and administrators of national federations, high-performance managers, talent development managers, and national coaches, for example. For more information, please visit https://development.bwfbadminton.com/members/player-pathways

SECTION TWO

ESTABLISHING AN EFFECTIVE PLAYER PATHWAY

SECTION INTRODUCTION

A solid player pathway can take players from grassroots level to podium success. Such pathways help to ensure a clear shared vision of what the process looks like. They are most effective and efficient when all those involved understand their roles and how they fit into the overall process.

In terms of the pathway itself, this means a well-defined programme philosophy, clear starting and ending points, and specified steps along the way. There should be transparency around the different stages through which players progress, as well as the requirements to move from one stage to another, and the options and support available at each stage.

Coaches, in order to be more effective within their specific areas, need to know how their work fits into the bigger picture and how to effectively work together with the different people and organisations involved. It is important for coaches to have a global vision of what that entire pathway looks like, even though they may only accompany players on a certain segment of that journey. For example, coaches working with players at the beginning stages of the pathway need to provide appropriate support and challenges to assist in their continued development. Coaches working with players at the higher end of the spectrum need to understand the nature of elite training.

This section will look at the various elements that should be considered in establishing or strengthening a player pathway. Specifically:

- **Module 2** will look at how players start out on the pathway through initial processes of talent detection and identification.
- **Module 3** will examine different models of how talent can be optimised during the different stages of young players' development.
- **Module 4** will explore the characteristics and best practices of systems designed to support players along their journey from grassroots to elite level.
- **Module 5** will examine the varying needs of young players at different stages in their development, including goals related to skills, competition, training, coaching styles, and parental involvement.
- Finally, **Module 6** will consider the elite end of the spectrum, including some of the ways that the nature of elite training is fundamentally different.

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MODULE 2
TALENT DETECTION AND IDENTIFICATION

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01. INTRODUCTION

Sporting success at the highest levels is a visible show of results achieved. Nations with strong traditions in badminton place a high value on their achievements, as this helps to:

- create a feeling of national pride
- demonstrate high levels of coaching and athletic competence
- motivate others to become involved in badminton
- motivate others to aspire to the highest levels of badminton by creating visible role models
- attract funding for future elite performer development (e.g., government grants)
- attract funding for the sport, such as sponsorship or television rights

The motivators for achieving badminton success listed above have created a great deal of interest in the field of identifying and developing talent. Countries are striving for the system that is most efficient at identifying people with the potential to reach the highest levels of play. This is, in other words, a way to ensure that the players with the best chance of eventual podium success do in fact enter the player pathway.

The subject of talent detection and identification, however, is a complex one. Some of the challenges faced when designing and implementing an effective talent detection and identification system include:

- lack of clarity over whether badminton champions are "born" or "made"
- inconsistent definition of terms
- inconsistent application of terms
- use of talent-identification methods that may be more appropriate for closed-skill sports (e.g., athletics, rowing, cycling) rather than the open-skill nature of badminton
- limited allowance for cultural differences
- insufficient flexibility to allow for individual differences
- resistance to change

This module aims to explore these issues and help coaches better understand both the aims and the challenges surrounding talent detection and identification.

LEARNING OUTCOMES

By the end of this module, coaches will be able to:

- define terminology used within talent detection and identification
- consistently apply terminology used within talent detection and identification
- discuss issues surrounding current methods of talent detection and identification

02. KEY TERMINOLOGY

GENETICS

Genetics can be defined as *"the science of heredity"*. Put more simply, it is the study of how parents pass on physical and psychological characteristics to their children. A talent system highly influenced by genetics would probably look for evidence of success in badminton or similar sports in previous generations of a family. Supporters of a genetics approach to talent detection would point to successful players whose parents were also successful.

Supporters of this approach might also collate measurements of top players (e.g., height, weight, etc.) looking for an "ideal size" of player, and then use measurements for families to predict the size a young child might reach. If the prediction is close to the size of an "ideal" player, then that child would be selected. This approach assumes that:

- there is an ideal size for a successful badminton player
- it is possible to predict with accuracy the eventual height/weight of an adult from measurements taken in childhood

ABILITY

Ability was defined in the Level 2 Coaches' Manual as:

"a consistent, long-lasting attribute that is largely genetically determined and underpins a player's sporting performance".

Abilities are therefore closely linked to genetics. A useful way to think of abilities is to imagine there are a number of "work tools" that we are born with. Some people will be born with more tools and/or higher quality tools.

Despite considerable research in this area, there is no definitive list of abilities that is universally agreed upon. However, there is some agreement as to how abilities may be categorised. These ability categories include:

1. **Perceptual abilities**, which are concerned with an individual's interpretation of an event. Perceptual abilities often involve vision. Examples would be judging the speed, height, etc. of a shuttlecock flying through the air.

Photo credit: James Varghese

2. **Motor abilities**, which involve the production of specific movement patterns, such as overarm throwing.

3. **Physical abilities**, which involve the demonstration of specific physical capabilities, including flexibility, balance, strength, endurance, and speed.

4. **Cognitive abilities**, including how we learn, retain information, solve problems, and concentrate.

The Youth Sports Trust (England) has also suggested a different categorisation of abilities, including:

- **Social** - exhibited through behaviours such as leadership and team cohesion
- **Personal** – including control, confidence, commitment
- **Creative** – showing originality and independence of thought

It is important to keep in mind that, in reality, these abilities often work in combination.

GIFTEDNESS

Applied in a sporting context, the term "giftedness" can be defined as:

"the capacity to display high levels of competence in generic sporting abilities".

The link between the concepts of giftedness, ability and genetics is strong. Young children displaying early signs of competence in broad underpinning abilities (e.g., running, catching, balancing, etc.) are classified as gifted, with a large amount of credit for their early displays of excellence being attributed to the genetic "gifts" being passed down from their parents. However, the existence of a set of genetically endowed abilities, gifted by parents and pre-disposing a child to future excellence in a sport can be challenged. A multitude of factors can influence the development of a young child who appears to demonstrate excellent physical abilities, including most notably psychological and sociological factors.

POTENTIAL

Potential can be defined as *"being capable of becoming"*. This is a very frequently used word in sport and implies that observers (coaches, teachers, parents, etc.) can identify characteristics early in development that underpin elite adult badminton performance. However, in order for measurements of potential to be valid (i.e., measuring potential and not simply performance), the characteristics being measured would need to be stable over an extended period of time.

Coaches may observe effective technique, tactics, physical prowess, learning, etc. in young children and interpret this as a sign of "potential" for excellence in adulthood. Such observations are then often used to select those children for talent development programmes. The problems with this approach, however, are two-fold:

- The observation of the young child's early success is really a measure of performance at a moment in time, rather than a predictor of future adult excellence. Thus, a significant proportion of those selected may not actually have "potential", but just performed well at the time of selection.
- Some children will not perform well at the time of selection for a talent programme, although they do, in fact, have potential. However, their non-selection for a talent development programme can have long-lasting effects on their motivation to compete within that sport.

PERFORMANCE

Performance can be defined as *"the manner or quality of functioning"*. A coach evaluating a player's performance would, for example, look at how and to what standard a player completes certain tasks. In sport, these tasks are often categorised into:

- Technical
- Tactical
- Physical
- Psychological
- Lifestyle

Performance can be evaluated over a period of time (giving an indication of learning during that period), or at a particular moment in time.

SKILL

A basic definition of skill was offered in Level 2, along with a discussion around some of the characteristics of skilled performers. Within the context of talent detection and identification, skill can be more precisely defined as:

"the capability of producing a performance result with maximum certainty, minimum energy, or minimum time, developed as a result of practice".

Schmidt and Wrisberg, 2000, p. 29

Skills are therefore developed through practice and are, on the whole, sport-specific in nature.

Coaches, commentators, spectators, etc. tend to use the terms "ability" and "skill" to mean the same thing – for example, describing a player as "demonstrating great ability" when performing a jump smash. As explained above, however, the correct term would be "demonstrating great skill".

Photo credit: BWF/ BadmintonPhoto

TALENT

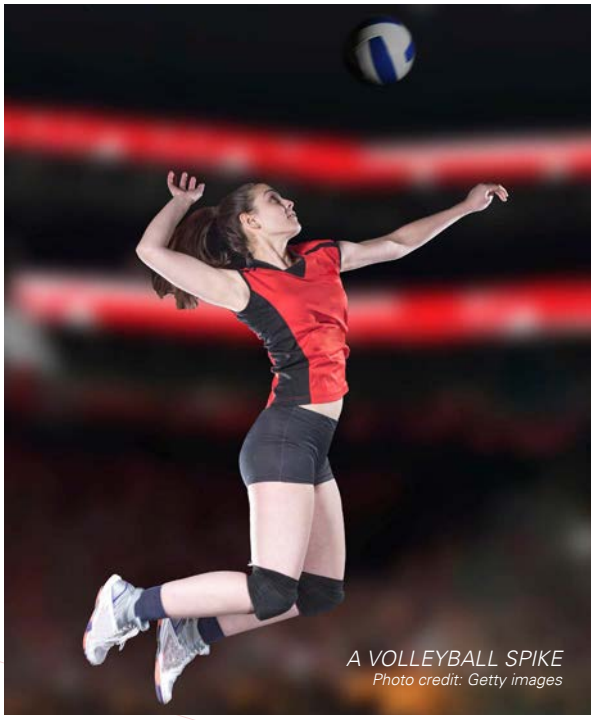
Talent can be defined as:

> *"the capacity to excel in a specific domain (e.g., sport, art, business, politics, medicine, etc.)".*

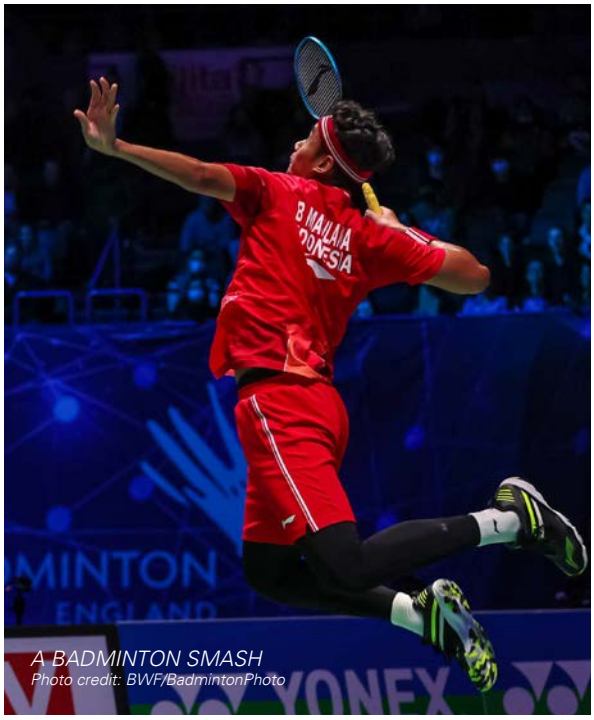
When discussing talent within a player pathway, it is also important to clarify the different processes by which players may enter, progress through, and exit the pathway. These are summarised below.

Talent Detection

- discovering potential high-level badminton players among people *who are not currently participating in badminton*



A VOLLEYBALL SPIKE
Photo credit: Getty images



A BADMINTON SMASH
Photo credit: BWF/BadmintonPhoto

Talent Transfer

- detecting talent from outside badminton and transferring it into badminton

Talent Identification

- recognising current badminton players with the potential to become elite badminton players

Typically, this involves evaluating a young player across a variety of areas (e.g., technical, tactical, physical, psychological, and sociological).

Talent Development

- implementing a process to develop players' talent optimally

Talented individuals are either detected (from outside badminton) or identified (from within badminton) and placed in the talent-development environment.

Talent Selection

- measuring the progress of players within the talent-development environment to make such decisions as:
  - » moving players up the talent-development pathway, perhaps into a higher-level training squad
  - » moving under-performing players out of the talent-development environment

Talent Discard

- determining that talented players, as the result of an assessment, are:
  - » not introduced to a talent-development programme
  - » removed from a talent-development programme

03. ISSUES FOR CONSIDERATION

ELITE PERFORMERS: BORN OR MADE?

The fairly simple answer to the "born or made" question is "both"! It would appear logical to point out examples of players who appear to have genetic advantages (percentage of fast-twitch fibres, ability to learn quickly, etc.), but equally valid is the point that no-one reaches the top without considerable commitment to deliberate practice. That practice has to be of substantial duration, intensity, and quality in order to make an elite champion.

ARE WE MEASURING THE RIGHT THINGS?

Traditional methods of talent identification in badminton often involve the following:

- Observation of young players (typically 10-13 years old) at tournaments, typically followed by selecting the players reaching the latter stages for inclusion on elite training programmes.
- Observation and measurement of players (typically 10-13 years old) on "Talent Detection" days. Such days typically involve measurements of the body (e.g., height/weight/skinfold), physical tests (e.g., jump height) and evaluation of technical and tactical skills.

Criticisms of this approach include the arguments below:

- Coaches and selectors observing players at tournaments or during talent detection days assume they that are measuring *potential* to achieve at the highest levels. However, they are more likely to actually be measuring *performance* at that moment in time, rather than potential to reach the top of the game. For example, psychological/behavioural factors have more relevance to eventual top-class performance, yet the emphasis in the early stages of development typically tends to be on anthropometric, physical, technical, and tactical issues.
- Many tests included in "Talent Detection" days, especially those concerned with anthropometric and physical measurement, have their origins in testing aimed at discovering talent in relatively closed-skill sports, such as cycling, swimming, rowing, sprinting, etc. It is questionable whether these measures are as significant in an open-skill sport such as badminton, where decision-making skills are also crucial for success.
- Since there is a great deal of variation in height and build of top-level badminton players, the merits of including anthropometric measurements in talent detection days are questionable.
- Tests often involve measurement of physical characteristics (e.g., flexibility, power, etc.). This approach assumes that this trait will remain stable as the player grows – i.e., that a young player with a jump height in the top 5% will maintain this position as an adult, with the result coming purely down to genetics, rather than training.
- Measurement of technical and tactical competence only a snapshot of one moment in time. Some young players may have had much more badminton training, which does not necessarily mean they are more talented. Rather, they have been lucky enough to have a favourable environment in which to train. There is also no indication that those technical and tactical skills will continue to progress in the future.
- Selection for talent development programmes on the basis of results from junior age group events can result in a bias towards children born earlier in a calendar year. This is because they may have up to one year's additional development time compared to other children born within the same calendar year.
- Parents can have a huge impact on the development of talent, yet they are rarely explicitly considered in the talent-detection process.

The main issue with this approach is that rather than indicators of potential to reach elite adult levels of play, what is actually being measured is performance at that specific moment in time.

TRAINED TALENT SPOTTERS: WHAT SKILLS DO THEY NEED?

Since it is such a crucial role, the need to recruit and train effective talent spotters is vital. Those recruited would be required to demonstrate:

- success in coaching, most notably in developing talent
- knowledge of the performance factors (technical, tactical, physical, psychological, and lifestyle) required for success in badminton
- accurate observational skills
- ability to objectively compare observed skills to agreed criteria

WHAT KIND OF PREPARATION SHOULD OCCUR PRIOR TO TALENT DETECTION?

There is general acceptance that children are unlikely to achieve the highest standards in any sport without mastering fundamental movement skills early in their development. An overview of these skills is included below:

Travelling Movements, where the body, usually upright, moves from one point on the ground to another (e.g., running, jumping, and skipping)	***Object-Control Movements***, which involve small objects being sent, travelled with, and received (e.g., throwing, catching, dribbling)	***Balance and Coordination***, which underpin and permeate the travelling and object-control categories

A short training period (of around three months) where these fundamental skills could be developed would allow coaches to observe the progression of children during this time. Using many of the ideas incorporated in the Shuttle Time Programme, it would be possible to put together such a programme, retaining the generic nature of the skills being developed whilst still "selling" the concept of badminton. For example:

- throwing games could involve throwing large/weighted shuttlecocks
- the court lines could be used for a variety of footwork drills

AT WHAT STAGE SHOULD TALENT DETECTION/IDENTIFICATION STOP?

Talent *identification* should continue for as long as possible, allowing late developers within badminton the chance to benefit from the advantages of a talent development system. It is questionable whether talent *detection* (with talent coming from outside badminton) should be sustained for as long, as it is unlikely that athletes from outside badminton would be able to learn the necessary skills to perform at a high level if they are only introduced to the sport in their late teenage years.

DIFFERENT CRITERIA AT DIFFERENT STAGES

The degree of emphasis of each of the performance factors in the talent detection process may vary depending on the maturity of the individual. For example, physical testing may be more applicable when detecting talent in 16-18-year-olds than in 10-13-year-olds, as the older players' physical characteristics will have stabilised. On the other hand, for 10-13-year-olds, their ability to develop sport-specific technique may be more relevant.

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TALENT DEVELOPMENT MODELS

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01. INTRODUCTION

Talent detection and identification can help get players with potential into a sports system. However, further development of that talent will need to occur if players are to continue progressing along the player pathway. There are many ways of looking at what it means to develop talent, as well as how this should be structured or organised. Different models of talent development may look at various stages in terms of the behaviours that should be exhibited, or the skills that can be trained. Others may look at the characteristics that the overall system should have, or what kind of goals should be set at different points along the pathway. Of course, coaches' perspectives on what it means to develop talent will undoubtedly influence their outlook on training and interaction with the players. As such, it is important that they be consciously aware of how they view talent development and how this affects their approach to coaching.

This module will provide an overview of four different theoretical models of talent development, which will help coaches understand some of the issues to be considered in this area, and how these have been addressed by different authors.

LEARNING OUTCOMES

By the end of this module, coaches will be able to:

- describe the basic structure and content of four talent development models
- evaluate the strengths and weaknesses of the talent development models discussed

02. BLOOM

Bloom (1985) proposed a model of talent development based on research of high achievers in both sporting (swimming and tennis) and non-sporting (music, art, science, and math) areas. The table below includes the main components of this model.

STAGE NUMBER	STAGE 1	STAGE 2	STAGE 3
STAGE NAME	**INITIATION**	**DEVELOPMENT**	**PERFECTION**
Performer behaviour	• Joyful • Playful • Excited • "Special" • Fun/social oriented	• Hooked/committed • Potential identified • More serious • Task/achievement oriented	• Obsessed/dominates life • Personally responsible • Independent • Willing to dedicate time/ effort required for highest standards
Mentor characteristics	• Process centred • Kind/cheerful/caring • Notices child's "giftedness"	• Superior technical knowledge • Strong personal interest • Respected • Strong guidance/discipline • Expects quality results	• Master coach • Feared/respected • Love/hate relationship • Successful/demanding
Parental role	• Positive • Shared sense of excitement • Supportive • Notice child's "giftedness" • Identify appropriate mentors	• More moral and financial support (to maintain mentor relationship) • Restrict other activities • Concern for holistic development	• Lesser role
General	• Little or no emphasis on competition	• Competition used as a yardstick for progress	• Fine tuning
Transition (from one phase to another)		• Development of athletic identity • Accelerated development • Introduction of a more technical coach • Performance becomes more achievement orientated • Talent identification • Competition becomes yardstick of success • Increased commitment	• Prioritisation of sport in life • Psychological rebellion • Transition characterised by turning points stimulated by successful performance/key event • Introduction of a master coach

03. LONG-TERM ATHLETE DEVELOPMENT (LTAD)

The LTAD model identifies various stages of development from birth to retirement and attempts to describe the types of activity that should occur during those phases in order to achieve optimum sporting development. LTAD was introduced in the Level 2 Coaches' Manual, with a brief mention of the challenges surrounding the model. Here it will be considered in greater detail in the interest of better understanding different development models. It is important to point out that although it was not specifically designed as a talent development model, LTAD has often been used in this context.

A six-stage LTAD framework is shown below.

LATE SPECIALISATION

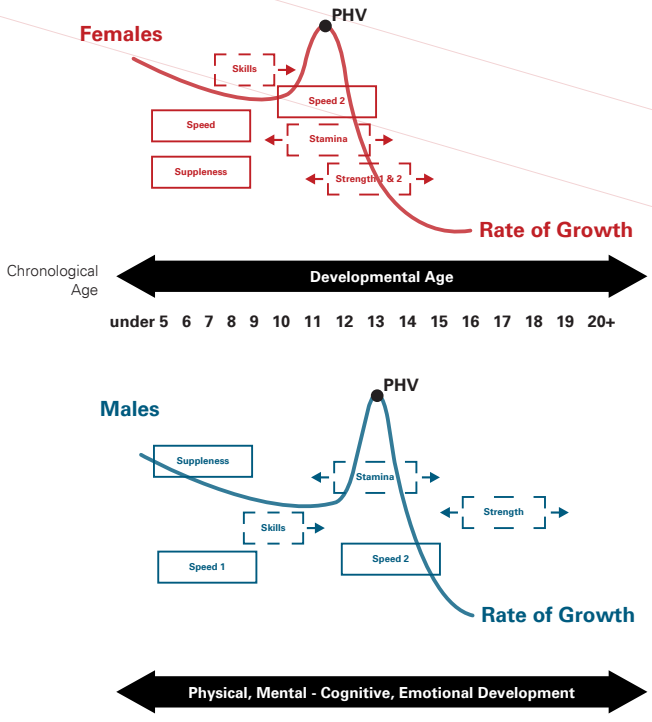
STAGE	GOAL	APPROXIMATE AGE *	NOTES
FUNdamental	Learn all fundamental movement skills (build overall motor skills)	Male: 6-9 Female: 6-8	
Learning to Train	Learn all fundamental sports skills (build overall sports skills)	Male: 9-12	
Train to Train	Build aerobic base, build strength towards the end of the phase + further develop sport-specific skills (build "engine" + consolidate sport specific skills)	Male: 12-16 Female: 11-15	Period where Peak Height Velocity (PHV) most likely to occur
Train to Compete	Optimise fitness preparation + individual sport specific skills as well as performance (optimise "engine", skills + performance)	Male: 16-18 Female: 15-17	
Train to Win	Maximise fitness preparation and sport, individual specific skills as well as performance (maximise "engine", skills, and performance)	Male: 18+ Female: 17+	
Retirement/retention	Retain athletes - coaching, administration, officials, etc.		Age at which this occurs is individual choice

**Note that although ages are quoted for each stage, these are very broad guidelines that should be applied with care, due to the vastly differing rates at which individuals can mature.*

Two key concepts within Bayli and Hamilton's LTAD model are:

- peak height velocity (PHV), which involves identifying when the rate of growth of a child is at its greatest by measuring growth rates
- "windows of trainability", which involves identifying times in a person's long-term development when different types of training can be applied most optimally (i.e., when the training effects of that type of training are thought to be optimal).

The diagram below illustrates the relationship between "windows of trainability" and PHV, with different windows occurring at different times. Note also the differences in training emphasis for males and females.



04. MARTINDALE, R. J., COLLINS, D., & DAUBNEY, J.

After a review of the literature and an examination of the gap between recommendations and current practice, Martindale, Collins and Daubney (2005) came up with a model that aimed to offer guidelines toward effective talent development environments. Rather than trying to delimit or describe stages, they focus on ***the characteristics that an effective model should have***, particularly regarding the long-term view of athlete development.

KEY FEATURES	KEY METHODS	NATURE OF THE MODEL
Long-term aims and methods	• Develop a long-term vision, purpose, and identity • Develop systematic planning and implementation • Provide coherent reinforcement at a variety of levels	**Integrated, Holistic and Systematic**
Wide-ranging coherent messages and support	• Provide coherent philosophies, aims and methods at a variety of levels (e.g., parents, coaching content, practice and reward systems, selection, competition structure, NGBs • Educate parents, schools, peers, coaches and important others (and encourage positive contributions) • Utilise role models at a variety of levels • Set up a variety of support networks over the long term (e.g., peer, coach, sport staff, family) • Provide forums for open and honest communication patterns at a variety of levels	
Emphasis on appropriate development, not early success	• De-emphasise "winning = success" at developmental stages • Provide clear expectations, roles and meaning within the big picture at every level • Provide "stage specific" integrated experiences and teaching: » fundamental physical and perceptual skills » fundamental mental skills (learning and development; life; performance related) » sport-specific skills (technical, tactical, mental, physical, perceptual) » balance • Encourage increasing responsibility and autonomy in learning/development • Develop intrinsic motivation and personal commitment to the process • Promote personal relevance, athlete understanding and knowledge	
Individualised and ongoing development	• Provide opportunities and fundamentals to as many youngsters as possible • Provide flexible systems to allow for variation in performance and physical development • Identify, prepare for and support individuals through key transitions • Provide regular individual goal setting and review processes • Provide systematic reinforcement contingencies	

05. CÔTÉ & HANCOCK

Côté and Hancock (2014) have developed a model based on considerable research which is called "The Developmental Model of Sport Participation". This model promotes the idea that youth sports systems normally have three objectives of maximising:

Personal development	***Participation***	***Performance***

Problems arise however where one of these "3Ps" start to dominate, with the result that this emphasis can harm the other two strands. For example, an over-emphasis on unrestricted "free play" may enhance participation, but not necessarily lead to the objectives of personal development (e.g., teamwork) or performance (high skill levels). Another problem is that an erroneous approach to one individual objective may in fact become self-defeating. For example, for many sports, early specialisation in that sport and an early emphasis on competitive achievements is likely to reduce, rather than improve, adult performance standards.

DEVELOPMENTAL MODEL OF SPORT PARTICIPATION (DMSP)		
BALANCING THE STRANDS OF:		
PERSONAL DEVELOPMENT	**PARTICIPATION**	**PERFORMANCE**
• Prioritise safety • Organise activities in a manner suitable for the child's stage of development • Help children build supportive relationships • Provide a sense of belonging to a community • Expose children to positive morals/ values • Provide opportunities to do things that make a real difference/ play an active role in the organisation • Provide opportunities for social skill building, including: » learning how to form positive relations with peers » forming strong links between families/ schools/other community groups	• Offer opportunities to try a variety of sports • Provide opportunities for activities that are "playful" and have limited adult control (i.e., deliberate play) • Provide an environment where activities are fun • Promote intrinsic motivation	Provide a transition from general, playful activities to sport specialisation and deliberate practice. Three broad phases are used to structure this transition, including: • Sampling Phase (6-12 years old) - same characteristics as the participation strand • Specialisation Phase (13-15 years old) - transition into emphasising involvement in one main sport, gradual increase in deliberate practice • Investment Phase (16+ years old) - full commitment to sport of choice and deliberate practice
ASSERTIONS THAT UNDERPIN THE DMSP • Early participation in a variety of sports: » does not reduce the chance of peak performance as an adult » reduces the chance of dropping out of sport early » improves overall personal development by exposing children to different experiences • High amounts of play: » during the sampling years is fun, reinforcing intrinsic motivation for future sport participation » in a variety of sports during the sampling years provides a solid foundation that ultimately benefits the sport they commit to in the investment (16+) phase • Around the age of 13, children should be offered the opportunity to begin moving towards specialisation or continue at a recreational level, possibly in a variety of sports. • Around the age of 16, children have the necessary skills (physical, cognitive, social, emotional, and motor) to invest in specialisation in one sport.		

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NCIMS

BADMINTON COACH EDUCATION

COACHES' MANUAL

LEVEL 3

MODULE 4
A PLAYER DEVELOPMENT FRAMEWORK

MODULE 4
A PLAYER DEVELOPMENT FRAMEWORK

Photo credit: Badminton Oceania

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01. INTRODUCTION

As discussed in the previous module, there are different ways of understanding what talent development means, and different theoretical models approach this in widely varying ways. Coupled with a theoretical understanding of what talent development means, coaches need to address how they achieve this in their day-to-day work with players. A player development framework could provide a set of guidelines, identifying the types and level of skill that should be exhibited by players at different stages of their development if they aspire to achieve a high standard of play.

An agreed player development framework for badminton, for example, could help define:

- the order in which specific technical, tactical, physical, psychological and lifestyle skills are taught
- coach education, with coaches requiring different skill sets at different stages of players' development
- parent education programmes
- competition structures
- the introduction of specialists (e.g., strength and conditioning coaches)
- the environment in which the badminton programme is delivered
- the duration and intensity of training

However, there are many challenges surrounding the development of such a framework, including:

- the lack of evidence to support the ideas that coaches believe to be true based on their personal experiences
- cultural differences across countries
- differences between males and females
- differences between actual age (e.g., 12 years old) and physical/emotional/cognitive age (i.e., early and late maturers)
- the multi-faceted nature of an open skill sport such as badminton, involving development in a complex mix of technical, tactical, physical, psychological and lifestyle factors

The aim of this module is therefore:

- to provide a set of flexible guidelines as a starting point to examine the type and level of skill players should be able to demonstrate if they are to progress optimally in the sport of badminton
- to highlight aspects of the sport that need to be structured in a way that supports players most effectively

The key to the developing a successful framework would depend, to a large degree, on a number of factors, including:

- an appreciation of the need for flexibility in adapting to different cultures
- constant evolution of the framework, driven by scientific research and coach dialogue from a variety of cultures
- coaches' displaying not only sound knowledge of the framework (the science of coaching), but also the sensitivity to adapt the framework in order to meet the needs of individuals (the art of coaching)

LEARNING OUTCOMES

By the end of this module, coaches will be able to:

- identify the components and stages of a model "Player Development Framework"
- discuss the characteristics of different stages of the framework presented here
- compare the framework presented here to what is done in their countries

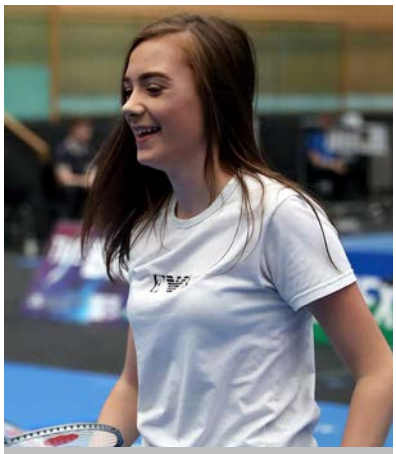
02. KEY TERMINOLOGY IN PLAYER DEVELOPMENT

CHRONOLOGICAL AGE

Chronological age means "the amount of time that has elapsed since birth". Typically, chronological age is given in years (e.g., 12 years old).

10 years old

14 years old



17 years old

Photo credit: BWF/BadmintonPhoto

DEVELOPMENTAL AGE

Developmental age can be defined as "*the stage of maturity of an individual*". Explained in a different way, we have certain expectations about how a person will look or behave at different chronological ages. Developmental age is more complex than chronological age and has several dimensions, including:

- physical maturity (different children go through puberty earlier or later)
- cognitive maturity (children will show differing abilities to appreciate a range of perspectives when dealing with different scenarios)
- emotional maturity (children show differences in their ability to understand and manage different feelings, such as joy, anger, sadness, fear, disgust, surprise, trust etc.)

When building a profile of players, it can be useful for coaches to consider, at least informally, not only a player's chronological age, but also the extent to which that player's physical, cognitive and emotional maturity is ahead or behind what would be expected for a person of that age. For example:

PLAYER A			
CHRONOLOGICAL AGE	**DEVELOPMENTAL AGE**		
	Physical Maturity	*Cognitive Maturity*	*Emotional Maturity*
12 years old	+2 years	+1 year	-2 years

Player A is 12-year-old boy. Physically he is a very early maturer, as much as two years ahead of what would be expected for a person of that age. He demonstrates above-average problem-solving skills and enjoys being given tactical challenges to solve (one year ahead of what would be expected), but he is emotionally insecure, taking constructive criticism personally and lacking the capacity to take responsibility for his own actions, even when they are incorrect.

Whilst care should be taken with this approach due to its subjective nature, it does help to heighten coaches' awareness that children of the same chronological age may show quite different levels of maturity. In turn, this means that both what and how they coach may be different for children of the same chronological age.

TRAINING AGE

This refers to the number of years that have elapsed since a person began formal, structured training in badminton.

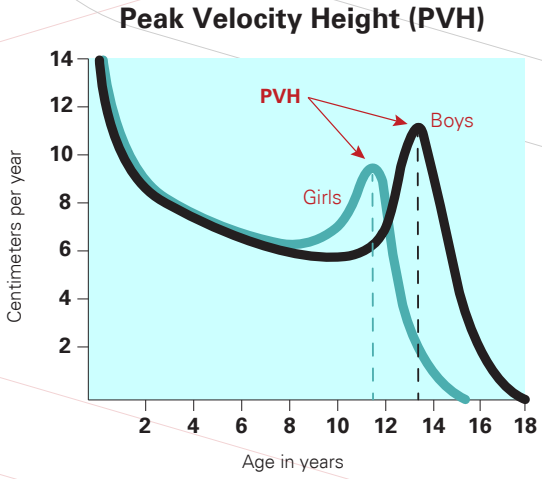
PUBERTY

Puberty is the process of physical changes by which a child's body matures into an adult body capable of sexual reproduction. Puberty can occur between the ages of 10 and 17, with the large majority of children experiencing puberty during the middle of this age range. Girls typically experience puberty before boys.

The physical changes experienced during puberty are caused by increases in hormone release and are different for boys and girls. Apart from body changes related to the sex glands, the most noticeable visual effect of puberty is accelerated growth (both height and weight).
There are cultural differences in the onset of puberty and many of these differences are thought to be related to nutrition.

PEAK VELOCITY HEIGHT

Peak velocity height (PVH) is the name given to the point in time when a person's rate of growth is at its greatest. This point occurs during puberty and, like puberty itself, usually occurs earlier in girls than in boys.



The next five sections will explore the changing dynamics of working with young players in development, with regards to:

- Goals for the different performance factors *(technical, tactical, lifestyle, psychological, physical)*
- Coaching profile
- Competition advice
- Training considerations (F.I.T.T.)
- Parental support

Each section will examine the different phases in player development *(Sampling, Specialising, Investment)* to highlight what may be needed/expected at the different stages. While approximate ages are given for each phase, it is important to remember that this will also depend on the context. Some countries will have little formal player development for players under 10, while others will start quite early on. Rather than a strict timeline, the phases offer a general guide for players' progression.

03. GOALS FOR DIFFERENT STAGES

SAMPLING PHASE (APPROXIMATELY 6-12 YEARS OLD)		
By the end of this period, players will be able to:		
Technical	**Hitting** (skills sustained under simple, predictable rallying conditions)	adjust their grip: • depending on the shuttle's position in relation to the body (backhand, forehand, in front of/level with or behind the body) carry the racket: • out in front of the body when approaching the net and defending in the midcourt • in an elevated position in preparation for forehand overheads • with elbow down and racket head up in preparation for backhand overheads execute **serves** including: • backhand low and flick serves (striking from the hand) • forehand low/flick/high serves (from a dropped shuttle) – note: fh high serve is a skill required to train other skills in the group (forehand overhead) perform **forecourt strokes** including: • backhand and forehand net shots (close to and off the net, spinning and not spinning the shuttle) • backhand and forehand lifts using a flicking technique perform **midcourt strokes** including: • backhand and forehand blocks, drives and lifts off the body • backhand and forehand drives from the midcourt perform **rearcourt strokes** including: • forehand overheads with a throwing action and forearm rotation, including being able to hold the shot • forehand clears, smashes and dropshots with similar hitting actions • slices and stik shots • flowing backhand overhead action
Tactical	• describe the base position (recognising it as a flexible concept) • recognise the advantages of "early" (less time for opponent, opportunity to hit down, greater number of options) • use and cover height, width, and depth effectively to create/cover space • devise and use simple game plans that maximise own strengths and minimise own weaknesses • devise and use simple game plans that exploit opponents' weaknesses and reduce the effectiveness of their strengths • devise and use set plays around serving and returning (singles and doubles) • adjust defensive and attacking formations during "set plays" in doubles	
Lifestyle	• explain the importance of appropriate hydration and drink accordingly • describe the different components of diet and their importance to sporting performance • adopt and maintain appropriate nutritional habits • maintain participation in other sports (athletics, gymnastics, cricket, handball, etc.)	

SAMPLING PHASE (APPROXIMATELY 6-12 YEARS OLD)		
By the end of this period, players will be able to:		
Psychological	**Commitment**	• appreciate that involvement in sport is a good thing (for keeping healthy, being with friends, learning new things, etc.) • focus on enjoying learning new skills and doing them well (without the necessity of using these to win) • try hard (trying hard is more important than winning) • solve problems (e.g., invent a game, design a practice) • help set/work towards process goals within a training session (e.g., 10 lunges pointing foot towards marker on net, keep shuttle in the air 10 times, etc.)
	Concentration	• focus attention on a variety of stimuli (visual, auditory, kinaesthetic, etc.) to assist learning • use imagery (e.g., land the shuttle ["the bird"] in the target ["the nest"]) • focus attention in the right area (e.g., watching the shuttle)
	Control	• think positively (difference between "I can't do this", "I can't do this yet" and "I can do this if I keep trying") • follow rules of behaviour
	Confidence	• establish self-esteem ("I'm honest, I'm caring, I try hard" – these things count the most) • celebrate successes (stressing success as learning new skills, trying hard, helping others, etc., rather than outcomes) • express thoughts and feelings (happy, sad, pleased, tired, up for it, disappointed, etc.)
	Cohesion	• work with others • demonstrate an ethical approach to badminton, including respect for the game (playing to the rules) and people within the game – practice partners, opponents, coaches, officials, etc.
Physical	**Balance**	• balance statically using different bases of support (feet, knees, elbows, hands, etc.) • land from a variety of jumps (one foot, two foot, spin in the air, etc.) on balance, performed in multiple directions (predictable sequences) • perform multi-direction lunges on balance
	Coordination	• start – perform split-steps with different feet position and move off in response to shuttle being struck • travel – using a variety of methods (run, side-step, chassé, cross-behind, pivot) in multiple directions • skip rhythmically (with a rope) • jump efficiently, using body segments in sequence and appropriate arm counter-movements • perform an overhead throwing action using a sideways stance and trunk rotation
	Quickness	• move hands quickly (e.g., clapping games, striking rapidly fed shuttles) • move feet quickly (fast feet exercise in the tramlines)
	Speed	• cover the ground rapidly using various methods (running, chassé, cross-behind, grapevine, pivoting) • move off quickly from a variety of stances
	Agility	• start/stop/change direction efficiently • combine a broad range of movements in three planes (forwards/backwards, side to side, up and down)
	Strength	• perform basic bodyweight exercises with correct technique (squats, lunges, adapted press-ups, back raise, trunk curls)
	Stamina	• keep active, although no specific target training for stamina is prescribed
	Suppleness	• use dynamic exercises to increase range of movement as part of warm-up • perform static stretches in cool-down

SAMPLING PHASE (APPROXIMATELY 6-12 YEARS OLD)		
	Other considerations	
Coaching	• Make it fun • Sell the sport • Involve parents (but set boundaries) • Establish rules of behaviour • Make practice varied • Be aware of the coach's role in long-term development – be willing to pass player on	• Coach skills from generic to sports-specific • Apply correct basic technical/tactical knowledge • Encourage participation in other sports as well as badminton • Be a friend to the players • Encourage creativity/imagination
Training	• Identify environments where training will take place (e.g., school, club) • Avoid the use of training cycles (e.g., peaking for tournaments) in this phase	• Decide on the *frequency* – how many training sessions per week • Decide on the *intensity* – low, moderate, or high intensity, or a balance of each • Decide on the *time* spent training – duration of sessions/total training time per week • Decide on the *type* of training – technical, tactical, physical, and psychological
Competition	• Place greater emphasis on singles competition	• Decide on number of tournaments that will help support effective development (beware of over-competing)
Other Support	• Maintain open communications with other coaches involved in player development	
For Players (regarding other sports)	• Learn to swim, at least for personal safety • Maintain involvement in a variety of sports • Decide on time commitments to other sports	• Maintain a balance of team/individual sports • Select sports that train both sides of the body equally • Select sports that help develop fundamental skills (e.g., athletics, gymnastics)
For Parents	• Establish and reinforce parental philosophy with child and coach • Focus on respect and discipline	• Help their children to: » manage time » adopt appropriate nutritional habits » have sufficient rest

SPECIALISING PHASE (APPROXIMATELY 13-15 YEARS OLD)		
By the end of this period, players will be able to:		
Technical	**Hitting** (consistently produce a variety of strokes in matchplay against peers)	perform **forecourt strokes** including: • basic straight net shots, spin net shots, crosscourt net shots, held net shots, forecourt kills, net kills, basic net lifts, held lifts, double movements • return of low serve with racket head above the hand (doubles emphasis) • net play with racket head above the head (doubles emphasis) perform **midcourt strokes** including: • blocks, drives, and lifts from the side of the body (often, but not always, singles bias) • blocks, drives, and lifts off the body (often, but not always, doubles bias) perform **rearcourt strokes** including: • forehand clears/held clears, dropshots/pulled dropshots/stop-drops, sliced/reverse sliced dropshots, smashes/stik smashes • backhand clears, smashes, pulled dropshots
	Movement	• perform a variety of movement patterns to different areas of the court at pace in matchplay • adjust movement patterns according to the tactical situation (especially when recovering after a stroke) in matchplay
Tactical	• devise and implement game plans after studying opponents' strengths and development areas • adjust strategies within games • work with coaches to implement agreed game plans • work with coaches to adjust strategies in the middle of matches (responding to discussions during intervals) • adjust style of play (safe, hard hitter, deceptive, quick, aggressive, change of pace, etc.)	
Lifestyle	• with guidance, plan an annual training programme, with gradual appreciation towards peaking in the later part of this phase • plan and follow an annual competition program • take responsibility for packing own bag in preparation for training/competition • monitor food/fluid intake and adjust according to appropriate nutritional guidelines • take increased responsibility for managing sporting, family, and educational commitments	

SPECIALISING PHASE (APPROXIMATELY 13-15 YEARS OLD)		
By the end of this period, players will be able to:		
Psychological	**Commitment**	• set and work towards short-/medium-/long-term goals (with an emphasis on process goals) • devise and follow a basic training/competition schedule • sustain 100% effort in training and competition, whether supervised or not
	Concentration	• use imagery to improve technically and tactically • adjust focus (broad to narrow, internal to external) depending on the situation
	Control	• use routines to help maintain optimum arousal levels • display neutral or positive body language
	Confidence	• use imagery to enhance confidence (visualising success) • review and evaluate performance objectively (recognising strengths and development areas)
	Cohesion	• work within a badminton team (teammates, coaches, parents, school, specialists), specifically establishing and working towards agreed team goals
Physical	**Balance**	• balance statically using different bases of support and equipment (e.g., balance boards, Swiss ball, etc.) • land on balance from jumps (using one- and two-footed landings) in unpredictable sequences • perform multi-direction lunges on balance in unpredictable sequences
	Coordination	• appreciate that the growth spurt may temporarily affect movement efficiency • link movement components to form coherent movement patterns • adjust movement timing as required (regulated by shuttle being struck by opponent)
	Quickness	• compete 100% in quickness exercises against their peers • include quickness exercises as part of a warm-up (especially pre-competition warm-up)
	Speed	• compete 100% in speed exercises against their peers • demonstrate progressive improvement in speed (although there may be some interruption in the progression due to the growth spurt)
	Agility	• link recognised movement patterns to all areas of the court • perform flowing shadowed court movements to all areas of the court on balance, in response to unpredictable directions from a training partner
	Strength	• differentiate between training for absolute strength, strength endurance and elastic strength (power) • perform a range of strength exercises, with safe technique, using a variety of equipment (elastic bands, Swiss balls, dumbbells, barbells, medicine balls) • integrate strength training into a weekly training schedule (with different emphasis in different phases of the year)
	Stamina	• integrate stamina training into a weekly training programme (different emphasis in different phases of the year) • record high level of stamina testing scores (requires comparable testing norms to be available) • record improvement in stamina testing scores (measured against self)
	Suppleness	• integrate static stretching sessions into a weekly training programme • record high level of testing scores (requires comparable testing norms to be available) • record improvement in flexibility scores (measured against self) – however, these may be compromised by effects of puberty

SPECIALISING PHASE (APPROXIMATELY 13-15 YEARS OLD)		
Other considerations		
Coaching	• Make it fun • Sell the sport • Develop parents' skills via player-support workshops (around self-reliance, communication, tournament planning, etc.) • Maintain rules of behaviour (players, parents, etc.) • Instil discipline • Be aware of the coach's role in long-term development – be willing to pass player on	• Demonstrate strong technical/tactical knowledge – a clear picture of elite play requirements • Help child to make choices in transition from multi- to single-sport participation • Encourage creativity/imagination • Make practice varied • Expect quality
Training	• Identify environments where training will take place (e.g., school, club) • Begin to introduce/use concepts of training cycles within context of an annual plan	• Decide on the *frequency* of training – how many times per week • Decide on the *intensity* of training – low, moderate, or high intensity • Decide on the *time* spent training – duration of sessions/total training time per week • Decide on the *type* of training – technical, tactical, physical, and psychological
Competition	• Decide on the number and level of tournaments that will help support effective development • Select tournaments where peak performance is the goal	
Other Support	• Maintain open communications with other coaches involved in player development • Begin to build working relationships with specialists	
For Players (regarding other sports)	• Gradually reduce commitment to other sports (decided by the player)	
For Parents	• Establish and reinforce parental philosophy with child and coach • Focus on respect and discipline • Attend player-support workshops • Promote increased self-reliance for the child	• Help their children to: » manage time » adopt appropriate nutritional habits » have sufficient rest

INVESTMENT PHASE (APPROXIMATELY 16-21 YEARS OLD)		
By the end of this period, players will be able to:		
Technical	**Hitting**	focus on training/improving specific hitting skills: • for certain events (singles and/or doubles) • identified as necessary for personal improvement • in preparation for particular opponents
	Movement	focus on training/improving specific movement skills: • identified as necessary for personal improvement • in preparation for particular opponents
Tactical	• analyse opponents using live observation and/or video replay • formulate their own game plans • formulate game plans together with a coach and/or partner • implement game plans • adjust game plan as required during a match • respond to coaching advice during a match • play to own strengths and cover weaknesses • review matches objectively (describing what happened) • evaluate matches objectively (identifying strengths and development areas)	
Lifestyle	• take full ownership of managing commitments (training, competition, education, work, rest, socialising, holidays, etc.) • sustain nutritional habits consistent with those of a professional sports person • describe and follow the WADA guidelines regarding drug compliance • establish/maintain/develop interests outside the sport of badminton • manage periods of injury (train around injury, study opponents, assist in coaching, etc.) • establish/maintain strategies for dealing with long phases of travel	

INVESTMENT PHASE (APPROXIMATELY 16-21 YEARS OLD)		
By the end of this period, players will be able to:		
Psychological	**Commitment**	• set and work towards short-/medium-/long-term process, performance, and outcome goals • devise and follow periodised annual training/competition programmes
	Concentration	• maintain concentration in a variety of practice, match, and tournament situations
	Control	• maintain emotionally appropriate states in a range of competition environments
	Confidence	• use imagery to enhance confidence (visualising success) • use self-talk
	Cohesion	• work effectively within an extended support team (e.g., manager, sports psychologist, strength and conditioning coach, physiotherapist, sponsors, administrators, etc.)
Physical	**Balance, Coordination Quickness, Speed, Agility**	• perform co-ordinated badminton-specific movement patterns, on balance and at speed
	Strength	• perform a range of strength exercises, covering all areas of the body, with appropriate technique • follow an individualised strength-training programme, adjusted according to the stage within an annual cycle • achieve established norms for strength based on data from top players
	Stamina	• follow an individualised stamina-training programme, adjusted according to the stage within an annual cycle • achieve established norms for stamina based on data from top players
	Suppleness (Flexibility)	• follow an individualised flexibility-training programme, covering all areas of the body, with appropriate technique • achieve established norms for flexibility based on data from top players • use dynamic exercises to increase range of movement as part of warm-up • incorporate a routine of static stretches in cool-down
	Rehabilitation	• follow prescribed rehabilitation routines in recovery from injury • integrate prescribed preventative exercise advice into existing physical training programmes

INVESTMENT PHASE (APPROXIMATELY 16-21 YEARS OLD)		
	Other considerations	
Coaching	• Make it fun • Maintain rules of behaviour • Maintain discipline • Create a love/hate relationship • Manage psychological rebellion	• Demonstrate strong technical/tactical knowledge - experience in elite sport • Encourage creativity/imagination • Make practice varied • Be demanding – insist on quality
Training	• Consolidate use of training cycles within the context of an annual plan	• Decide on the *frequency* of training – how many times per week • Decide on the *intensity* of training – low, moderate, or high intensity • Decide on the *time* spent training – duration of sessions/total training time per week • Decide on the *type* of training – technical, tactical, physical, and psychological • Decide on the *type* of training – event specialisation
Competition	• Decide on the number/level of tournaments that will support effective development • Select tournaments where peak performance is the goal and plan around this	
Other Support	• Maintain open communications with other coaches involved in player development • Build working relationships with specialists (sports psychologists, strength and conditioning coaches, etc.)	
For Players (regarding other sports)	• Keep other sports occasional and recreational (e.g., during active rest in annual cycle)	
For Parents	• Play a gradually diminishing role • Promote increased self-reliance for the young adult • Manage psychological rebellion	

04. COACHING CHARACTERISTICS AT DIFFERENT STAGES

Guiding a person's development from beginner to internationally successful player is not easy. As individuals pass though childhood and into adulthood, their developmental needs will vary. In order to meet these needs successfully:

- coaches may need to adapt, expanding their knowledge and changing their delivery styles
- there may need to be different coaches with different knowledge and styles at different stages

PLAYER DEVELOPMENT MODEL: COACHING KNOWLEDGE/STYLE		
Sampling Phase (Pre-puberty)	**Specialising Phase (Puberty)**	**Investment Phase (Post-puberty)**
Coaching knowledge • Understanding of children's characteristics (physical, emotional, cognitive) in the pre-puberty phase • Good grasp of the generic sports skills transferable to badminton (sending and receiving, movement skills, spatial awareness, etc.) • Solid command of basic badminton skills (technical and tactical) • Ability to deliver basic badminton skills in many varied ways • Awareness of the other stages in the pathway (puberty, post-puberty)	**Coaching knowledge** • Understanding of young people's characteristics (physical, emotional, cognitive) in the puberty phase • Good depth and breadth of badminton-specific knowledge (technical and tactical) • Solid command of other performance factors (physical, psychological and lifestyle) • Awareness of other stages in the pathway (pre-puberty, post-puberty) • Experience with annual planning • Expertise with competition structures relevant to these age groups • Awareness of requirements for success in badminton at this developmental stage (puberty) and beyond	**Coaching knowledge** • Strong/in-depth technical and tactical knowledge • Solid understanding of physical/psychological/lifestyle development • Experience with international badminton at adult level (playing and/or coaching) • Awareness of other stages in the pathway (pre-puberty, puberty)
Coaching style • Acts as a friend to the children • Sells the sport of badminton • Makes it fun • Establishes and maintains discipline • Delivers basic badminton skills using a wide variety of methods • Involves parents, as appropriate • Encourages creativity/imagination • Encourages involvement in a wide variety of sports	**Coaching style** • Adapts style from friend to disciplinarian • Makes it fun • Maintains rules of behaviour • Encourages player self-reliance • Encourages parents to develop self-reliant children • Varies practice routines • Encourages creativity/imagination • Nurtures a growing commitment to badminton	**Coaching style** • Takes on the role of disciplinarian • Encourages creativity/ imagination • Makes it fun • Keeps practice varied • Maintains rules of behaviour • Encourages player self-reliance • Works effectively within a coaching team
Other aspects • Planning skills (linked, progressive sessions) • Self-awareness – ability to critically analyse own coaching performance (review and evaluate) • Capacity to mentor other coaches working at this level	**Other aspects** • Planning skills (annual planning) • Self-awareness – ability to critically analyse own coaching performance (review and evaluate) • Ability to work effectively with others (e.g., sports psychologists, strength and conditioning coaches, etc.) • Capacity to mentor other coaches working at this level	**Other aspects** • Planning skills (annual planning) • Self-awareness – ability to critically analyse own coaching performance (review and evaluate) • Ability to work effectively with others (e.g., sports psychologists, strength and conditioning coaches, etc.) • Capacity to mentor other coaches working at this level

05. COMPETITION AT DIFFERENT STAGES

Competition is an essential element of player development. However, for competition to be effective throughout the player's development, it needs to be well planned and take into account how the following aspects may vary:

- Singles, doubles and mixed, versus a focus on specific events
- Matches of best of three games to 21, or a variety of formats
- Group, knockout, league ladder formats
- Individual and/or team events
- Total number of competitions in a year
- Spacing of competitions
- Standard of competition (e.g., some you could win, some where you may win some matches, some tough ones that are just for experience)

Photo credit: BWF/BadmintonPhoto

The table overleaf gives some broad advice on competition planning.

PLAYER DEVELOPMENT MODEL: COMPETITION ADVICE		
Sampling	**Specialising**	**Investment**
Across all stages, make the focus of competition: • having fun • being with friends • trying as hard as possible and being proud of the effort • seeing competition as a chance to learn and improve		
• De-emphasise winning by having equal rewards for "best effort", "top team member", "best supporter", etc. • Provide a mix of individual and team formats. • Consider events where boys and girls compete against each other (e.g., singles events where boys and girls play each other). • Make use of group formats to ensure more games for all. • Use shorter games so players can "restart" more often (e.g., three games to 7 rather than one to 21). • Focus on locally based competition to reduce travelling. • Consider how much competition in a season is appropriate (e.g., one to two competitions per month over a seven-month season).	• Provide a mix of individual and team formats. • Include competition in singles, doubles, and mixed events. • Plan for single-sex singles and doubles events (e.g., boys' singles, boys' doubles, girls' singles, girls' doubles). • Make a gradual transition to best of 3 x 21. • Plan a mix of locally based competition and competition across wider geographical areas (more travelling). • Use a mix of group and knockout formats. • Play a mix of junior events and lower-level senior events. • Gradually introduce annual planning based around peaking for specific competitions.	• Include competition in a mix of individual and team formats. • Begin to target specific events (e.g., singles and/or doubles and/or mixed). • Contemplate regional, national, and international travel for competition. • Focus mainly on knockout events. • Manage the transition from junior to senior events. • Base competition planning around peaking for specific competitions (two to three per season). • Take the achievement of ranking points into consideration in choosing competitions.

06. F.I.T.T. AT DIFFERENT STAGES

In order to be effective, the composition of training and competition during the long-term development of a player requires careful consideration. Offering overly prescriptive advice for training and competition can be counter-productive, as this will not allow for the varying needs of individuals or the differences between cultures. The aim of this section, therefore, is to provide a flexible template where coaches can formulate their own player development advice sheet.

The F.I.T.T. (Frequency, Intensity, Time, and Type) model explored in previous levels of BWF Coach Education will be used as a basis to help coaches explore the needs of their players at different stages in their development. There are two key parts to this process:

- Table 1 provides some general guidance in this exploration, but mainly serves to ask the questions that need to be answered in order for coaches/administrators to develop their own advice sheet.
- Table 2 provides a blank template where the coach's decisions can be added.

TABLE 1 - PLAYER DEVELOPMENT FRAMEWORK: TRAINING AND COMPETITION (F.I.T.T.)

Sampling	Specialising	Investment
Frequency Questions to consider include: • Should the number of sessions increase as the pre-puberty phase progresses. If so, by how much? • How many sessions per week would be required to support the progressive learning of badminton skills, whilst allowing for other demands (e.g., education, other sports, social time) to be met? • Will the frequency of sessions vary during a year? If so, by how much?	**Frequency** Questions to consider include: • Should the number of sessions increase as the puberty phase progresses. If so, by how much? • How many sessions per week would be required to support the progressive learning of badminton skills, whilst allowing for other demands (e.g., education, other sports, social time) to be met? • Will the frequency of sessions vary during a year? If so, by how much?	**Frequency** Questions to consider include: • Should the number of sessions increase as the post-puberty phase progresses. If so, by how much? • How many sessions per week would be required to support the progressive learning of badminton skills, whilst allowing for other demands (e.g., education, other sports, social time) to be met? • Will the frequency of sessions vary during a year? If so, by how much?
Intensity Children's aerobic and anaerobic capacity can be improved by varying the intensity of exercise within and across sessions. Consideration should be given to: • Scheduling high-intensity/quality speed work (anaerobic) early in a session (before fatigue becomes a factor) • Providing aerobic conditioning through low-intensity technical work • Variation in the intensity of sessions during a year (and by how much) • Recovery time	**Intensity** • Will the intensity of sessions vary during a year? If so, by how much? As the puberty period progresses, increased variation of intensity may occur as the need for periodisation of the annual cycle becomes necessary.	**Intensity** • Will the intensity of sessions vary during a year? If so, by how much? Consideration should be given to the position within the annual cycle (periodisation).
Time • How long should sessions last?	**Time** • How long should sessions last?	**Time** • How long should sessions last?
Type • What is the balance between on-court training (including both practice and competition) and off-court training?	**Type** • What is the balance between on-court training (including both practice and competition) and off-court training? • Does the nature of the training depend upon the timing within an annual cycle? If so, how? • What is the best ratio between on-court training and competition?	**Type** • What is the balance between on-court training (including both practice and competition) and off-court training? • Does the nature of the training depend upon the timing within an annual cycle? If so, how? • What is the best ratio between on-court training and competition?

TABLE 2 - PLAYER DEVELOPMENT FRAMEWORK: TRAINING AND COMPETITION (F.I.T.T.) ***TEMPLATE TO BE USED BY COACH***		
Sampling	**Specialising**	**Investment**

07. PARENTAL SUPPORT AT DIFFERENT STAGES

Parents undoubtedly play a role in the development of young players. The significance of that role can, however, vary depending upon cultural influences and the stage of development of the child.

This section aims to give suggestions as to the knowledge, skills, and philosophies that parents may need in order to help their children progress successfully in badminton, as well as how these can be developed.

PARENT SUPPORT DURING DIFFERENT STAGES		
Sampling	**Specialising**	**Investment**
• Clearly define the roles of the child, the parents, and the coach. • Establish a consistent philosophy that is adhered to by the child, coach, and parent (e.g., having fun, giving full effort, respecting others, playing fairly, etc.). • Establish appropriate nutritional habits. • Encourage child to be well prepared (shoes, rackets, water bottle, etc.).	• Refine the roles of the young person, the parents, and the coach as appropriate. • Maintain a consistent philosophy that is adhered to by the young person, coach, and parents (e.g., having fun, giving full effort, respecting others, playing fairly, etc.). • Maintain appropriate nutritional habits. • Help the young person develop appropriate time-management skills (planning/balancing training, rest, social time, and education). • Progressively develop self-reliance in the young person. • Be aware of the goals set by the young person and coach. • Work with the coach and player to establish an annual plan.	• Play a gradually diminishing role. • Promote increased self-reliance for the young adult. • Manage psychological rebellion.

Parents spend more time with their children than any coach, and they are generally the most significant influence in shaping their behaviour. This means they are a key element in helping children enjoy and progress within a sport. Of course, the most successful efforts will occur when parents' and coaches' messages to young players reinforce each other. If, on the other hand, players receive conflicting messages, it will be frustrating for all involved, as the young person will have to choose who to "please", and parents and coaches may waste energy competing with each other or repairing breakdowns in communication.

Depending on how involved parents expect to be, and how necessary the national association deems it to encourage parental involvement, it may be beneficial to provide parents with relevant tools to support their children. The following list of suggestions may prove useful:

- Offer a range of ways in which support can be provided to parents. Online resources (e.g., nutritional advice, managing stress in competition, developing self-reliance, etc.) can be particularly useful, especially with videos.
- Include case studies of successful national players talking about their development within the sport and how their parents handled this.
- Consider workshops led by a facilitator, which can allow parents to exchange experiences within a given cultural context.
- Topics that may be helpful to parents include:
  - » Nutrition
  - » Building self-reliance
  - » Goal setting
  - » Managing stress
  - » Communication skills
  - » Time management
  - » Competition planning
  - » The Laws of the Game
  - » Building a working relationship with the coach

Finally, parents will generally be instrumental in guiding young athletes to prepare for their futures, which involves helping them balance the demands of sport and education. Many young athletes are able to successfully combine badminton training with ongoing study (secondary and potentially beyond). There are various programmes and resources available to support athletes in this process, and it is important for both parents and coaches to be aware of these. For example:

- **BWF Player Career and Entourage Policy** – outlines the BWF's commitment to the holistic development of players
- Scholarship opportunities in conjunction with the World Academy of Sport:
  - » **Athlete Certificate** – online programme equipping athletes from 15 to 18 years of age with the tools to manage their sporting careers
  - » **Bachelor of International Sport Management Degree** – online degree programme through Federation University (Australia)
  - » **Postgraduate Certificate in International Sport Management** – online programme in conjunction with the University of London
- IOC courses:
  - » **IOC Athlete365 Career+** – workshop aimed at helping athletes identify their interests and skills, while charting a course for their ongoing development
  - » **IOC Athlete365 Learning** – short courses on sport-related topics (nutrition, psychology, etc.) that athletes can complete online

For more information on these resources, please consult the "Players" section of the BWF Development webpage.

BADMINTON COACH EDUCATION

COACHES' MANUAL

LEVEL 3

MODULE 5
TOWARDS AN EFFECTIVE TALENT DEVELOPMENT SYSTEM

MODULE 5
TOWARDS AN EFFECTIVE TALENT DEVELOPMENT SYSTEM

Photo credit: BWF/BadmintonPhoto

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01. INTRODUCTION

Even the most effective talent detection and identification system will have limited impact if that talent is not placed into an effective player development environment. This module will explore some of the challenges inherent in establishing such player development environments as part of a talent development system. It will also help readers examine their own talent systems in relation to some of the aspects discussed.

Many of the concepts discussed here are explored in much greater depth and over a much wider scope in "*Player development systems in the performance pathway in four world-leading badminton nations: A literature review and interviews with experts from Indonesia, Korea, Denmark and Spain*", a study commissioned by the BWF and carried out in partnership with Leeds Becket University in the United Kingdom. The report is freely available on the BWF Development website and offers ample supporting evidence for the theory and principles presented in this module.

LEARNING OUTCOMES

By the end of this module, coaches will be able to:

- identify key aspects of an effective talent development system
- evaluate their own countries' talent development systems with regard to these aspects
- describe how to establish a talent development system

02. CHARACTERISTICS OF EFFECTIVE SYSTEMS

An effective talent development system should have a clearly stated programme philosophy to set the tone for the programme and make sure everyone is on the same page. A successful system will generally have a clearly defined organisational culture, with a shared idea about the final endpoint on the journey of development (performance model), as well as how this development should occur (development model).

In addition, talent development systems should:

- be structured enough to provide guidance, but flexible enough to adapt to the context (for example, to allow for individual/cultural differences).
- be realistic and take into account local limitations regarding logistics and resources.
- take into account the elements discussed in the previous two modules (understanding of key principles and concepts around talent, knowledge of talent development models).
- include ongoing monitoring of the system itself.
- be linked to a shared vision among stakeholders (funders, government, NOC, parents, etc.).

Above all, it should be recognised that different cultures/contexts may approach the idea of a talent development system differently, or they may prioritise different aspects – but they all need a clear, integrated, transparent pathway that works for their own situation and is constructed specifically around their own culture and logistics.

Talent development systems can be broken down into three basic stages:

- **Talent Detection and Identification** (identification and recruitment)
- **Environment** (training and learning)
- **Performance** (presentation of talent to competition, which happens outside that "known" or comfortable environment)

The following sections will look at each of these stages, highlighting relevant findings from the Leeds Becket study, and discussing what this means for coaches who are:

- establishing a talent development system in their countries, or
- carrying out a review and/or assessment of their current system.

Finally, the importance of stakeholder buy-in and different ways to achieve this will be explored.

03. TALENT & ENVIRONMENT

According to the three-stage model mentioned above, the first stage involves getting talent into the system. Of course, this is by no means a simple task. Module 2 examined some of the challenges and issues surrounding the identification and detection of talent. The literature review for the Leeds Becket study further underscores just how complex the notion of player development is, citing factors including genetics, psychology, support systems, time spent training, and even luck!

Because the above-mentioned factors do not occur in isolation, the interaction and interplay of these factors adds yet another unknown element. The Leeds Becket study drew the following conclusions about what this complexity means for those involved in player development:

1. "Human development is *highly heterogeneous and individualised*." As noted above, there are many variables that can contribute to development, and these will present themselves and interact differently in each individual.

2. Because of this unpredictable nature of human development, it can be questioned whether the practice of early talent identification and selection is related to exceptional performance later in life. This is especially true where talent identification processes are more based on policies and resources than on theories of human development.

3. The multiple factors that contribute to development and the unpredictable results from their interaction mean that these processes are not subject to control, and even well-planned interventions will not automatically lead to success. The study suggests that coaches can influence and guide, but not control. This has implications for the expectations on the part of all those involved (coaches, players, parents, other stakeholders).

The three points mentioned above highlight some of the inherent challenges in both the ***selection*** and ***development*** of talent. As also mentioned in the Leeds Becket study, on one hand, national systems must employ a selection process at some point in order to make the best possible use of the limited resources available for player development. On the other hand, the uncertainty around early identification and selection, combined with the long-term nature of player development, makes it extremely difficult to predict future success.

Different parameters have been used to try to effectively select players for talent development. The Leeds Becket study points out that at different points in time these have included:

- technical and tactical factors
- discrete performance variables
- psychological and social characteristics

However, they conclude that considering any of these different aspects in isolation will not yield a complete perspective. In other words, the interaction of the different aspects must be taken into account within a holistic view of player development. This notion of complexity, especially with regard to the unpredictable result of the interaction of multiple factors, will be discussed further in Module 7 within the context of elite training.

The study stresses that two of the key issues around player selection are:

- the need for improved player selection strategies
- the importance of delaying the selection process for as long as possible

Regarding the former, they point to a move towards a multi-disciplinary approach based on a variety of factors, citing work with Premier League football coaches who try to apply a "balance of probabilities" and/or "gut instinct" in their decision-making processes. With regards to the latter, this of course makes sense in light of the uncertainty already discussed.

Both of these issues highlight the importance of a clear understanding of local logistics and resources, which will help inform the development structure and ensure that the system is realistic and relevant within the context in question. One of the main aims of the BWF Level 3 Coach Education course is for coaches to be able to critically analyse other systems in the interest of applying and adapting them to their own national context as appropriate.

04. ELEMENTS OF SUCCESSFUL ENVIRONMENTS

The different countries examined in the Leeds Becket study had different approaches to their talent identification philosophies, as well as about how restrictive or inclusive they aimed to be. Whether the entrance to the pathway is extremely open and flexible or more prescriptive and limited, once athletes are in the system, this leads us to the second stage in the model – the environment in which they continue to develop.

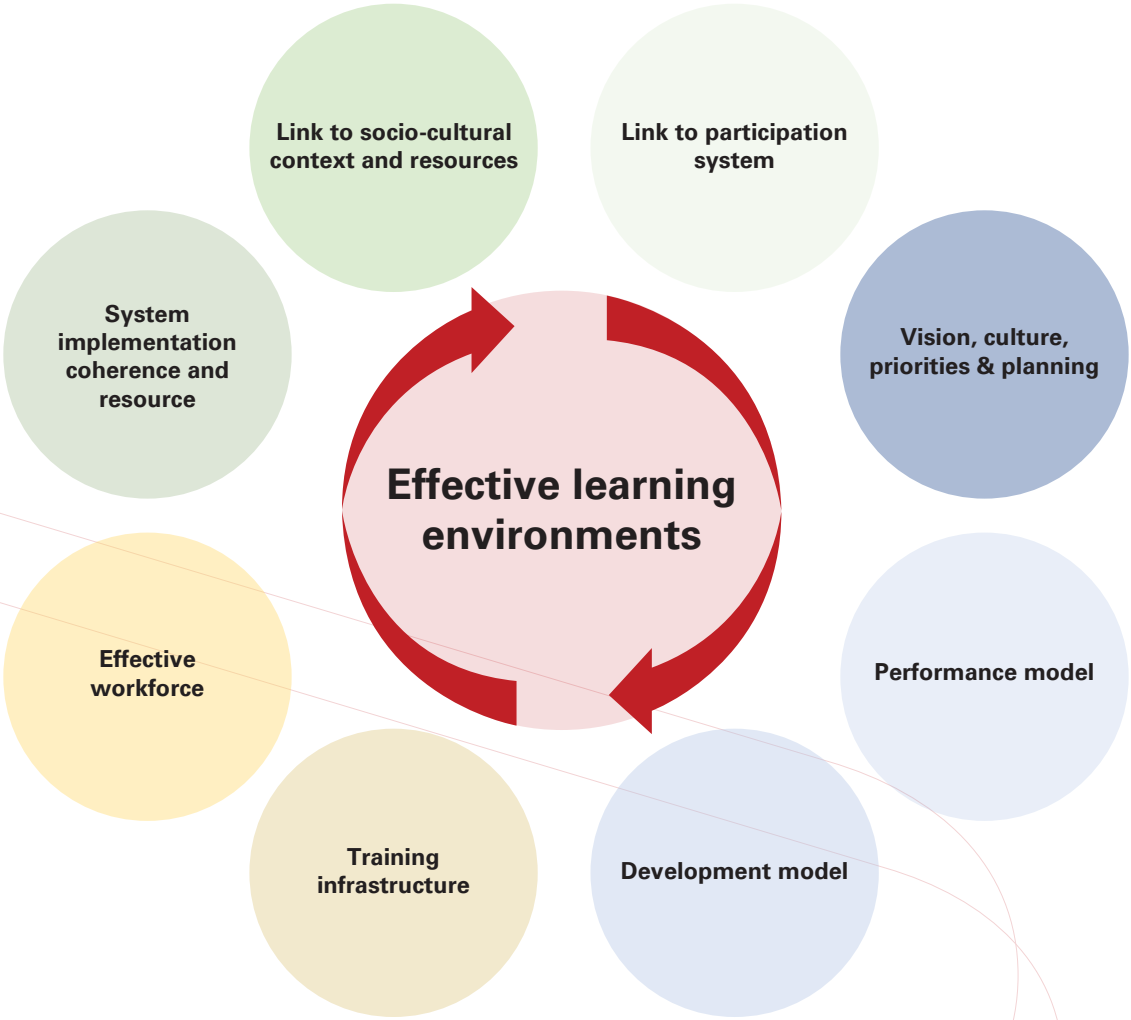
"Environment" includes the training and learning opportunities that the system offers. The Leeds Becket study makes an interesting distinction regarding this "environment", considering it from two different perspectives:

- the high-level ***strategic aspects*** that shape and define programme philosophies
- the ***practical aspects*** that consider how the system interacts with (affects) the players

Each of these perspectives will be examined in further detail below.

ENVIRONMENT: STRATEGIC ASPECTS

The multiple high-level strategic aspects that contribute to effective learning environments can be represented in the following diagram. This perfectly illustrates the complexity and the comprehensive nature of the overall system. While some of these aspects are explored in this resource, there is a great deal of further information in the study that can prove extremely useful to anyone involved in talent development systems.
As mentioned in the section introduction, each of the national systems examined has its own idea as to how restrictive entry to the talent development environment should be. However, they all



Source: BWF/Leeds Becket study

recognise the need for different training strategies (physical, psychological, competition, etc.) at different moments in the young athletes' development. A theoretical framework to guide such strategies was presented in Module 4 (along with some overarching principles in Module 3). Of course, these strategies will always need to be adapted for the context in question, but it is worth stressing the importance of elements such as:

- ***implementing an age-stage approach*** (with guidance as to appropriate engagement for developing players)
- ***handling transition points*** (through careful and thoughtful management of sensitive transitions in players' development)
- ***monitoring the system*** (including initial assessment, setting of KPIs, review of progress, and resulting feedback)

Each of these elements will be discussed in further detail below.

IMPLEMENTING AN AGE-STAGE APPROACH

The Leeds Becket study describes age-stage differentiation as being *"based on the idea that individuals at different ages and stages of development acquire particular characteristics or can be exposed to environments that provide the foundation – or enable them to be ready – for engagement in particular types of training activities"*. As discussed in Module 4, it is important to keep in mind that chronological age and stage may not always be aligned and there can be considerable individual differences.

The four countries examined in the study demonstrated roughly the following stages:

- Early engagement in the sport (but not necessarily specialisation) from 5/6 years to 11/12 years
- Technique development from 10/11/12 years to 14/15/16 years
- Tactical development from 14/15/16 years to 17/18 years
- Focus on higher-level competition and competition behaviours from 18/19 years

The different countries introduced centralised programmes started around 10/11/12 years of age (generally regional, and then progressing to national). More serious exposure to national competition also started in the 10/11/12 age range, with a focus on experience and development rather than on winning. Some of the differences among the countries centred on how they approached physical preparation and development.

HANDLING TRANSITION POINTS

Whenever players move from one stage to another, this represents a significant change in their lives. As such, a crucial aspect of an age-stage approach is the successful management of these transition points. By definition, transition points are when something novel and significant happens, and may include:

- physical changes (such as puberty)
- logistical changes (for example, in education, training venue, etc.)
- progression (which may imply a change of coach, training centre, etc.)

Such transitions often take players out of their comfort zones, as they may involve changes in their routines, peer group, self-esteem, etc. This leaves them especially vulnerable to frustration, variations in performance, and even drop-out. Coaches must be prepared to support players during these transition periods in order to minimise any negative effects on the players and on the team. The Leeds Becket study suggests identifying the potential transition points and putting strategies in place to ensure that these are handled properly. They also mention the importance of clear communication among stakeholders, including athletes, coaches, managers, and parents.

MONITORING THE SYSTEM

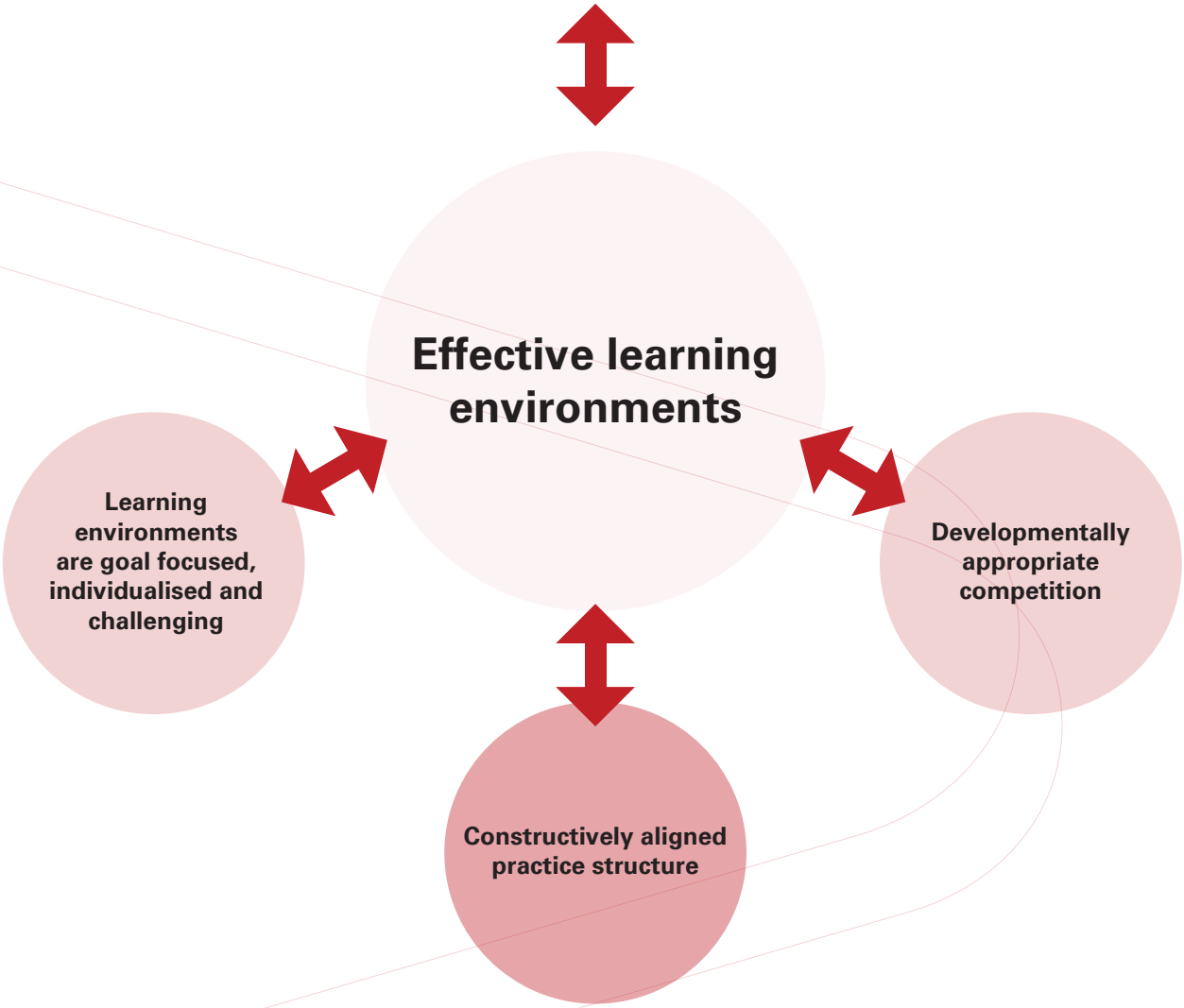
Monitoring of player and coach performance within the system has also been identified as a key element of a successful development system. An interesting example of one way to achieve this is discussed in the Leeds Becket study. "Performance profiling" is described as an athlete-driven procedure that helps focus on what is important to the athlete. This can involve asking players to identify the qualities or characteristics of an ideal player (which might include physical, tactical, mental, and technical skills, along with other areas such as lifestyle and nutritional habits, for example). Players then rate the importance of each of these to an ideal performer, and finally rate their own skills in these areas. The gap between the ideal and the self-assessment will assist in the construction of individual goals and KPIs for the players, as well as informing the programme plans and content. Performance profiling can be used in groups as well as with individuals, and both coaches and players can be involved in the process.

The continual monitoring of the talent development programme should also include the documentation of all sessions and related activities. This data collection should be done on both a group and individual basis. Review of this information when compared to competition performance should again inform the planning and content of the programme. On an individual level, data collection is critical in allowing analysis of performance, and can be particularly used to assess levels when players return to training from injury or enforced breaks.

ENVIRONMENT: PRACTICAL ASPECTS

It is important to remember that all the high-level strategic aspects examined above are aimed at creating and supporting the key element in the middle of the diagram: *effective learning environments*.

Of course, the goal of effective learning environments, as described in the Leeds Becket study, is to *"encourage and facilitate skill acquisition and performance to elite level"*. In contrast to the strategic/policy side of things, this is where the talent development system directly interacts with young players, helping them improve their game. This practical "on-the-ground" level of effective learning environments can be represented in the following diagram.



Source: BWF/Leeds Becket study

The following elements, as can be seen above, contribute to shaping the players' experience and development in a practical sense:

- learning environments that are goal focused, individualised, and challenging
- practice structures that are constructively aligned
- competition that is developmentally appropriate

The Leeds Becket study explores these elements from both theoretical and practical perspectives, and it may be useful for coaches to examine any or all of these in further detail. Many of the elements will also be touched on in the elite training section this Level 3 resource. For example:

- ***Goal setting*** and different ***goal orientations*** are examined in the context of elite training environments (Module 6).
- The focus on the ***individual*** is discussed with regard to:
  - » the importance of self-determination for sustained motivation (Module 6).
  - » the personal nature of learning processes and reflection (Module 7).
  - » the role of the individual in successful teamwork (Module 9).
- The coach's role in helping the player work through ***challenging situations*** is explored within the use of systemic coaching (Module 8).
- The demands around developing crucial qualities in elite players mean that ***practice structures*** should include:
  - » the necessary spaces for the reflection that will promote learning and growth (Module 7).
  - » the opportunity for elite players to take charge in their areas of particular expertise (Module 9).
  - » experiences that will help players develop anticipation, especially the inclusion of game-like practice (Module 10).

05. COMPETITION IN BOTH DEVELOPMENT AND PERFORMANCE

Competition is a very broad topic, as it occurs as a regular facet of any sports programme and serves a variety of purposes. On one hand, competition is an important part of players' development, as it provides an opportunity to measure their progress and to gain valuable experience. Some of the points mentioned in the Leeds Becket study around the importance of this kind of learning experience from the players' perspective include:

- motivation to train harder
- gaining competitive game experience
- gaining competitive experience against better players
- experiencing wins and losses

All four countries in the study recognised that competition plays in important role as a development experience for all age groups. Of course, it must be managed appropriately and planned in a way that takes development needs (both individual and group) into account.

The study further pointed out that from a development perspective, competition can also be helpful for coaches, in that:

- it gives them a chance to observe players in competitive situations and to make assessments
- it provides evidence for selection to squads

On the other hand, competition is also the end goal of the development process, and in this context, it is about performance. The aim of the player pathway from grassroots to podium is a winning performance.

06. STAKEHOLDER BUY-IN

As mentioned among the characteristics of effective talent development systems, a shared vision among stakeholders is crucial. If all those involved have a common goal and an understanding of how to reach it, resources can be better destined, and decisions will be more widely supported. However, this does not happen easily or automatically.

Appropriate and timely communication with a variety of stakeholders is not only a sign of good governance, but also a way to get stakeholders' support and keep them updated and involved. The Leeds Becket study underscored this, reporting that the four countries engaged in deliberate and targeted communication with all their stakeholders. This communication was extensive, tailored, and responded to stakeholders' preferences, as a way of keeping them informed.

Of course, there will always be mismatches with stakeholders, and some of the common ones mentioned in the study had to do with:

- tensions between different parts of organisational structure (for example, between clubs and the national federation)
- different expectations (parents pressuring children to win rather than to do their best)
- different approaches (coaches at some levels not wanting to change the way they have always worked)

Surely there are as many potential mismatches as there are stakeholder relationships. However, this is one of the many areas where a clear understanding of the local context and culture can help identify or even predict problems and implement appropriate strategies. While coaches may not be directly involved in these processes, it is important that they understand the importance of stakeholder buy-in for the overall health of the programme and that they contribute to this as appropriate. For example, they may be able to support effective communication and buy-in strategies by sharing relevant information about player progress or success stories with the national federation. Or if they are in more regular contact with the parents of young players, they may be instrumental in helping them internalise the expectations for players at different stages in terms of responsibility, attitude, nutrition, effort versus performance, etc.

07. ESTABLISHING A TALENT DEVELOPMENT SYSTEM

The following questions, grouped into different points along the player pathway, should be considered when establishing a Talent Development System. Alternatively, they can be used to examine an existing system in light of the aspects discussed in this module.

1. Entry into a Talent Development System

    - Is it formal (a signed agreement) or informal?
    - Is it conditioned? (On participation/attendance? Or on performance/results?)
    - What is the term of the agreement?
    - How is progress measured and how often? (What is the principle/philosophy?)
    - How is attitude, consistency and effort measured in sessions?
    - What is the role of the coach?
    - Who detects talent and how is it measured?
    - What is the stated philosophy, vision, and mission of the system?

2. Progression within the system

    - How does a player move to the next level? (How many levels are there?)
    - What kind of evaluation/commitment is involved?
    - How is the evaluation done? Who is involved?
    - How (and how much) is communicated to the player?
    - Is there a plan with objectives? (short-, medium-, and/or long-term?) How are these measured, followed up on? Is it a group plan or an individualised one? If it is a group plan, does it change to individual at a higher level?
    - Is this consistent with the stated philosophy of the program?

3. Retention within the system

    - What transitions are likely to affect program loss? (Primary to secondary school, secondary to university, puberty, etc.)
    - What plans are in place to avoid program loss during these transitions? At other points/in general?

4. Exit from the system (vs. retention in the broader system)

    - How do players leave the system? (Are they removed? Are there other options? Probation? Suspension? Demotion?)
    - What is the exit decision based on? (Results, effort, attitude, etc.? Does this vary according to the level?)
    - Is there a plan/platform to keep them involved in badminton (as club players, sparring partners, coaches, TOs, board members, volunteers, etc.)?

Other elements to consider

- Proper documentation at all stages of the program
- Testing / protocols to be used
- Support services to be provided (physical prep, medical, psychological, lifestyle)
- Roles of stakeholders (stakeholder mapping exercise)
- Links with schools, universities
- Relation to clubs

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BADMINTON COACH EDUCATION

COACHES' MANUAL

LEVEL 3

MODULE 6
THE ELITE END OF THE SPECTRUM

MODULE 6
THE ELITE END OF THE SPECTRUM

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01. INTRODUCTION

The previous modules have examined how players get into the player pathway, and how they progress along the various levels during their development. Of course, the ultimate goal of the pathway is for players to reach the elite level of performance. Not all players have the talent, dedication, and desire to reach this pinnacle, and so it is of particular interest to examine how players actually become elite players and are able to continue to develop throughout their careers. This module will take a closer look at what it means to be an elite player, and what is required of the athlete, the coach(es) and the system in order for elite performance to be sustained.

LEARNING OUTCOMES

By the end of this module, coaches will be able to:

- describe the importance of intrinsic motivation for elite players
- explain how the different aspects of the elite training environment can affect players' motivation and performance
- identify the advantages and disadvantages of different goal orientations in an elite environment
- discuss different ways to foster positive conditions in an elite training environment

02. THE ROLE OF MOTIVATION

Elite players, who have a high level of skill and have played for a long time, have probably reached their level because when they started playing badminton, they found that it was fun. They probably got satisfaction from the game of badminton itself, as well as from the different challenges inherent in the game. Thus, it is certainly important that elite players, in order to keep on developing their skills and level of performance, maintain a high level of motivation throughout their entire elite career.

From a psychological perspective it can be argued that human beings are by nature curious, active, and fundamentally motivated for learning and developing. In other words, people first and foremost tend to do activities for the fun and the experience of it, which is the basis for ***intrinsic motivation***. This can be contrasted with ***extrinsic motivation***, at the other end of the spectrum, which has to do with external rewards like prize money or trophies.

The different kinds of motivation were discussed in more depth in the Level 2 Coaches' Manual, but the key point here is that when people are driven by intrinsic motivation, they tend to enjoy activities more than if they are motivated by fear or rewards (or, in other words, driven by extrinsic motivation). Individuals who are intrinsically motivated tend to be more persistent than others, which in our case means that there is a greater chance they will play badminton for a longer period, and hopefully remain involved in badminton throughout their entire lives. It is important to note that, while players may initially get involved in badminton for different reasons, those who succeed at elite level are generally guided by intrinsic motivation.

03. THE TRAINING ENVIRONMENT

The environment around the player has a big part in fostering the kind of motivation needed to bring about and sustain elite-level performance. In the Level 2 Coaches' Manual, the work of psychologists Edward Deci and Richard Ryan was introduced within discussions around motivation. These authors explain that in order for people to be intrinsically motivated, they must have fundamental feelings of ***competence***, ***autonomy***, and ***relatedness*** (Deci & Ryan, 2008). As such, it is worth considering how these conditions can be created and fostered within elite training environments.

In order to feel ***competent***, players must experience that they are good at things, and that they make a difference in their badminton environments. The recognition of players' skills and contributions to their training environments is therefore essential to their feeling competent, thus maintaining and developing intrinsic motivation. Recognition of unique skills and contributions to a group will, apart from intrinsic motivation, also develop the players' self-esteem (Honneth, 1996). Conversely, elite environments that do not recognise elite players' skills and contributions will undermine the intrinsic motivation and the self-esteem of the players. Such environments will, according to Deci and Ryan's theory, probably also have a negative influence on the players' performance. All of these concepts will be explorer further in the coming modules.

On a related note, in order to experience ***autonomy***, players must feel that they are fundamentally responsible for their own lives, badminton careers and decisions. From this perspective, it is interesting that external rewards, such as cash prizes or trophies, can actually undermine the feeling of autonomy. Ryan & Deci (2000) claim that this is because the external rewards will move the feeling of control from the player to the external environment, thereby making the player feel less in control. As such, players may feel less autonomous, as a result of which, intrinsic motivation may actually decrease. In fact, any actions that give the player less control over the outcome will run the risk of weakening feelings of autonomy, as will be discussed later in this module. In contrast, elite environments that respect and facilitate players' abilities to make their own decisions will result in greater development and higher performance levels.

Finally, in order to experience ***relatedness***, players must feel that they are in a safe and secure environment, and that the people around them are genuinely interested in their personal wellbeing and development. Positive, nurturing environments will, in this sense, help facilitate the players' feelings of relatedness, and therefore aid in the development of intrinsic motivation.

Of course, it is not easy to consistently provide these kinds of conditions, and more than likely this will require a concerted effort on the part of all those involved. The next section will address ways in which the different parties involved can help to create an ideal climate for fostering intrinsic motivation.

04. RELEVANT ACTORS IN THE ENVIRONMENT

COACHES

Coaches, of course, have a significant role when it comes to developing and maintaining elite players' intrinsic motivation. They have extensive knowledge about the badminton-specific elements, but they must also be able to apply elements of communication, learning theory and psychology in order to foster the social and psychological conditions necessary for players to progress.

As will be discussed in the elite coaching section, successful elite coaches have to be able to communicate with players in a way that helps them use their prior experience and learn to solve problems. The skilled use of questions, as discussed in depth in Level 2, can be an effective way to help elite players draw on the knowledge they already possess, to encourage them to work together, and to promote the reflection that is crucial at this level. This will also aid players in recognising their specific competences, which in turn will support the development of autonomy.

Elite coaches need to have high-level knowledge around the technical and physical aspects of badminton, but if they are to foster intrinsic motivation among their players, they also have to know how to design training exercises which facilitate choice-making and reflection. As players get more and more comfortable making choices and evaluating the results of those choices, their feelings of competence and autonomy will be enhanced. Coaches are a central part of creating this kind of elite environment aimed at developing autonomy, competence, and relatedness, and thereby, the intrinsic motivation that will help players progress.

OTHER PLAYERS

Other players in the environment also have an important role in developing and maintaining intrinsic motivation. If players in a group recognise each other's skills and contributions to the training environment in a visible way, such an environment will create feelings of competence and relatedness within the group. If there is a common understanding about the key criteria for success, it is likely that the environment will become a context for developing intrinsic motivation. For example, an emphasis on development through enjoyable and positive experiences is something that can be incorporated from youth through elite levels. Agreeing on common general goals in an elite environment is therefore essential for the development of intrinsic motivation. It may be worth pointing out that, depending on the culture of the players/coach/club, this may not always come naturally. However, it is something that coaches can make an effort to develop as part of their practice.

THE SYSTEM AND ITS VALUES

It is of great importance that the system to which players belong support the development of intrinsic motivation. This means that if players are to experience situations that promote intrinsic motivation, these situations must be in line with the system's fundamental values.

A value can fundamentally be understood as a premise for making choices and therefore a guideline for acting. From this perspective, values are what determine how people act in a specific context. If you want to develop intrinsic motivation within a system, values that promote autonomy, competence and relatedness must be an important part of the organisation and its fundamental assumptions about itself (Schein, 1994). For example, "self-development", "responsibility", "joy", "respect" and "differentiation" are values that could support development of intrinsic motivation, as these values facilitate the active participation of the players, making them feel competent and successful and that they are valued members of the group.

In contrast, it makes no sense for an organisation to endorse the development of intrinsic motivation, yet demonstrate values like "obedience", "belief in authorities" and "one-way communication", as these values view the individual as a passive participant in the learning process.

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05. THE IMPORTANCE OF GOAL ORIENTATIONS

Obviously elite athletes must be very goal oriented. However, the way goals are set can have a significant influence on how players view their progress and their success. The Level 2 Coaches' Manual offered a brief introduction to different types of goals, depending on the purpose and the focus of each. Here we will look more closely at the nature of ***process goals*** and ***outcome goals***, as well as how each relates to motivation.

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When working with ***outcome goals***, the focus is to demonstrate ability relative to others, in order to outperform them and publicly demonstrate one's skills and performance. The advantage of these kinds of goals is that they are easy to measure, so it is easy to determine if the goal has been achieved. However, the big problem with outcome goals is that they are not easily controlled. Athletes are comparing themselves to other people, but they have no control over those people's actions. Because players cannot control the achievement of these goals, their feelings of autonomy, and thus their motivation, may suffer.

Photo credit: Badminton Singapore

On the other hand, when working with ***process goals***, the focus is on developing skills and competences to be able to handle or solve a specific task in the best possible way. Working with process goals means that the outcome can actually be controlled, as the process or result is not being compared against others. As such, an emphasis on process goals would help players focus on and appreciate what they have learned, whether or not they win. This would naturally encourage them to continue their learning process, focusing on future improvement, rather than looking at winning or losing as the only measure of their success.

An approach to goal setting that focuses on process goals and personal development could be important in elite training environments where intrinsic motivation and thereby joy and fun are key issues. As mentioned, these kinds of goals are within the players' control, which will encourage the development of feelings of autonomy and competence. At the same time, working with process goals should also yield better results, as people who are motivated intrinsically will generally perform better (Deci & Ryan, 2008).

An interesting example of using process goals with elite players is the preparation of Danish women's singles player Camilla Martin for the world championships in 1999. As it was very difficult for Camilla to beat the Chinese players, the focus in the preparation for the tournament was changed from the outcome goal "how can we win", to the process goal "what elements are necessary to develop in my game, in order to prevent the Chinese from making spin shots at the net". At that time, the Chinese were practically the only women's singles players who used this shot. To achieve the process goal, for six months before the tournament Camilla practiced her pulled backhand shot, for use in situations where she was forced to take the shuttle behind her. It is important to bear in mind that at that time, this shot was rarely used in women's singles. She was actually able to implement the stroke in the game, which was probably one of the reasons that she won the tournament. However, it is important to point out that the eventual outcome (her victory) happened to be a positive side effect of the process goal she had worked towards (developing the new stroke).

06. CREATING EFFECTIVE ELITE BADMINTON ENVIRONMENTS

Those players who make it to the elite level have gone through various stages of development along the way. Training environments that foster intrinsic motivation will help them continue to develop at this top end of the player pathway. The following chart summarises some of the ways that coaches, and the system as a whole, can create such conditions.

IN ORDER TO FACILITATE...	*IT IS IMPORTANT TO ENSURE...*
GENERAL WELLBEING	• a system based on values that facilitate intrinsic motivation • a focus on fun elements of the game (deceptive shots, spin shots, developing anticipation, etc.) • common general goals agreed among all the actors in the environment
FEELINGS OF COMPETENCE	• differentiation (working on relevant levels with relevant topics for the individual player) • positive performance feedback • freedom from demeaning evaluations • recognition of players' unique skills, knowledge, and contributions
FEELINGS OF AUTONOMY	• opportunities for players to make their own choices, especially regarding badminton-specific issues • respect for players' feelings and opinions • communication based on dialogue and questions • opportunities for self-direction • an avoidance of pure instruction to players • a focus on tactical and mental elements in daily training, because tactics is about making choices • a focus on creative thinking in communication and specific training exercises • a focus on mastery goals
FEELINGS OF RELATEDNESS	• activities and exercises done in cooperation with others • a positive environment, where players are "seen" and not ignored (for example, asking how people are doing, or saying hello and goodbye are simple actions to facilitate feelings of relatedness) • relevant information from the organisation, coaches, etc. given to all players in the group

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SECTION THREE

KEY ASPECTS OF ELITE COACHING

SECTION INTRODUCTION

The work of an elite coach is significantly different in many ways from coaching at other points in the pathway. Some of the particular characteristics that distinguish elite players were discussed in Module 6, as part of the examination of the top end of the player pathway. This section will look more closely at the nature of coaching elite players and the particular skills and knowledge that elite coaches need to further the development of their players.

For the most part, elite players will have a polished set of technical, tactical, and physical skills. After all, if players did not have exceptional skills in these areas, they would have not made it to the elite level! Although their training will still include work in these areas, the elite coach will not necessarily be teaching them new skills along these lines. In fact, in many cases, the skill level of the players will be higher than that of the coach, which may be difficult for some coaches to reconcile. However, this certainly does not mean that coaches have nothing to teach their players, as it is the way the players and coaches work together to use these skills to create winning situations that is of utmost importance. This is where the knowledge and experience of the coach can make all the difference.

Because of this fundamental difference, the approach to coaching here in this Level 3 Coaches' Manual differs significantly from the structure used in the Level 1 and Level 2 manuals. Level 1 and Level 2 organised coaching practice around five key performance factors: Technical, Tactical, Physical, Psychological, and Lifestyle. However, since elite players have already built a fairly standard, high-level toolbox in these areas, we will focus on how coaches work with players to apply these skills to a winning game.

Elite coaches need to have a solid grasp, not only of all the performance factors previously mentioned, but also of techniques to challenge players' ideas and practices, to facilitate their continued learning and growth, to help them work effectively with those around them, and to use their skills to achieve the best possible results. As such, this section will address the following areas:

- **Module 7** will explore how players learn and how coaches can help create the necessary conditions for significant learning to take place.
- **Module 8** will examine the role of communication in successful training, as well as how to improve/ensure optimum communication processes in different contexts.
- **Module 9** will look at some of the advantages as well as the potential complications of working with elite players in team environments, and how to maximise the benefits of teamwork.
- Finally, **Module 10** will examine how coaches can help players improve and apply anticipation, which may be one of the key areas allowing them to exploit their other skills to the greatest degree possible.

Because there will not be an explicit focus on the performance factors as addressed in Level 1 and Level 2, coaches are encouraged, as a pre-course task, to identify any of these aspects that they feel they may need to review.

BADMINTON COACH EDUCATION

COACHES' MANUAL

LEVEL 3

MODULE 7
HOW LEARNING HAPPENS AT THE ELITE LEVEL

MODULE 7
HOW LEARNING HAPPENS AT THE ELITE LEVEL

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01. INTRODUCTION

As discussed in the section introduction, elite players generally have a fairly standard "toolkit" of technical skills, but it is how they use these to outwit the opponent is what makes elite-level badminton different. As such, the kind of learning that players need to stay on the forefront necessarily involves challenging their previous ideas and constantly coming up with new solutions.

This module will look at the nature of the choices that badminton players must make on court in an increasingly complex game, as well as the kind of learning processes that can help them continue to improve their level of play. Several learning theories will be explored, to give coaches a better understanding of how learning comes about and what conditions can help optimise the learning process.

Finally, the role of reflection in the learning process will be examined, from both a theoretical perspective and an on-court application aimed at developing players' reflective skills. While the BWF Level 2 Coaches' Manual introduced some initial considerations around reflection as part of the learning cycle, the approach here will examine how coaches can successfully use reflection to help elite players take advantage of their own knowledge and experience.

LEARNING OUTCOMES

By the end of this module, coaches will be able to:

- explain the concept of complexity and how it applies to elite badminton
- apply concepts from relevant learning theories when designing coaching sessions with elite players
- explain the difference between active reflection and premise reflection
- describe ways to help elite players develop both active reflection and premise reflection

02. THE CONCEPT OF COMPLEXITY

COMPLEXITY AND MODERN SOCIETY

Today we are living in what can be called a polycentric society, which means that there is no single overall explanation to why things are the way they are. Furthermore, technological development means that we have constant access to a great deal of information and inputs. As a result, we have to make choices regarding what information and which inputs are relevant for us, in order to be able to produce a suitable outcome upon dealing with the information in a cognitive process.

A society and situations like these are, in another words, characterised by "complexity". Because complexity involves constant change, uncertainty, and unpredictability, it requires being open to new possibilities by making new choices. At the same time, it requires taking risks, because our choices could be wrong. However, the only choice we don't have is not to make one, as we must make choices in order to cope with the situations we are experiencing.

This complexity also means that, in a sense, even "society" is individualised, because the choices that are relevant for one person may be different from those that are relevant for another person. It can be argued that different people see and understand the world in different ways, which means that even in similar situations they will make different choices and act in different ways. However, if we can make the "right" choices as often as possible, thereby lowering the risks inherent to complexity, we will be able to function optimally in a given context.

COMPLEXITY AND BADMINTON

The game of badminton is fundamentally a complex activity, particularly at the elite level. Players have to make shots from all around the court, taking many different variables into account. As was introduced in the tactical section of the Level 1 Coaches' Manual and further developed in Level 2, choosing relevant strokes for the specific situation means being aware of their own placement, body position and movements, as well as those of their opponents. Players have to choose where to move on court after making a stroke, and they have to be able to remember what has happened earlier in the game. Similarly, when their opponents are making a stroke, players have to be able to register both placement on court and body position (their opponents' and their own). Once again, it is important to be able to remember what has happened before in similar situations, in order to be able to anticipate what will happen next.

As such, there is a lot going on over the course of a match, which means that players have to make numerous choices, and in those specific moments on court, only the players themselves can make those choices. Furthermore, the complexity of the game at elite level is even higher than at lower levels, as elite players use deception in order to limit their opponents' ability to anticipate. This will increase the uncertainty of situations at the elite level, which again will add to the complexity.

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Similar to society in general, the game of badminton has increased in complexity over time. The development of new racket technologies has made rackets lighter and more flexible, which means that players have more choices in each match situation. For example, lighter rackets make it possible to use different types of backhand strokes, which were almost impossible with the old, heavier rackets. Also, the application of new knowledge around physical training has made players stronger and faster over time, which again means that the number of possible choices will increase. For example, players today can choose between making jump shots and staying on the ground for heavy smashes, as improved strength makes jump shots more of an option. On another note, changes to the scoring system also have a significant effect on the dynamics of the game, which affects elite players' training on physical and tactical levels. For example, badminton has gone from being dominantly aerobic to more explosively anaerobic, which changes the physical demands on the players.

In conclusion, the game of badminton is an increasingly complex activity, especially at the highest levels. In order to handle this complexity, elite players need to practice in ways that help them develop the ability to make effective choices. Because dealing with complexity is a cognitive process, which among other things requires reflective skills, it is important for coaches and players to work together to develop these skills. At the same time, it is important to point out that good decision-making skills, whether related to on-court decisions or broader lifestyle and training choices, are developed over time. As such, ideally players should be supported and trained as good decision-makers from an early age. The section below can help coaches better understand the learning process and what this means in terms of effectively supporting players' development.

03. LEARNING THEORIES

In the Level 2 Coaches' Manual, there was an exploration of different learning styles, along with models of experiential learning that showed how these different learning styles may fit into the learning cycle. While learning styles have to do with how learners prefer to take on information (for example, by visual, auditory, or kinaesthetic means), this section will go deeper to explore different theories of how learning actually takes place. This understanding of the learning process will help coaches to structure meaningful practice with elite players.

We will look at three well-known learning theories that can each make relevant contributions to our understanding of players' learning processes within elite environments:

- Constructivism
- Observational learning
- Communities of practice

These theories can help shape our view of learning and may influence the approach a coach takes, depending on the specific goal, topic and learning situation. Each learning theory will be examined in terms of:

a. The principles behind the theory
b. How the theory relates to badminton training
c. The role of the coach within the theory
d. Expected learning outcomes

This will be followed by a discussion of how a solid understanding of the different theories can help coaches make sound decisions about how to work with their players to bring about significant learning.

CONSTRUCTIVISM

Principles of constructivism

Constructivism, whose early proponents include Jean Piaget and Lev Vygotsky, views knowledge as being constructed by the individual in a cognitive process where inputs (or "disturbances") from the outside are related to existing experiences, with the result being new knowledge and new experiences. In other words, from a constructivist perspective, knowledge is created in an interaction between "disturbances" and existing experiences (Dolin 2007). American psychologist David Ausubel (1968) has argued that, "the most important single factor influencing learning is what the learner already knows" (p. vi). Along the same lines, Chilean scientist Humberto Maturana (1987) claims in his development theory that human individuals are "autopoietic systems", which means that individuals always refer to their own experiences, and therefore no one else can know what the result of a given input will be. Thus, from a constructivist perspective, pure instruction and direct transfer of knowledge from one person to another are impossible.

Constructivism and badminton

Applied to badminton training, as elite players usually have a long career behind them, the importance of the players' experience cannot be underestimated. From a constructivist point of view, the players have to be active and think for themselves in order to release the full learning potential contained in this experience. This means that one-way communication and a "do-as-you-are-told" approach will not bring about the kind of learning and development that we have been discussing in an elite environment. However, if we expect players to take an active role in their own development, they must be encouraged to think for themselves from early on. This is addressed in the Level 1 Coaches' Manual, where the advantages of a democratic coaching style include improved problem-solving and decision-making. The idea is further developed in Level 2, where solid questioning skills can invite players to be active participants in their own learning experience. If these foundations are laid early in the players' development, the constructivist approach to learning described here can be quite useful in handling the complexity and the resulting tactical demands that probably represent the greatest challenge at the elite level.

Role of the coach

When taking a constructivist approach to working with elite players, the role of the coach should be carefully considered. From a constructivist point of view, the coach is first of all a co-player, who facilitates learning by creating relevant disturbances or inputs, in order for the players themselves to then reflect on these. The reflection process will, as a result, lead to new knowledge, developed by the players themselves. This means that the specific content of the practice is of great importance. When working with elite players from a constructivist point of view, the content of the practice should continuously challenge the players' existing experiences, in order to "disturb", and thereby facilitate the reflection process.

In order to challenge these existing experiences, the practice must focus on creating situations where unexpected things happen. In other words, the players must experience "disappointment" regarding what they think will happen next on court, in order to initiate the reflection process, and thereby the development of new and more advanced experiences and knowledge. In practical terms, this "disappointment" can be achieved through on-court exercises, but coaches can also be creative and incorporate the use video of video to set up a situation and discuss expected versus actual outcomes. It is important to clarify that "disturbances" and "disappointments" simply refer to situations that are contrary to what was expected, rather than implying negative experiences or emotions. This will be addressed in greater detail in the next section, where the process of reflection is described further.

The relevance of a constructivist approach when working with elite players cannot be underestimated. Elite players have a lot of varied and valuable experiences, built up through many years of training and competition, which also means that in many areas they probably know more than the coach. The only way that we, as coaches, can get access to the knowledge and experiences of the players, and thereby create appropriate "disturbances", is to interact with the players in an inquisitive manner, based on respect for the relevance of the players' own perspectives. Coaches may want to refer back to the in-depth discussion of questioning skills in the Level 2 Coaches' Manual for ideas on how to best take advantage of these interactions.

Expected outcomes

As discussed earlier, the game itself is more complex with elite players, as compared to lower-level players, which means that players have to choose from many inputs every second on court, and hopefully make the right choices in order to win the rally as often as possible. A constructivist approach to learning/coaching will facilitate the reflection process, which can help players to reduce and navigate the complexity, and to make the best possible choices on court. In addition, when we apply constructivist principles, giving the players an active role and responsibility for their own choices, we will be able to optimise the learning process and improve decision-making, as well as fostering intrinsic motivation through the development of autonomy and competence.

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SOCIAL LEARNING THEORIES

While constructivism focuses on the learners' internal cognitive processes in building knowledge, there are other learning theories that take the social context into account as part of the learning process. In other words, social learning theories look beyond the individual to focus on social relations, and view groups of people as a context for learning. Learners can look to their peers as valuable resources with unique sets of knowledge and experience. At the same time, the communication and negotiation that take place in groups working on the same topics create an internal learning environment, where the individuals in the group learn from each other. In the following section, we will explore how two different social learning approaches can benefit the development of elite players.

OBSERVATIONAL LEARNING

Principles of observational learning

Canadian-American psychologist Albert Bandura proposed the idea of observational learning, which developed out of behaviourism into what Bandura himself labelled "social learning theory". Many people probably associate behaviourism with its early view of learning as a result of stimulus-and-response processes. Scientists such as Ivan Pavlov, Edward Thorndike and John B Watson were the first exponents of the theory of behaviourism, and in their perspective, only observable behaviour was of interest. They rejected the exploration of cognitive processes such as reflection, as they felt that only visible behaviour could show what individuals have actually learned.

However, Bandura's approach, which is credited for bridging the gap between behaviourism and cognitivism, recognises the role of mental activity in the learning process. He describes observational learning as a process where individuals can learn from watching other people perform. In other words, learning can be influenced not only by their own experiences, but also by what they observe others doing. If the observed behaviour leads to positive consequences for the person doing the behaviour, observers can store this in their minds and perform the behaviour later in similar situations (Deguchi, 1984). This view on the importance of cognitive processes distinguishes Bandura's theory from classic behaviourism and makes it relevant to the overall understanding of learning and elite training that is addressed in this resource.

Observational learning and badminton

If we apply Bandura's view on learning to the context of working with elite players, we can recognise that elite players' high levels of technical, tactical, physical, and mental skills make them the perfect "models" to observe. This would allow other players to store ideal images of skills in their memory. As such, observational learning can play a significant role in the elite training environment if training sessions include demonstrations where players can observe each other performing different skills. For example, a player with a particularly strong backhand smash could demonstrate the stroke in a rally context, so that team members can observe the different elements involved in carrying out the stroke, as well as how the opponent responds depending on the speed or the placement of the smash. Those observing can analyse how the stroke is performed and well as what outcomes are achieved, and store these in memory for possible future use.

Role of the coach

In order to successfully implement observational learning processes, coaches should ensure that training sessions include spaces for demonstrations. The coach could arrange for different players to demonstrate skills they are especially good at and may also involve the players in the process of choosing the demonstrations. Depending on the context, the players' needs, and the availability of suitable models, coaches may also choose to incorporate video demonstrations. The benefits of using video demonstrations were addressed in Level 2, and this may also help coaches expand players' experience beyond the talents present within their own team. This is particularly important in contexts where players may have less natural exposure to a wide variety of other elite players.

Expected outcomes

In observing not only the actions performed, but also the positive or negative consequences of these, players will have the opportunity to analyse and store what they have learned as part of their repertoires for future use. In addition, as discussed previously, the opportunity for players to demonstrate their particular skills for their teammates can also contribute to other positive aspects like feelings of competence, motivation, and recognition.

COMMUNITIES OF PRACTICE

Principles of communities of practice

American anthropologist Jean Lave and Swiss scientist Etienne Wenger first used the term "communities of practice" in describing shared learning experiences within groups of established practitioners (Lave & Wenger, 1991). This was typically applied to apprenticeship-type learning experiences, rather than formal educational programmes. In fact, Lave and Wenger do not propose these ideas as educational strategies, but rather as a way of understanding how learning happens within such groups. In looking at the learning process, they also address the structure of the "community", in that there are central members and more peripheral members. The peripheral members start out learning from the central members, and in doing so become more established members of the community. The main tool for learning in communities of practice is "negotiation of meaning" (Wenger 1998), which means that in order to learn anything, the members of the group have to be active and participate in the communication.

Communities of practice and badminton

Wenger later described communities of practice as "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly". In practical terms as applied to badminton, groups of players will learn relevant badminton skills when practicing and participating in tournaments together. In a group of elite players, the central members could be the players with the highest performance levels, or players with significant experience in other areas. So for example, if the group is involved in a discussion around what tactical strategies to implement when playing against a particular opponent, the central members may initially share their thought processes while the peripheral members listen and ask questions. As the peripheral members become more experienced and confident, they may start to offer opinions or even alternate strategies for consideration.

Role of the coach

As each elite player has a great deal of unique knowledge and experience, it could be beneficial to organise training sessions in a way that encourages players to explore different topics and share their knowledge. From a coaching perspective, then, the coach's role would centre around creating situations where the players work together to discuss and solve technical, tactical, physical and mental challenges, in order to facilitate the sharing of knowledge among the players. As in the other approaches that have been examined, this involves a shift from the coach being in complete control to the coach creating the conditions for the players to help each other develop.

Expected outcomes

Learning is understood as meaningful participation in an established community, and thus there is a strong focus on communication as the tool necessary for development and learning. There is no predetermined content to be learned, but rather a process of collaboratively formulating solutions for typical situations faced by players. The focus on social interaction and interpersonal communication as key elements of the learning process also fosters a sense of relatedness, which as previously mentioned, is an important component in building intrinsic motivation.

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DISCUSSION OF LEARNING THEORIES AS APPLIED TO ELITE BADMINTON

The three learning theories that have been discussed in this section address different aspects of how learning actually takes place, and each offers certain perspectives on understanding the learning process. While they may focus on different elements, they are not necessarily at odds with each other. For example, constructivism focuses on the internal reflection that learners go through in constructing knowledge, based on the external inputs ("disturbances") and their prior knowledge. However, those inputs can come from different sources, including the interactions with coaches and peers discussed in the social learning theories. At the same time, observational learning describes the process that takes place as the result of watching another person perform an action and observing and noting the consequences of that action, without rejecting the importance of reflection as an internal process which will always take place. Finally, constructivism and communities of practice both aim to create situations which provide the conditions for meaningful inputs, so that the resulting knowledge will then be incorporated by the learner, with both views recognising that knowledge can't be transferred directly from one person to another.

This may seem confusing at first, but the importance of these different theories is that they can provide coaches with a better understanding of the learning process and what this means in terms of working with elite players. By understanding both the ***internal mental processes*** that are involved in learning, as well as the ***key social interactions*** that can create the ideal conditions for learning to take place, coaches will have a better toolbox when it comes to planning and implementing training sessions, as well as supporting players' development in general. As such, they will be better equipped to establish environments that create maximum learning opportunities for elite players.

It is also worth mentioning that different cultural contexts will have different views on what constitutes an ideal learning/coaching situation, as well as what kind of interactions (coach-player, player-player) are desirable. This applies to both the coaches and the players! While some coaches will feel quite comfortable encouraging their players to reflect, others would prefer that they simply follow instructions. Some players will welcome a coach's request for opinions and ideas, while others will question the coach's motives, or even competence! In certain cultures, particularly those with strong traditions of apprenticeship, the concept of communities of practice may be quite familiar, while others may look for a more formal structure. The intent of this resource is not to tell coaches what they "should" do, but rather to help them explore and understand the learning process, so that they can make the best decisions possible within their own coaching contexts.

SUMMARY OF LEARNING THEORIES

The chart below offers a quick comparison of the main aspects of each of the learning theories discussed in this section. Once again, it should be noted that the roles of the coach in the different approaches are not mutually exclusive, nor are those of the players.

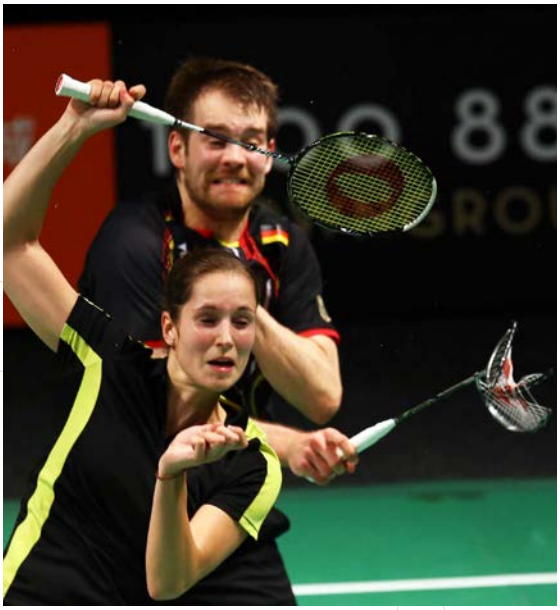
	CONSTRUCTIVISM	OBSERVATIONAL LEARNING	COMMUNITIES OF PRACTICE
Role of the coach	To create on-court situations that challenge the players' pre-conceived notions or previous experiences, thereby provoking the players' reflection process	To create situations where players can demonstrate an area of particular strength, skill, or competence, thus allowing other players to observe the process and the results	To facilitate conditions for interaction (discussion, problem solving, strategising) around key topics for the group
Role of the players	To actively engage in the reflection process in order to build new knowledge and options for on-court action	To act as models that will help peers form an ideal mental image To observe other players' strong areas	Central members: to share their knowledge and experience Peripheral members: to actively participate in group activities

Basis for learning	A mental restructuring of prior knowledge based on new inputs and information	The storing of information about others' performances and the consequences of these performances	The sharing of practices and experiences that are central to the main purpose of the group
What this looks like in practice / What happens on court	Coach and players participate in exercises designed to "disappoint" players, followed by reflection sessions to examine what happened, what the result was, and how this may influence future actions	Coach designates space in practice sessions for players to demonstrate their areas of expertise, while other players observe both the actions and the results of the actions	More experienced or skilled players share how they approach certain challenges or deal with certain situations, with newer players having the opportunity to listen and eventually engage in discussion

04. REFLECTION AS A CRUCIAL TOOL FOR LEARNING

WHAT IS REFLECTION?

When we reflect, we are thinking. We are "disturbed" by inputs from the outside and relate these inputs to our existing experiences. In this process we learn and change, thereby becoming better able to handle future challenges.



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John Dewey is perhaps the most important exponent for reflective thinking, and he explains that reflection happens when our actions do not have the expected outcome. When we are "disappointed", the cognitive process of reflection begins, in order to figure out what to do next. Conversely, when our actions do have the expected outcome, there will be no need for reflection. As mentioned earlier in this module, this means that if we want elite players to practice their ability to reflect, we have to create situations where they will be "disappointed", regarding what they expect in a specific situation.

The process of reflection, according to Dewey, consists of two components he calls "observation" and "memory" (Dewey, in Højrup & Pedersen, 2010), or in other words, disturbance and experience. When players realise that things didn't go as expected, they will relate what actually happened to their existing experiences. This reflective process will develop and change their experiences, meaning that afterwards they will have deeper knowledge and increased potential for efficient action in the future. However, the process of reflection takes time, which means that for these skills to be developed, the exercises have to contain small breaks for reflection. In other words, it is important for the coach to schedule short breaks within the practice where the players have time to think for themselves.

As mentioned before, the level of complexity is higher in elite badminton as compared to lower levels, and therefore so is the need for reflection. While elite players are better at trying to anticipate the opponent's next move, at the same time, their opponents are continuously trying to deceive them. This means that elite players will be "disappointed" more often regarding the expected outcome of their choices and actions, as their opponents will try to be as unpredictable as possible. As such, there is an increased demand for the ability to reflect, both in the actual moment (on court) and afterwards (in a post-match analysis).

DIFFERENT TYPES OF REFLECTION

Fundamentally, we can distinguish between two types of reflection.

REFLECTION-IN-ACTION

The first type of reflection is called "active reflection" or "reflection-in-action". This last term was developed by American philosopher Donald Schon, who claims that reflection can take place in the moment of an action, which means that the time spent in the reflection process is maybe counted in seconds or fraction of a second. Schon describes reflection-in-action as "on-the-spot surfacing, criticizing, restructuring, and testing of intuitive understandings of experienced phenomena" (Schon, 1986, p. 42).

As the definition indicates, reflection-in-action is based on how the person feels and intuitively experiences a situation. This intuitive understanding of the situation is followed by thinking about the problem as well as possible solutions, which results in new possibilities for action in order not to be disappointed in situations to come. The demand for reflection-in-action skills is very high in badminton, especially for elite players. When practice sessions focus on creating situations where the players are "disappointed" – meaning that their actions do not have the expected outcome – it is primarily reflection-in-action skills we are aiming at developing.

REFLECTION-ON-ACTION

The second type of reflection is called "reflection-on-action", which includes "premise reflection". The term "premise reflection" was defined by Russian scientist Jack Mezirow (1990). This kind of reflection does not happen while the individual is acting, but is a process which takes place after the action has happened. Premise reflection aims at developing fundamental views on how we understand a certain issue, in our case badminton. This means that premise reflection is about questioning our usual ways of looking at an activity, our pre-suppositions, in order to develop new and creative ways of acting.

This kind of reflection is set in motion by what Mezirow calls "a trigger event", which serves to raise a person's awareness of his/her current perspective. For example, an elite player finds out at some point that her opponents have gotten to know her, and therefore can anticipate what she is doing on court. Her on-court difficulties create a "disorienting dilemma", in which the player realises that things are not happening as expected based on previous experience. The tool for handling this problem could be premise reflection.

The coach has an important role when players use premise reflection to work on changing fundamental approaches to their game or other areas of their lives. This is because the process requires feedback from the environment and from equal communication partners. The coach, as mentioned previously, serves as a co-player, who can help and "disturb" the players, in order for them to find new ways of understanding themselves and their game.

It can be seen that the issue of reflection is closely connected to the ideas around constructivism discussed in the previous section, where the learners have to make connections and "construct" knowledge. Reflection means that the players have to make their own choices, and the coach's interaction with the players delivers the "fuel" for the reflection and choice-making processes. While both reflection and learning can only be achieved by the players themselves, the coach has a fundamental role in guiding them in the process and setting up ideal conditions for reflection and learning to take place.

HOW TO DEVELOP REFLECTIVE SKILLS

Players will generally need practice, under the coach's guidance, to become familiar and comfortable with the reflection process. Because the types of reflection discussed above are two distinct processes, carried out at different times and for different purposes, coaches will have to employ separate strategies to develop them. A summary of suggestions for developing each type of reflection is offered below.

WAYS TO WORK WITH *ACTIVE* REFLECTION ("IN ACTION") SKILLS	WAYS TO WORK WITH *PREMISE* REFLECTION ("ON ACTION") SKILLS
• Make exercises where things change in order to challenge the players' existing views • Include breaks for thinking within the exercises • Facilitate the reflection process by being at the court and asking open questions at the moment things are happening • Create "controls" in the exercises, so the players can see their reflection leading to more efficient actions	• Arrange time for communication after practice and matches • Respect that the coach is an equal partner in the communication process • Try to challenge existing presuppositions in order to change the players' fundamental perspective on things • Use open questions in the dialogue • Talk about "why" more than "what" and "how", as the "why" in this case addresses the fundamental premises of actions

EXAMPLES OF EXERCISES FOR DEVELOPING "IN ACTION" REFLECTIVE SKILLS

- Singles exercise – The player can only play to the feeder's half court, and the player is not told where the feeder can play. The feeder can play to the player's half court and can also use a specific crosscourt shot at will (it could be a smash, a lob, a clear, etc.). Every five minutes the feeder gets a different crosscourt shot to use, without the player knowing this. The player has to continuously discover which shot the feeder can use when playing crosscourt and try to take advantage of knowing this.
  (Changing circumstances will challenge the player's reflective skills.)

- Singles exercise – Games to 5 points. The court is divided into six areas: two at the net, two in the middle, and two at the backline. After each game, the loser can close one of six areas on his/her own side, meaning that the opponent can't play the shuttle to the closed area. The winner is the one who wins four games first.
  (The player has to adapt to new courts and therefore new choices every time a game has finished, as well as deciding how to gain an advantage through the area that has been closed.)

- Doubles exercise – Game to 21. The pair gets 3 points instead of 1 point if they can grasp the shuttle with an overhand catch in front of the service line at the net.
  (The normal way of hitting the shuttle with the racket will not be the best choice in this exercise, which means the players are "disturbed" and have to re-evaluate their understanding of the situations.)

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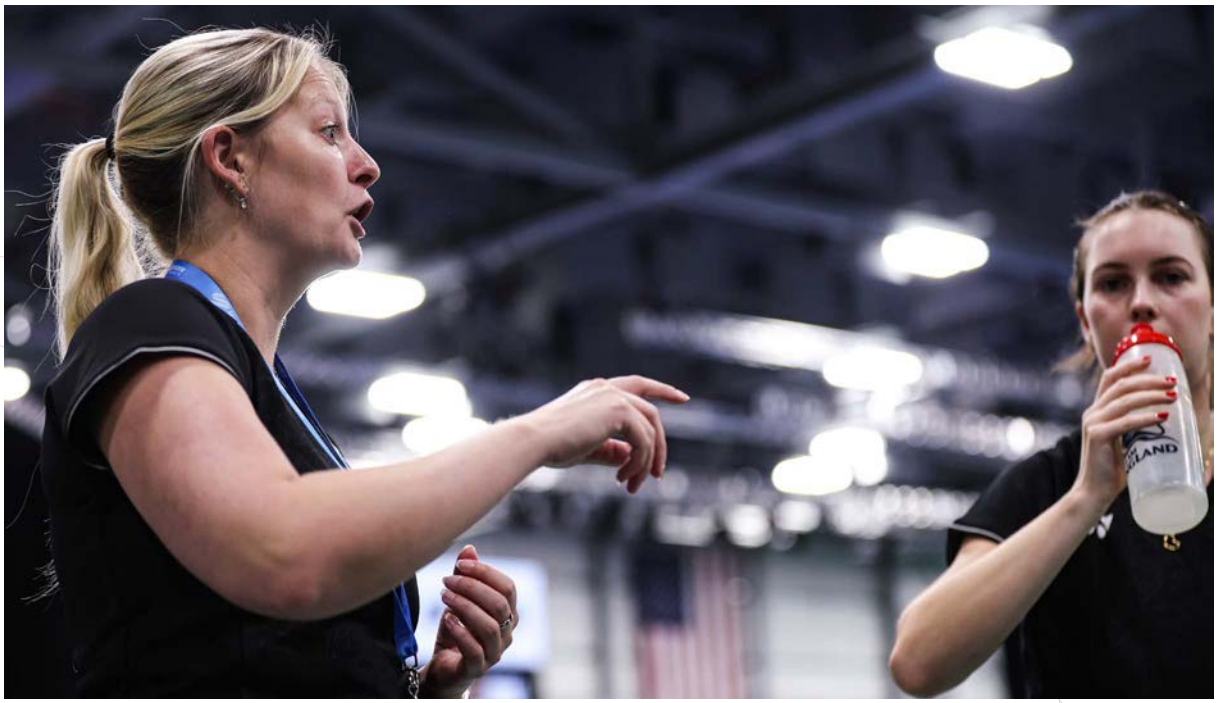
BADMINTON COACH EDUCATION

COACHES' MANUAL

LEVEL 3

MODULE 8
COMMUNICATION AND COACHING

MODULE 8
COMMUNICATION AND COACHING



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01. INTRODUCTION

The previous module pointed out the importance of using elite players' unique experiences to contribute in a valuable way to their own and other players' development, and it is only through effective communication that we can externalise these experiences and bring them into play. As such, communication is one of the key elements in bringing about the "disturbances" that result in reflection and learning, and this module will begin by examining how communication takes place. Effective communication also contributes to the aspects of teamwork and group dynamics that will be discussed in the next module.

Because the coach also has significant knowledge and expertise and will need to work with the players to bring about learning, this module will then explore an approach called systemic coaching, which is characterised by player(s) and coach using dialogue to create learning and knowledge together.

Finally, as elite coaches will likely find themselves in international settings at some point, the module also deals with issues surrounding communication with players from different cultures.

LEARNING OUTCOMES

By the end of this module, coaches will be able to:

- describe different models of communication
- explain how our understanding of communication may shape our interaction with players
- explain how systemic coaching may differ from traditional approaches to coaching
- identify ways to apply systemic coaching principles to their own practice
- identify various dimensions which can affect the way people from different cultures communicate
- identify typical training situations in which these dimensions may come into play
- discuss ways for coaches and players to recognise difficulties in communication and handle them appropriately

02. UNDERSTANDING HOW COMMUNICATION TAKES PLACE

WHAT IS COMMUNICATION IN GENERAL?

The word "communication" comes from the Latin words "communicatio" which means connection and exchange, and "communis" which means common. Communication can be *interpersonal*, which involves communicating with others, or intrapersonal, which involves communicating with oneself. This section will focus mainly on *interpersonal* communication and how this can be applied to elite coaching. We will look at different purposes for communication (to transfer information, to find out something about the other person, to achieve consensus, to challenge the other person's view on things, etc.) and how this communication can be understood to take place.

MODELS OF COMMUNICATION

To examine the communication process, we will present two of the most-commonly recognised models of communication (transmission and interaction) and we will also explore the relation model, which takes into account the complexities of human relationships in the communication process.

THE TRANSMISSION MODEL

The transmission model sees communication as a matter of transferring information from one person to another. The person who sends the information has a message or idea to be wrapped in words and sent to the receiver. The person receiving the message will then unpack the information, and in this way receive the message in its original form (Frandsen et al., 2002). Communication understood as transmission sees the receiver as passive in the communication process, with no reflection needed in order to receive a message. This means that communication is essentially seen as a "one way" process, where the person sending the message is responsible for the process to succeed.

This model could be helpful in explaining certain types of communication - for example, in the interval between two games when a coach tells the player to smash more. If the player actually smashes more afterwards, the coach will assume that communication has been successful. However, the "one way" nature of this model means it will best serve to illustrate communication in situations where coaches are mostly interested in players just doing "what they are told". Because the focus is on transmitting a message (for example, to be on time for practice), and not in any reflection or feedback, the model can adequately represent this.

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THE INTERACTION MODEL

In contrast to the transmission model, the interaction model presents communication as a dynamic process, which involves both sending and receiving. The two parties create the process together, as the receiver of the message interprets the message and sends back an understanding of and reply to the received message. Thus, there is a strong focus on feedback in this approach to communication (Andersen, H & Leth-Jorno, M, 2013). The way the receiver understands the information that has been sent depends on his or her experiences regarding the context in which the communication is taking place. In other words, the receiver's knowledge (about the topic, the person sending the message, and the situation) will determine how he or she understands the information sent. It can be seen that this approach to communication recognises the role of reflection and feedback, as the information received in communication is regarded as "disturbances", which can only be understood by relating them to existing experiences.

To contrast with our previous example, if a coach thinks that a player should have smashed more, instead of saying this directly, the coach might ask the player why she played the way she did. In this way, the coach can get a better understanding of the situation, while at the same time respecting the player's intuitive understanding of the game on court. As indicated previously in relation to reflection, the process is much more complex, and if you want to take full advantage of the feedback and interactive nature of communication, you need time for the process to be effective.

An interesting perspective on communication as "interaction" is offered by German scientist Nicklas Luhmann, who describes communication as the "*selection of information, selection of the utterance of this information, and a selective understanding or misunderstanding of this utterance and its information*" (Luhmann, 1992). In other words, in this view, communication is a process in three steps. In the first two steps the person sending the message has to choose what to send and how to send it, and in the third step the receiver has to choose how to understand the message.

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The key element in this definition is that communication is *a process of choices*, which means that it is not certain how the two parties will understand and interpret the contents of the communication. It can also help us understand that even in what may seem to be "one way" communication, the receiver is always actually playing an active role, rather than being a passive "target" for the information. An understanding of communication based on this kind of mutual responsibility should prove much more helpful for coaches who aim to foster an active process rather than a "do as you are told" approach.

THE RELATION MODEL

In a more recent view, communication is seen as a relation or a feeling (Greve, 2010). The "relation model" aims at creating a connection between individuals, and as such, it is important that the people communicating understand each other and are honest and transparent in the communication. This means that in order to improve the dialogue, they have to learn something about each other on an emotional level as well. From this perspective, understanding can only be created by communicating in a way that the receiver perceives as relevant and constructive. Therefore, participants in the dialogue have to establish a common understanding of each other (Andersen, H & Leth-Jorno, M, 2013).

Additionally, the relation paradigm regards it as important that the body language of those involved in the communication signal interest and openness, in order for the communication to flow in a dynamic way. The idea is that you only want to give something if you get something back – in this case recognition that you are an interesting person to talk to.

The approach to communication presented in the relation paradigm can help us to understand some of the specific problems that come about in working with elite players, as they have a lot of different experiences, both positive and negative, that can affect their motivation for communicating about different topics. Knowledge about the communication partners' good and bad experiences can make the communication more relevant and efficient.

The three models above serve to provide different perspectives on how the communication process works, and thus to help coaches achieve a better understanding of their interactions with players (as well as other stakeholders in the overall player pathway).

03. SYSTEMIC COACHING WITH ELITE PLAYERS

The previous section on communication highlighted the role of interaction within the communication process. This section will go a step further to look at how the interactions among the many elements that make up a system produce a certain level of complexity and uncertainty. In order to work effectively within any system, including an elite badminton environment, this must be taken into account. The nature of these interactions, and how they can result in a greater understanding of different perspectives, will be examined within the context of coaching and how to structure coaching sessions.

WHAT IS SYSTEMIC THINKING?

Introduction

Systemic thinking involves a holistic perspective on life because it deals with systems and the interactions between the elements that make up those systems. It is important to bear in mind that a system is characterised not by the individual elements, but rather by their interactions within the system. This kind of thinking can be especially helpful in understanding that in systems consisting of people, causality is not always clear and visible, as different individuals will react in different ways based on the interactions that occur within the system.

Working with People

One of the fundamental ideas of the systemic approach is that the only way to begin to understand an individual is by knowing as much as possible about the system of relations to which that person belongs. This is true in any context, including sport, and as such it is quite relevant for coaching at any level. However, the badminton-related relations of elite players are often particularly complex, which means that communication aimed at allowing coaches to understand their contexts and relations will be especially important when working with elite players.

Another key concept in the systemic approach is that people's social reality is based on the interpretation of experiences resulting from their social relations. Because we all are part of such complex social systems, this means that we can never fully understand another human being. In a coaching context, talking with players about the role their social relations play can help achieve a better understanding of their social reality. This can also help players understand that each person has a unique social reality, which can sometimes be a source of disagreements, but can also provide a rich diversity of perspectives.

A final concept of the systemic approach is that it makes no sense to break a system down into its parts and examine every part (or person) separately, as every part is a product of interactions with other parts. An interesting implication of the systemic approach is that, because our actions are determined by our relations and our interactions, we all have good reasons for acting the way we do at any given moment. Therefore, the issue of "blame" makes no sense from this perspective. This could make it much easier for players to learn from their experiences (whether positive or negative), as it may help them see that making mistakes or bad choices on court does not mean that they are less intelligent or less capable. They may simply need to look at what led them to make these choices in order to identify better alternatives.

Coaches and Players

The systemic approach recognises that systems (or players, in our case) are affected by the world around them. As previously discussed in the section on learning theories, any instructions or inputs from the outside are filtered through a person's own experiences; however, interaction with the coach will always influence the players in some way. The coach will make the players reflect, and thereby create new knowledge and new understanding. Thus, a systemic approach means that the coach, by understanding the players as part of complex systems, will be able to identify and create relevant "disturbances" and work together with the players to create new knowledge.

WHAT IS SYSTEMIC COACHING?

In the Level 1 Coaches' Manual, there is an exploration of the coaching process, looking at the responsibilities implicit in the role of the coach, as well as different coaching styles and the importance of recognising one's own coaching philosophy. The Level 2 manual goes deeper into aspects like planning and goal setting over an annual cycle, as well as discussing different coaching methods. Here in Level 3, the nature of an expert coach's interaction with the players is examined, along with how this supports player development, especially within elite contexts. Along those lines, John Whitmore, who is one of the pioneers in coaching, and who was the first to describe coaching as a general learning tool, defines coaching as:

"…unlocking a person's potential to maximize their own performance. It is helping them to learn, rather than teaching them" (Whitmore, 1996).

This definition clearly indicates that coaching is not about transferring knowledge, but rather a matter of making other people think on their own. Whitmore's definition also shows that coaching is an asymmetric relationship centred around the person being coached, who can also be called the "focus person".

A definition of coaching which reflects the systemic approach is:

"Systemic coaching can be defined as a dialogue, where a coach helps the focus person to see different perspectives on the relation between challenge/problem and focus person" (Moltke, 2009).

This definition has a focus on the issue of relations, which is a central aspect in systemic coaching. As such, part of the coaching dialogue deals with social relations and how these can influence the focus person's situation. In this approach, there is no point in describing a person in isolation, because only by looking into the relations between people can we try to understand and help the individual.

The coach's role in systemic coaching is closely linked to a constructivist learning approach, in that the coach serves as a co-producer of new knowledge. As such, the coach will often "provoke" the focus person (player) in order to initiate the reflection process, which can sometimes be achieved by the use of hypotheses. By using hypotheses within the dialogue, the coach can introduce his or her own assumptions, which may be contrary to the perspective of the focus person and can therefore serve as a trigger for reflection. For example, a hypothesis like, "You may need to change your lifestyle in order to become a better player", followed by the question "What would you do?" should trigger a reflection process in the focus person. In systemic coaching, this use of hypotheses and reflective questions is important, but also a little risky. It is important that within the coaching dialogue, coaches do not "fall in love" with their own views and hypotheses, but rather stay open-minded and curious, in order to keep things centred on the world of the focus person.

When looking at coaching as a dialogue where one person wants to help another person solve some kind of problem, questions can play an important role in this process. Used properly, questions can help keep the dialogue centred around the player rather than the coach, which, as mentioned before, is essential for effective coaching. The different kinds of questions that coaches might use, depending on the situation, are dealt with extensively in the Level 2 Coaches' Manual. There will also be a closer look at the specific use of questions within coaching sessions later on in this section.

As mentioned above, this view of coaching is quite similar to a constructivist approach to learning, with questions serving as the tool for creating reflection. When appropriate open-ended questions are used, players are stimulated to think on their own, regarding their situations and challenges. Such questions can "provoke" players and begin the reflection process, which can help develop general reflective skills. In addition, players develop ownership and responsibility for their own actions, by reflecting on and answering the questions, and thereby coming up with their own solutions to any relevant challenges. In other words, answering questions creates a sense of autonomy (Tomm, 1988). This is because the answers can be seen as personal choices, which as discussed earlier, is essential in order to establish intrinsic motivation.

DIFFERENT CONTEXTS FOR COACHING ELITE PLAYERS

This section will examine different ways that coaching may take place at an elite level, from two distinct perspectives. The first perspective is the formalised coaching session, between a coach and a player/focus person, which is agreed in advance and deals with a specific problem or issue, normally brought up by the player. The second perspective is how to incorporate the use of coaching and questions into general communication in elite environments.

A) FORMALISED COACHING SESSIONS

When coaching players in formalised coaching sessions, the coach may assume the role of "game master". This means that it is the responsibility of the coach to continuously evaluate and ensure that the coaching process is moving in the right direction regarding the initial purpose of the session and the changing perspectives of the player during the session. The player, on the other hand, is responsible for the specific contents of the session, because the player decides within the framework of the session exactly which topics the dialogue will address, as a result of his or her reflection process. In the role of game master, the coach needs to be able to work on two levels – the "meta" level and the "specific" level. Each of these two levels has a different purpose and involves different approaches and communication techniques, as will be explained below.

The meta level:

Working on the meta level involves thinking about and discussing how the specific coaching dialogue is happening. It is, in other words, "communication about the communication". The coach has three fundamental tools, when dealing with the meta level:

- the contract
- time outs
- the evaluation

The first tool is the *contract*. Before starting the specific coaching session, the coach and the player agree on the "how", "what" and "where" of the session (Molly, Storch, Juhl, Molly-Søholm, & Dahl, 2013). In this case, the agreement could be that the "how" will be a dialogue based on questions. They also agree on what the topic of the session should be, with the understanding that as the dialogue develops, the topic may need to be modified or adjusted. Finally, they agree on the expected outcome of the process. In terms of the player, the purpose of the contract is to create ownership of the process and thereby facilitate engagement and reflection during the session. The coach can then use the contract as a tool on which to base the evaluation of the process that took place during the coaching session.

The second tool is *"time outs"*. Time outs are small breaks in the coaching session, where coach and player discuss whether or not the process is moving in the right direction according to the agreements in the contract. Time outs can be used to adjust the process or to redefine the purpose or direction of the session. It is fundamentally the coach, as game master, who decides if there is a need for a time out during the session. However, in working with elite players, it could also be quite appropriate for the player to ask for a time out. The player, as mentioned before, has valuable knowledge and experience that coaches will want to externalise, and asking for a time out actually indicates that the player has been reflecting and is actively engaged with the topic of the session.

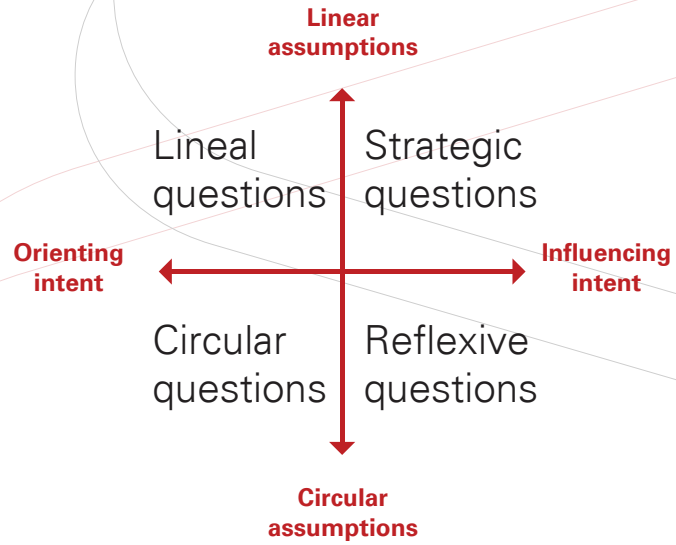
The third tool is the *evaluation* of the session. In this kind of formalised coaching session, the evaluation fundamentally centres around finding out if the player is happy about the outcome of the session, with regard to what was agreed in the contract. This part of the evaluation also aims to motivate the player for future action as a result of the coaching session. Part of the evaluation, therefore, could be to determine what should happen next, based on the discussions in the session, as well as to establish how to follow up on this. As such, the evaluation phase is a key element in ensuring that specific results will follow from the coaching session.

The specific level:

Specific coaching sessions will develop differently and involve different types of questions, as each coaching dialogue is unique and difficult to predict. The communication framework developed by Karl Tomm (1988) can help explore the different ways in which coaches may use questions to achieve a variety of purposes during a coaching session.

Tomm proposed this model as a way of classifying the nature of questions and why they might be used. However, it may also be useful to look at Tomm's model in phases, where coaches might start with lineal questions and then moving on to circular, reflexive, and strategic questions.

The original model of Interventive Interviewing (Karl Tomm 1987 & 1988)



Below are some examples of what this might look like in practice.

PHASE 1:
In this initial phase, the coach has the role of a "detective", in trying to find out exactly what the player's problem or challenge is. This generally involves asking about things that have happened in the past, in order to create an understanding of the issues involved. In this phase, the coach's questions have an orienting intent, meaning they help the coach get a better picture of the situation. The questions asked are in this phase based on lineal assumptions, which means that there is an expectation of causal connections (cause and effect). Examples of specific questions in this phase might be, "When does this happen?" or "What do you do when this happens?"

PHASE 2:
In this phase, the coach has the role of an "anthropologist". This means that the coach's questions still have an orienting intent (i.e., the coach is still trying to get a clear understanding of the situation), but the questions are now based on circular assumptions, rather than lineal assumptions. Circular assumptions build on the importance of the relation of the different parts of a system, and they are therefore in contrast to ideas about direct causality. For example, the coach asks into the player's relations, and how these relations affect the player's situation and challenges. This is a good example of the systemic perspective discussed earlier, as systemic thinking is characterised by a focus on relations and patterns. Examples of questions in this phase might be, "If I were a fly on the wall in the situation you are describing, what do you think I would see?" or "How do you think other players see you when you practice together?"

PHASE 3:
In this phase, the coach has the role of an "artist", helping the player to come up with solutions regarding the challenges discussed. The questions here are still based on circular assumptions, and furthermore, they aim to make the player reflect. The basic purpose of this part of the session is to influence what will happen in the future. Again, this is a good example of the systemic perspective, as the coach can use different techniques including hypotheses to "disturb" and "provoke" the player. In other words, the coach is a co-producer of potential solutions to be implemented in the future. Specific questions in phase three might include, "If you act this way, what could we expect would happen?" or "What do you think the other players would suggest in order to solve this problem?"

PHASE 4:
In this last phase, the coach has the role of "captain". The purpose here is to agree on a specific plan, in order to implement new solutions. The questions used in this phase are based on lineal assumptions, as a specific question should lead to a specific answer as part of the plan. In other words, this phase is about deciding specifically what to do next. Examples of questions in this part of the session might be, "At what point do you think this problem will be solved?" or "What will you do first thing in the morning?"

B) COACHING AND GENERAL INTERPERSONAL COMMUNICATION IN ELITE ENVIRONMENTS

Coaching in formalised sessions has advantages as well as disadvantages. The advantage is that the coach has a lot of time available with the player and can therefore get to know the player very well. This makes it possible to establish a deeper understanding of the player's problems and challenges, which can help develop and maximise the player's potential. The disadvantage is that the coach must have time available to do sessions like these, which can be problematic if the coach is responsible for a squad of players.

One way of handling this challenge is to encourage players to support each other as part of their day-to-day training practice. For example, players could try to implement questions and dialogue aimed at improving aspects of training into their general communication within the elite training environment. This would allow players to get high-level input more often and from different perspectives. However, this way of communicating may not come easily or naturally to the players, as shown by a study (Larsen, 2016) where players had a three-hour course on coaching techniques at the beginning of the project and were continuously encouraged to use questions when interacting during practice. In this case, the attempt to implement a kind of ongoing coaching among peers was not found to have a positive effect on the players' communication, as in follow-up interviews, they all said that they found it strange and embarrassing to communicate in this way.

Because players are generally not accustomed to this kind of communication with their peers, they may need support in adopting new ways of interacting, as well as time to see the potential benefits. In the interest of taking advantage of players' unique skills and knowledge as an important resource in supporting each other's growth, some of these issues will be discussed further in the sections on Recognition and Teamwork, as well as Peer Feedback.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04. CULTURAL ASPECTS IN ELITE COACHING CONTEXTS

CULTURAL ASPECTS OF COMMUNICATION

While in the past the majority of elite players came from Asia, there is currently more and more diversity at the top levels, with Europe in particular gaining a lot of ground. Recent medal spreads include a greater variety of Asian countries, as well as an important presence from Denmark, England, and Spain, among others. In addition, players are training in more international contexts, and elite players will often spend significant periods of time not only outside of their home country, but outside of their region or continent. Along the same lines, elite coaches are working in an increasingly international market, and they may find themselves coaching players of many different nationalities during the course of their coaching careers.

Previous sections have stressed the importance of effective communication in the coaching process, and there can be little doubt that communication is at the heart of elite coaching. Given the internationalisation described above, a successful elite coach must not only demonstrate solid communication skills, but must also be able to put these into practice in different cultural contexts. This can be a challenge, as when people are socialised into a specific culture, they also learn specific ways of communicating. The norms, values and rules of their society instil certain communication styles, which differ from culture to culture (Gudykunst et al., 1996).

While it is beyond the scope of this resource to provide an analysis of individual cultures, there are certain fundamental patterns, or universal dimensions, that can be seen in cultures across the world (Hall, 1976; Hofstede, 1980; Schwartz, 2006). We will explore the following dimensions in order to help coaches navigate the challenges involved in cross-cultural communication:

- **Orientation**: Individualistic or collectivistic
- **Style**: High-context or low-context
- **Time**: Polychronic or monochronic
- **Power**: Egalitarian or hierarchical

Each of these dimensions will be discussed below, examining the two extremes in the dichotomy, and offering some examples of the frustrations that tend to arise from each side. However, it is important to keep two main principles in mind:

- First, each dimension is actually a continuum, and different cultures will fall at different points along that continuum.
- Second, there is also a good deal of variation among individuals from the same culture, so not all individuals from "x" culture will behave in "y" way.

The key lesson here is that by understanding some of the dimensions that affect interaction, we will be better equipped to effectively communicate with others, or to recognise and make repairs when we suspect there has been a breakdown in communication.

INDIVIDUALISTIC OR COLLECTIVISTIC

Cultures may differ in terms of how whether their members are seen primarily as individuals or as members of a group. With ***individualistic*** cultures, the goals of the individual overshadow the goals of the group. This is often characterised by a focus on responsibility for yourself and your closest family. In ***collectivistic*** cultures, the feeling of belonging to a group and loyalty towards this group are key elements. An individual is seen in relation to others and cannot be understood in isolation from context and social relations (Hofstede, 1980).

People who come from individualistic cultures will generally pride themselves on being self-reliant and often try to promote their own achievements, which may seem confrontational or selfish to those from collectivistic cultures. Those from collectivistic cultures will look to promote harmony in the group and loyalty within their group, which those from individualistic cultures may perceive as a failure to stand up for oneself, or as indifference towards those who are not part of that group.

Within a sporting context, this dichotomy may come to play in how an elite athlete views his or her success, for example. Someone from an individualistic culture may see success as the natural result of personal effort and commitment, whereas someone from a collectivistic culture may credit this result to group-related factors (Schinke, R.; Hanrahan, S.J. & Catina, P., 2008).

HIGH-CONTEXT OR LOW-CONTEXT

Closely related to the issue of individualism and collectivism, are two communication styles called low-context and high-context communication (Hall, 1976).

High-context cultures rely on common knowledge and understanding among members, so communication tends to be less direct and less explicit. This means that the listener has a great deal of responsibility for discovering the meaning. In contrast, ***low-context*** cultures tend to state things explicitly and depend heavily on what is actually said or written. As a result, the burden for sending the message falls primarily on the speaker.

Communication problems can easily arise along these lines, as individuals from high-context cultures may find those from low-context cultures to be too direct or to insult them by explaining the obvious. Conversely, individuals from low-context cultures may feel that those from high-context cultures provide insufficient inputs or direction, or that they are enigmatic or unforthcoming.

If we look at the first two dimensions in conjunction, within individualistic cultures, low-context communication seems to be the most prevalent type. People from individualistic cultures tend to talk more, and be more affect oriented, which means that people from these cultures have a tendency to be impulsive and say what they think in the actual moment. In other words, people from such cultures find that being direct is the best way to achieve the goals of the communication process. On the other hand, within collectivistic cultures, high-context communication is the most prevalent. In these cultures, it is important NOT to be too direct in your communication, in order to avoid insulting other people.

Applied to a badminton context, an example of this would be if a low-context coach tells a high-context player, "You are very good at building up the rally, but sometimes you don't get the reward from this build-up". This could be interpreted in many ways – for example, that the player is not choosing the right attacking shot to finish the rally, or that the quality of the attacking shot is not good enough. The coach may feel that the message has been communicated, but the player may be unsure as to what to do to improve the situation.

POLYCHRONIC OR MONOCHRONIC

Hall (1976) also made a distinction as to how different cultures perceive time. Individuals from ***polychronic*** cultures tend to do many things at once, and they usually manage interruptions and changes in plans well. They place great value on relationships with those around them. In contrast, those from ***monochronic*** cultures prefer to do one thing at a time and like to focus on schedules and time commitments. They value order and generally do not like changes in plans. Problems in communication may arise when those from monochronic cultures feel insulted or undervalued by interruptions in meetings or schedules, as well as when those from polychronic cultures feel that their efforts towards relationships and objectives are unnecessarily constricted by rigid schedules.

As applied to badminton training, a coach from a polychronic culture might make last-minute changes to the practice plan in order to schedule a session with a high-profile visitor. This may make monochronic players feel that the coach does not have a clear end goal or is not respecting their schedule. However, if they were to raise this objection, the coach would likely feel that they are being too rigid and that they do not trust in him/her to ensure that the overall goal will be met.

EGALITARIAN OR HIERARCHICAL

Different cultures also have different ways of perceiving authority, responsibility, and power (Schwartz, 2006). ***Egalitarian*** cultures value equality in terms of rights and power distribution. They appreciate input from many sources in the decision-making process. Subordinates are encouraged to ask questions and give opinions. In ***hierarchical*** cultures, on the other hand, those in top positions are entirely responsible for making decisions and are not to be questioned or challenged. The superior is the one who initiates conversations, and subordinates should only speak when spoken to.

There can be an obvious mismatch in style when leaders from egalitarian cultures invite opinions, discussion and even disagreements as a way of showing interest, and find their subordinates to be passive, unmotivated, or unwilling to participate. Likewise, leaders from hierarchical cultures may feel threatened or disrespected by subordinates who freely express their opinions or question decisions.

This last dimension has particular relevance for the discussion on constructivism and reflection in the previous module. The view of the coach as a co-constructor of knowledge and experience supposes a very egalitarian approach. If this is to be successfully implemented at the elite level, coaches will need to be aware of their level of comfort (as well as that of their players) with this kind of dynamic. Where there are significant differences in expectations around the roles of coach and players, these will need to be addressed before moving forward.

COMMUNICATING WITH PLAYERS FROM DIFFERENT CULTURES

Communication has repeatedly been emphasised as a vital tool when trying to bring the players' unique experiences into play and make them explicit. This section has highlighted some of the additional challenges that can arise when that communication takes place between individuals from different cultures.

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Successful intercultural communication involves knowing where potential areas of difficulty lie. Probably the most important first step for both coaches and players is to realise that their own way of seeing things is not the only way. Once they are aware that there are other ways of interpreting situations/messages/contexts, etc., they can begin to consider the dimensions along which cultures tend to vary, as discussed above. While neither coaches nor players will ever know all the details of another culture (nor is this a realistic, or even advisable, expectation), the different dimensions offer a starting point for considering other perspectives.

Along those lines, the question arises as to whose responsibility it is to adapt their communication style. While ideally, both parties will be able to grow and learn in the process, the particular situation in question is also of significance. For example, a coach who goes into another culture and is working with players primarily from that culture will undoubtedly have to make some adjustments in communication. However, this does not mean that the coach must completely change his/her style. If handled well, this can also represent an opportunity to challenge the players' way of thinking and encourage them to consider other perspectives. Armed with a solid understanding of some of the dimensions discussed, the coach (and if they are included in the process, the players) should be better equipped to successfully manage some of the obstacles in the process.

Conversely, if it is a player who is integrating into a new culture, s/he may have trouble adapting and understanding what the coach/teammates expect. If the coach tries to adapt and treat that player as s/he is accustomed to being treated, this may actually be a disservice, as the player will not learn to handle the challenges that will ultimately arise in interactions with other people. However, the coach can, by all means, try to understand where the player is coming from – especially when this can help lessen friction or misunderstandings (with the coach and/or other players). The coach can also help other teammates view the player as a resource with a different point of view (thereby creating rich "disturbances"), rather than a source of conflict. This is also particularly true in multi-cultural training situations where coaches and players come from different cultures and may even be training in "neutral" territory (in other words, yet another country).

As such, working effectively in an intercultural environment is not a matter of the coach adapting a communication style 100% to the player or the culture, but much more a matter of trying to understand each other's backgrounds and motives. This will allow those involved to optimise the communication process and take maximum advantage of the opportunities that result.

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BADMINTON COACH EDUCATION

COACHES' MANUAL

LEVEL 3

MODULE 9
TEAMWORK AND GROUP DYNAMICS

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01. INTRODUCTION

In the previous module, communication was explored as a tool to bring elite athletes' unique experiences into play. This module will look at how the ***recognition*** of those experiences can benefit the individual players, as well as how ***teamwork*** can ensure that their skills contribute to the development of the entire training group. ***Peer feedback*** will also be explored as an efficient tool to help elite players develop better skills and results by optimising their own learning process as well as that of their peers.

It must be recognised, however, that along with elite players' experience and knowledge come deep-rooted identities as badminton players, which can result in conflicts if they do not learn to recognise and understand each other. Unresolved or unaddressed conflicts, whether among players or between player(s) and coach, can have a significant negative effect on the training environment, and can even undo much of the benefits achieved through teamwork and peer collaboration. The previous module emphasised that individuals must be seen as part of a complex system in order to understand why they interact and react like they do, and this is also true when dealing with conflict. As such, this module will also discuss how to handle conflict from a systemic perspective.

LEARNING OUTCOMES

By the end of this module, coaches will be able to:

- describe the importance of recognition, especially in relation to self-esteem and motivation
- incorporate recognition in their day-to-day work with players
- explain how implementing a team focus can benefit elite players
- describe the advantages of using peer feedback with elite players
- create conditions for peer feedback to be implemented within their coaching practice
- explain the reasons for the appearance of conflicts from a systemic perspective
- apply conflict-resolution techniques in their coaching practice

02. RECOGNITION AND TEAMWORK

RECOGNITION – WHAT IS IT AND WHY IS IT IMPORTANT?

Recognition is fundamentally about demonstrating to other people that they have value and importance. Furthermore, it is about seeing others as real people who are equal and interesting (Heidegren, 2010). German social philosopher Axel Honneth (1996) states that recognition can be come from three different spheres:

- "love and friendship" (provided by family and close relations)
- "justice and equal rights" (provided by society)
- "social recognition for having unique skills" (provided by other players and colleagues)

Here we will focus on "social recognition", which is the most relevant to coaching in elite training environments. This is the recognition provided by group members who see an individual's competences as important for themselves and the social group to which they belong. Because elite players have a lot of high-quality experience regarding badminton and badminton practice, it should be possible to identify different areas in which each player is especially competent. In identifying these areas and making them visible to the other players and coaches, we create the conditions for players to experience social recognition.

There are many simple ways to show recognition, from a sincere compliment to a pat on the back. However, it is important to keep in mind that such gestures and expressions of encouragement are often culturally bound, and what is appropriate in one culture may be offensive in another. For example, eye contact is considered a show of interest and respect in some cultures, but a sign of defiance in others. Physical contact (like that pat on the back) will not be interpreting the same way in all cultures. If you are working across cultures, it is important to know what makes your players feel valued and recognised, as well as how they may interpret your customary displays of recognition.

As mentioned in the section on cultural aspects, it is not necessarily about one side or the other completely changing their behaviour, but in ensuring that understanding has indeed taken place. Otherwise, all the work that is put into creating a climate of recognition may end up backfiring! A simple conversation with the players at the beginning of the training process can help everyone understand the intentions behind different actions and also let the group know how the various members would like to be recognised. In a multicultural environment, this can also help players learn about each other's cultures and provide for further recognition of their teammates as unique and interesting people.

In the end, no matter how it is demonstrated, the importance of social recognition cannot be underestimated, as it is closely connected to the identity formation of the individual (Heidegren, 2010; Honneth, 1996; Honneth, 2003; Mead, 1913). Honneth (1996) even defines social recognition for unique competences as a fundamental psychological condition for developing high self-esteem, which has a number of positive consequences for the individual. People with high self-esteem are, among other things, characterised by being happier, more optimistic and more motivated, as well as being better able to handle feedback in a constructive way (Bandura & Cervone, 1986; Deci & Ryan, 2008; Lyubomirsky et al., 2006). This last point is important, as an improved ability to handle feedback will also improve the quality of the cooperation with coaches and other players. The use of feedback will be discussed in greater detail later in this module.

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HOW CAN WE FOSTER RECOGNITION WHEN WORKING WITH ELITE PLAYERS?

In order to create a recognising environment with elite players, we have to identify and bring into play their experiences and competences in such a way that the individual player will represent a positive element for the other players in the training environment. The importance of communication in bringing these competences into play was addressed in the section on Systemic Coaching. Once these areas have been identified, it can be very beneficial to delegate responsibility to the players, so that that each player is in charge of an area connected to practice, tournament activities, or social aspects of the elite environment.

Research in an elite badminton club in Denmark (Larsen, 2016), where a number of players were responsible for different tasks, shows that self-esteem is boosted if the tasks in question have the following characteristics:

- Tasks are chosen by the players themselves.
- The players' tasks are accepted by the rest of the group.
- Tasks are unique, meaning that players' competences around the specific tasks are also higher than those of the coach.
- Tasks involve communication and dialogue with other players or coaches.
- The players have the possibility to develop their areas of responsibility themselves.

An example from the above-mentioned study is that one of the players was appointed team captain, a role that didn't exist prior to the research project. The player actually defined and developed his functions as captain during the project and was recognised 100% by the other players for the way his role improved the training environment. The specific player's self-esteem developed quite remarkably during the seven-month project. Data for the study were collected through qualitative interviews with players, along with observations on players' behaviour regarding self-esteem parameters.

In short, the coach's role in an elite context will often centre on taking maximum advantage of players' prior knowledge and experiences, and one way to achieve this is through the delegation of areas of responsibility in the training environment. Apart from better results, this process will help develop stronger individuals, who are happy, believe in themselves, and are comfortable around others – qualities which are important in elite badminton, as well as in life in general.

EXPANDING THE BENEFITS OF RECOGNITION THROUGH TEAMWORK

Social recognition in elite badminton training, such as the experience described above, will often take place in the context of a team. The benefits of team cohesion were briefly addressed in the Level 2 Coaches' Manual, and this next section will further explore the nature of working in teams. It is important to clarify that "team" here refers to a group of players that regularly train together, rather than the specific line-up of players selected to compete in a team event. Understood as such, the benefits of working cohesively as a team in an elite setting are especially important, due to the high level of experience and knowledge of elite players. As previously mentioned, in some areas the players will have more knowledge than the coach, and in these cases, the coach's role centres around taking advantage of that knowledge to the benefit of the team.

There are many different definitions as to what constitutes a team, but most coincide on a few basic characteristics:

- interdependence
- a common goal
- a variety of skills

The fundamental idea of teamwork, from a systemic point of view, is that the team is more than just the individual parts added together. In other words, working as a team produces a synergy effect, which will add value and better results to the work done in this environment.

Another characteristic of teams is that each member has unique skills that complement the skills of the other team members (Søholm, Storch, Juhl, & Thiesgaard, 2009). This means that teams are heterogeneous groups, where each member has a unique role to play and is important in reaching the common goal of the team. At the elite level, one of the most relevant goals is that the members of the team continuously develop their badminton skills – in technical, tactical, physical, and psychological areas. Teamwork and team environments can help players to reach higher levels, as compared to other training environments, as a result of having the opportunity to learn from other players' specific and unique skills.

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From the above discussion around teams, it can be seen that team environments are ideal contexts for recognition to occur. As players have unique roles to play based on their particular skills and experiences, the key conditions for experiencing social recognition will be present. Thus, working as a team at the elite level can be a way to increase the quality of the work on specific badminton skills, as players will learn not only from the coach but also from each other. At the same time, because teams are ideal contexts for recognising the unique contributions of each player, teamwork can develop the players' self-esteem, which should result in higher motivation, and hopefully, better results.

In terms of what characterises a good team member, research supports the idea that elite players are especially suited to working in team environments. Bannerot (2004) found that factors such as maturity, work experience, and the ability to be self-critical were key for optimum functioning in teamwork. Logically, elite players have reached their high level of skill through years of experience. This also means that they generally reach elite level at a certain age and a greater level of maturity than, for example, youth players. Finally, the nature of elite-level play, in which opponents try to minimise possibilities for anticipation, means that players are always handling changing situations on court. As such, they are usually self-critical, constantly having to evaluate their own performance and question if they read the game correctly and made the right choices.

IMPLEMENTING TEAMWORK

When implementing a team approach in elite environments, there are a number of guidelines that may prove helpful:

- Each player should have a defined area of special competence. These should be chosen by the players themselves, and the players should have the chance to function as "coaches" for the other players, in order for them to learn from the specific players' competences.
- It could be beneficial for players, at some point in practice or tournaments, to have the chance to watch each other, with a focus on the special competences of the watched player. As discussed in the section on learning theories, this will help them to learn from each other through the "modelling" of special competences. Modelling is about learning and implementing other players' skills, as these are seen as positive options for improving one's own game (Bandura, 1974).
- In general, teamwork is about delegating responsibility to the team members. This means that the coach will have to define which areas in practice and tournament situations are suitable for delegation. This could be done in cooperation with the players.
- As teams and teamwork are characterised by communication (Søholm et al., 2009), it is important that the players in the team have the opportunity to communicate about and evaluate the work done within the team. Brief team meetings every week or every month could be a part of the schedule for the players.
- Specific team exercises could be implemented in daily practice, in order to highlight the idea that everyone in the practice group can contribute with something that is helpful for the whole group. Examples of specific exercises will be shown below.

The strategies listed above should aid in the development of "team thinking" with elite players. Depending how familiar, and how comfortable, the players are with the idea of teamwork, the strategies may need to be addressed and discussed at the beginning of the process. This will allow players to understand the potential benefits and express any questions or concerns they may have. It will also help the coach monitor how players feel about the process over time.

SAMPLE EXERCISES FOR BUILDING TEAMWORK

1. ***Singles exercise***: Two teams of four players (for example) are competing against each other. They will play a match of four different games with the following rules:

    - Game 1: You lose 2 points for making an unforced error in a rally.
    - Game 2: You get 3 points for making a winning shot that the opponent does not touch with racket or body.
    - Game 3: You have to win 3 rallies in a row to get a point.
    - Game 4: Normal singles match.

The team match is played on time, for example 30 minutes, and the winning team is the one with the highest number of points in total.

Each team will have to discuss, before the match, which player will have which task, in order to give the team the strongest possibility to win the match. In this process, the players will have to discuss and evaluate each team member's special competences, and how each member can best contribute to the team, in order to win the match.

The restrictions in the games could be designed so that different players' special competences, defined beforehand, would be in play. This could also be used as a general exercise aiming at developing overall team spirit.

2. ***Doubles exercise***: Two teams of six players/three pairs (for example) are competing against each other. They will play three different doubles games with the following rules:

   - Game 1: You get 3 points if a smash from the backline is followed by the net player killing the smash return.
   - Game 2: You get 3 points if the rally is won within the first 6 shots. Either pair then has the possibility to win 3 points in every rally.
   - Game 3: The pair that makes the first defensive shot in the rally will have to stay in defence for the rest of the rally.

   The purpose and rules for the doubles exercise are the same as for the singles exercise described above. It can be seen that in order for players to make the most of these exercises, they will need to incorporate recognition, evaluation (of others and self), reflection, and good communication skills. All of these can serve to build team cohesion towards reaching a common goal, thereby reinforcing motivation and self-esteem, and thus pulling together many of the elements discussed this far.

03. USING PEER FEEDBACK

WHAT IS PEER FEEDBACK?

From a learning perspective, ***feedback*** can be described as "information provided by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one's performance or understanding" (Hattie & Timperley, 2007, 81). In a sporting context, obviously that list of agents would also include „coach". The BWF Level 1 and Level 2 Coaches' Manuals address different aspects of how coaches can best provide feedback to players. Furthermore, the role of verbal feedback from the coach within players' motor learning process is examined in Module 13 of this resource. However, in keeping with the intent to capitalise on elite players' experience and knowledge, as discussed in the previous section on teamwork, the focus here will be on peer feedback.

Peer feedback can be defined as "a communication process through which learners enter into dialogues related to performances and standards" (Liu & Carless, 2006, p. 280). As the definition indicates, peer feedback is about two people on the same level or having the same role, providing each other with information aimed at improving knowledge or skills within a specific learning context. In an elite training context, this not only takes advantage of players' skills and experience, but also encourages them to take an active role in the management of their own learning.

WHY USE PEER FEEDBACK IN ELITE ENVIRONMENTS?

As mentioned at various points already, bringing the players' unique experiences into play has many benefits that can aid not only their own development, but also that of their peers in an elite training environment. For example, players involved in peer feedback situations will serve as resources for their peers, but they will also have the opportunity to reflect on their own development, especially if the peer feedback model described a little later in this section is implemented. Because elite players can benefit from achieving high levels of reflection, which is an important condition for further development of skills, the use of peer feedback can be an efficient tool for improving performance and results for elite players.

Another advantage of using peer feedback is that the amount of feedback each player receives will be much greater, compared to the coach being the only one giving feedback to the players. This can dramatically increase the opportunities for learning, provided that the feedback given by other players is relevant and constructive.

Furthermore, when players give feedback to their peers, they will, in the process, learn things about their own game that can be transferred directly into their own practice and badminton development. It is important for players to understand not only that peer feedback is a two-way process, but also that there are opportunities for learning and development when both giving and receiving feedback. They should not assume that the person giving feedback gets no benefit from the interaction. On the contrary, when we express and articulate to others what we know, our own learning will improve and be reinforced (Liu & Carless, 2006).

Finally, in the process of giving feedback to their peers, players will have the chance to develop general competences in communication skills, empathy, and so on. As such, if we are interested in developing "whole players", which is often mentioned in the overall goals for sporting organisations, peer feedback can be a relevant tool for achieving a more holistic development that will serve players on and off the court.

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PEER FEEDBACK IN PRACTICE

Research by Liu & Carless (2006) looked at how peer feedback and peer assessment influenced the learning situation when Hong Kong university students gave feedback to each other. They found that that one of the challenges in implementing peer feedback could be the matter of perceived expertise. Their results indicated that many students felt their peers were not qualified to give feedback. This, however, should not be an issue in peer feedback with elite players, as by definition they already have a very high level of expertise, which makes the relevance of the feedback even greater. As previously mentioned, in some areas the knowledge of the players is even higher than that of the coach, which is another reason that the use of peer feedback is an important tool within elite environments. If coaches want to foster an effective use of peer feedback and encourage players to appreciate its value, it may be advisable for them to point this out.

On another note, the Hong Kong study also showed that many students felt it was easier emotionally to receive feedback from peers as compared to teachers. This is probably because in the peer feedback situation there were no power relations or feelings of pressure. Thus, assuming that the quality of the feedback is good, this is yet another reason for implementing peer feedback in work with elite players. Of course, the feedback given by peers should be constructive and non-judgmental. In the following section, we will describe a feedback model which could be used to help players give effective peer feedback.

A FEEDBACK MODEL

In their work on supervision and learning, Alrø & Kristiansen (1998) describe a model for giving feedback, which aims to make the feedback constructive, as well as making the person receiving the feedback feel seen and heard, and thereby motivated to use the feedback positively.

The model consists of four steps:

1. The first step involves telling the person receiving the feedback what you specifically and objectively see happening in the situation. In other words, you hold up a mirror in front of the other person, so s/he can also see what has happened. This is to help the person receiving feedback feel seen and heard, and thus open to the feedback, so it can be used in a constructive and positive way.

2. The second step involves the person who is giving the feedback telling the other person how the situation influences the feedback giver on an emotional level. In other words, it is about communicating what you feel when you see what objectively has happened. For example, you might say, "When I saw you make this spin shot, I felt optimistic, even though the shuttle did not go over the net". This is to make the feedback situation "symmetric", creating a situation where both participants are on the same level. The idea is that the person receiving the feedback experience the feedback giver as a genuine person that can be trusted.

3. The third step involves interpreting what you have seen. In other words, it is about trying to explain WHY you think things happened as they did. For example, "I think the reason the shuttle did not go over the net is because you hit it too low". This interpretation opens up for the next step.

4. The fourth step involves giving advice based on the first three steps. For example, you could say, "My advice is that you hit the shuttle closer to the top of the net if you want to do a spin shot". A golden rule when giving advice is to be sure that the person receiving feedback actually wants the advice. To ensure this, you can simply ask, "Do you want my advice on this matter?"

As mentioned before, both parties should be active in the feedback process. This means that it is important for the person giving feedback to invite the person receiving feedback into the dialogue, by being open for comments on the feedback given.

Although the model may appear to be simple, many people have a tendency to jump right into step three and begin to interpret immediately. The risk in doing this is that you become judgmental, or that the other person has not been able to recognise what you are talking about. The effect of the feedback is thus at risk of become weaker or even non-existent.

IMPLEMENTING PEER FEEDBACK

The following ideas should be taken into consideration when implementing peer feedback in an elite training environment:

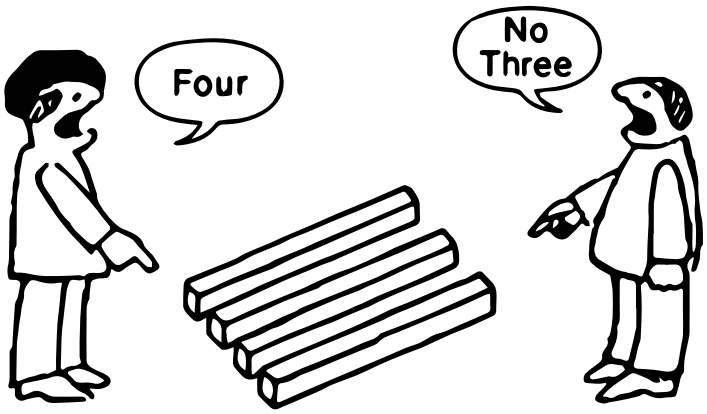
- Involving the players from the start of the process, by informing and discussing with them the purpose of using peer feedback. The positive acceptance of the players involved is very important if the process is to be constructive and engaging.
- "Educating" the players in the use of the feedback model. This means making time for small "workshops" or courses with the players.
- Making room for feedback sessions in the daily practice with the players. For example, small breaks between matches or exercises could be used for peer feedback sessions. Short sessions like this should last only a couple of minutes. Longer sessions could be placed before and after practice, and of course between practices.
- Continuously evaluating the concept of peer feedback with the players. There should be discussion around how it is working, or whether further actions are needed to optimise peer relations.
- Examining the role of the coach, which differs from environments where peer feedback is not being used. The coach has to be willing to hand responsibility over to the players, which has also been discussed at various points in this manual. In other words, the role of the coach in these situations will shift to that of a manager, coordinating and optimising the resources available.

In summary, peer feedback can be understood as a tool for improving elite players' performance and results. Furthermore, the use of peer feedback can help players develop better communication skills. At the same time, players will be able to further develop a sense of autonomy and improved reflective skills in the process, which should make them generally more motivated towards participating in badminton-related learning environments, as well as in other relevant contexts in their lives.

04. HANDLING CONFLICTS

WHAT ARE CONFLICTS AND WHY DO THEY APPEAR?

In general, conflicts appear when people disagree on different matters. From a systemic perspective, however, it is very important to remember that when people disagree, each person has a good reason for feeling and acting as s/he does. As discussed in previous sections, people will always understand situations from their own perspectives and interpret things based on their prior experiences. In many cases, conflicts are only conflicts because we interpret situations differently, and even though two people disagree on matters, they can actually both be right. The issue of fault or blame is therefore absent and irrelevant when handling conflict from a systemic view.



The reason for conflicts to appear could be many. Hornstrup et al. (2004) address four main dilemmas which are the basis for conflicts, as follows:

1. The first dilemma is that human beings are autopoietic systems (Maturana & Varela, 1987), which means that they always refer to their own experiences when trying to understand situations or other people. Because we have all accumulated different experiences during our lives, no two people can ever understand a situation in the same way, which will of course cause a risk of conflict.
2. The second dilemma is that we are limited by our language when communicating with other people. As Austrian philosopher Ludwig Wittgenstein (1953) said, "The limit of my language is the limit of my world". The limitations in and personal choices of our language mean that there is a lot of room for interpretation in everyday communication, which can result in misunderstandings and conflicts. As discussed in the section on "Communication", we can never be sure that a message will be understood by the receiver in the same way the sender meant it. Again, this does not mean that one person is right and the other is wrong, but rather that the only tool to solve problems is the same one that causes them – namely communication.
3. The third dilemma is that when people disagree, they often tend to focus on isolated elements confirming their own view on things, and at the same time they often refer to the past. In other words, they focus on things that can no longer be changed. This approach of course makes it difficult to find common ground, which means that conflict can arise.
4. The fourth dilemma is that when people disagree, they very often use negative language. The focus created by the use of this kind of language will then be on other people's mistakes and wrongdoings, which means that the situation tends to focus on placing blame or guilt. When the issue of blame is introduced into a discussion, it will generally be very difficult not to end up in conflict.

In order to deal with these dilemmas from a systemic point of view, we need to truly believe that other people have their own stories and have good reasons for acting the way they do. As mentioned before, the only tool that can be used for solving or avoiding conflicts is effective communication.

Next, we will describe a specific model for handling conflicts.

THE CMM MODEL – COORDINATED MANAGEMENT OF MEANING

The CMM model, developed by Cronen, Pearce & Harris (1982), consists of four steps and aims to handle conflicts by making visible different people's reasons for acting the way they do. The rationale behind the model is that if people understand each other better, the risk of conflicts will be lower. The four steps are:

1. *"The episode"* – In this step, those involved in the conflict express their views on the matter, in order for everyone to see and hear the different perspectives around the conflict. The main purpose of this first step is to offer a more detailed understanding of the situation for all involved, so that the problem can be understood in different ways.
2. *"Relations and positions"* – In this second step, the previous step is reinforced by talking about what people have said and done, in what contexts, and what different views they hold. The idea here is to make visible why different people have different views on things. At this point, the process also aims to highlight the fact that we all have some influence on other people's actions and opinions. This focus may actually succeed in removing the issue of blame/fault from the discussion.
3. *"Identity"* – In this step, those involved in the conflict share their personal backgrounds and any experiences from their lives that might be relevant for others to better understand why they see things the way they do. Making each individual's "life script" visible in this way can help others see "the person behind the conflict" and thus be more motivated and able to understand him or her.
4. *"The culture"* – In the fourth and last step, there is an examination of the way the culture (the organisation, club, etc.) influences how people in the group experience situations and how they act in different situations. For example, if a badminton organisation's most important goal is to win, this could clearly have an effect on how players interact with each other. If, on the other hand, their most important goal is for the players to develop their badminton skills, this would probably mean that they will interact in a different way.

Solving problems from this perspective could, of course, be relevant for anybody, but because elite players have some very special "life scripts" and competences, handling conflicts in this systemic way can help to ensure that these players feel validated and understood.

As badminton is an individual sport, elite players need to focus on their own personal goals and follow their own personal paths to reach those goals. This focus on their individual journeys could make it difficult for them to understand that other players have different realities. Using the CMM model could make other players' "realities" visible, thereby opening up possibilities for greater understanding and fewer conflicts.

Communication processes in player groups are often started up only when problems have already arisen. However, from a systemic approach, the CMM model could also be used for avoiding conflicts in the first place. It could, for example, be a good idea to have a weekly or monthly meeting, where players, coaches and any other relevant participants discuss what has happened during the last period and use the CMM model to share their views on things. Such a meeting could also be used to introduce new ideas or proposals, and again make different players' views visible and accessible to the others in the group.

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BADMINTON COACH EDUCATION

COACHES' MANUAL

LEVEL 3

MODULE 10
TECHNICAL & TACTICAL ASPECTS AT THE ELITE LEVEL

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TECHNICAL & TACTICAL ASPECTS AT THE ELITE LEVEL

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01. INTRODUCTION

One of the most notable characteristics of elite badminton players is that they make frequent use of deception when playing. Deception can be achieved by using the movement of the racket to suggest to the opponent that something else is going to happen (versus what actually happens). Cut shots and delayed shots are probably the most commonly used types of deception at the elite level. Deception using the movements of the body to send "faulty" signals to the opponent is also common in high-level badminton. The purpose of using deception, of course, is to frustrate or minimise the opponent's chance to anticipate what will happen next in the rally and make advantageous choices based on this anticipation.

Perhaps one of the main competences defining the world's best players is their ability to anticipate and thus make the best possible choices on court. It could be argued that even among elite players the technical and physical differences are not so great. In contrast, anticipation is the one area of competence that can be developed throughout an entire elite career. It is worth pointing out that anticipation is closely related to the reflection process described in Module 8.

LEARNING OUTCOMES

By the end of this module, coaches will be able to:

- explain what anticipation skills are and why they are important
- describe what kind of information elite players use to anticipate
- design exercises to foster anticipation skills in players

02. HOW DO ELITE PLAYERS ANTICIPATE?

Anticipation is about being able to "look into the future". It has to do with predicting what will happen next on court, in order to choose the best strokes or movements and thus achieve a better position in the specific rally.

In dealing with non-deceptive shots and situations, elite players are much better at anticipating what will happen next than are lower-level players. This is because elite players, as mentioned before, have a lot of experience and reflective skills that can help them identify the relevant clues in their opponents' movements. However, the use of deceptive shots and situations levels out much of the difference between elite and lower-level players, as players at the elite level use high-quality deception precisely in order to lower the chances for their opponents to anticipate. Research done in tennis found that elite players still had an anticipation advantage over lower-level players, but that deception was indeed more efficiently used at the elite level, in order to disturb the opponents' ability to anticipate (Rowe, Horswill, Kronvall-Parkinson, Poulter, & McKenna, 2009).

Photo credit: BWF/BadmintonPhoto

Elite players make use of their extensive experience, as well as reflection on what has happened at other moments on court, but if we look at how anticipation actually happens, it is also interesting to note that elite players rely on different kinds of "clues" or signals when observing the opponent. Whereas lower-level players mainly use local movement clues to predict and anticipate what will happen, elite players use a global strategy in the anticipation process. In the case of badminton, this means that elite players extract clues and information regarding the opponent's intentions from the racket as well as the opponent's entire body, with the racket arm, however, being the most important source of information.

Along similar lines, research done with handball players shows that when information clues were neutralised in the throwing arm, anticipation skills dropped significantly for elite players, compared to when other areas of the body were neutralised in the movement (Bourne, Bennett, Hayes, Smeeton, & Williams, 2013).

When extracting information from the movement clues of the opponent, two kinds of information come into play. The first kind is called ***structural information***, or simple patterns of mechanical motions (Bourne et al., 2013). In this case, the player extracts information from looking at isolated movements, for example in the arm. The second kind of information comes from what is called the ***biological motion*** (Bourne et al., 2013; Johansson, 1973). This kind of information comes from observing the whole body of the opponent, in motion on court, in the specific situation in question. As shown by the studies mentioned above, biological motion is the most important source of information in terms of anticipating what will happen next on court. It can be argued, then, that elite players are characterised by a global process of collecting information, combined with the biological motion approach as the basis for anticipation. As such, these could be extremely relevant considerations in preparing and organising practice and exercises for developing anticipation skills with elite players. There is further discussion around how anticipation happens, particularly from a motor learning point of view, in Module 13, Section 5 (Processing Information). Those who would like further background on the topic will find the Anticipation and Deception section particularly useful.

03. PRACTICING ANTICIPATION SKILLS WITH ELITE PLAYERS

Research shows that elite players become better and better at anticipating over the course of their careers, and that it takes around six or seven years of accumulated experience within a sport to really develop advanced anticipation skills (Weissensteiner, Abernethy, Farrow, & Müller, 2008).

The same research also indicates that the contents of the practice are important in developing experiences that will help improve anticipation skills. It seems important, then, that players have a large amount of task-related practice, which means that, in order to develop anticipation skills, practice has to be functional and game-like.

Taking a functional approach to practice is also in line with the idea that elite players extract information and movement clues from watching the opponent's whole body in motion, and not by focusing only on specific parts of the body. From this perspective, structured exercises such as multi-feeding are probably not the best way to develop anticipation skills, as players will not have the opportunity to read the necessary clues in this kind of practice.

As mentioned before, the ability to anticipate drops dramatically for elite players when the opponent uses deceptive shots or movements. Therefore, relevant practice with elite players should focus especially on developing anticipation in these situations. It can be argued that this is one of the key areas where elite players have the greatest development potential.

In working with exercises to develop anticipation, it is certainly beneficial, from a motivational and learning point of view, for players to feel rewarded when they anticipate correctly. For example, they may win a rally after having anticipated the outcome of a specific situation. Similarly, they may anticipate a smash from an opponent, and thus avoid losing the rally. As such, there is a built-in control in the exercises which will help players evaluate if the anticipation was correct. If this is deliberately explored in a reflection process, it can help players examine the situation that brought about the anticipation, and because of the positive outcome, they will try to achieve similar results in future rallies. This keeps players actively involved in evaluating the anticipation process, which, as previously discussed in the constructivist approach to learning, takes full advantage of elite players' unique experiences.

04. EXERCISES FOR DEVELOPING ANTICIPATION SKILLS

EXAMPLES FOR SINGLES:

1. Singles match. The tactical restriction is that, when returning the shuttle from an offensive position in the forehand rearcourt, the "feeder" can only choose between a straight smash and a crosscourt cut shot. The "player" works on identifying the clues in the opponent's movements and position, in order to develop the ability to anticipate which shot will be used. When the player anticipates correctly, he or she will automatically be in a better position in the rally than a moment before.

2. Singles match. The tactical restriction is that, when returning the shuttle from an offensive position in the backhand forecourt, the "feeder" can only choose between a straight backhand spin shot and a delayed backhand crosscourt lob. As in the exercise above, the player will practice the ability to identify clues in the biological motion of the opponent, thereby improving anticipation skills.

EXAMPLES FOR DOUBLES:

1. Doubles match. The tactical restriction is that whenever the "feeder pair" are in an offensive position with a backline player who can attack, this player can only choose between a full straight smash and a delayed straight dropshot to the middle. The "players" practice identifying the clues in the attacker's global biological motion, in order to bring themselves into a better position when the delayed drop shot is used. It is important to point out that if the dropshot is clearly towards the middle, it is the crosscourt defender who should make the return.

2. Doubles match. The tactical restriction is that when one of the "feeder pair" returns a short serve, a short straight net return should be used when his/her racket is horizontal, and a pushed return around the server should be used in the case of a vertical position. The server practices the ability to anticipate the service return, focusing again on the biological motion clues of the player returning the service. It is worth mentioning that although this specific exercise does not involve the "feeder" using deception, it is still a functional example of practicing anticipation skills, used by the best players in the world.

These exercises involve working with one of the players/pairs as feeders, with the other(s) actually practicing anticipation skills. A progression in the exercises would be to give all players the same restriction. In this way, all players are functioning as feeders as well as practicing anticipation skills.

05. CONNECTING TECHNICAL AND TACTICAL PRACTICE

Alongside work on developing anticipation skills, it is obviously important to keep strengthening and refining players' technical skills, particularly with regard to the use of deception. This will help develop strategies to handle any improved anticipation skills on the part of their opponents. For example, it is possible to implement both a tactical and a technical focus in the exercise examples above, as success in one area is dependent on the opponent's skills in the other area.

As has been emphasised in the Level 1 and Level 2 Coaches' Manuals, technical and tactical practice should never be disconnected. This is because "pure" technical practice still includes choices, and tactical practice must always take into account the technical level of the players involved. This integration of technical and tactical aspects is relevant not only for elite players, but as a general approach to practice with all ages and levels in badminton.

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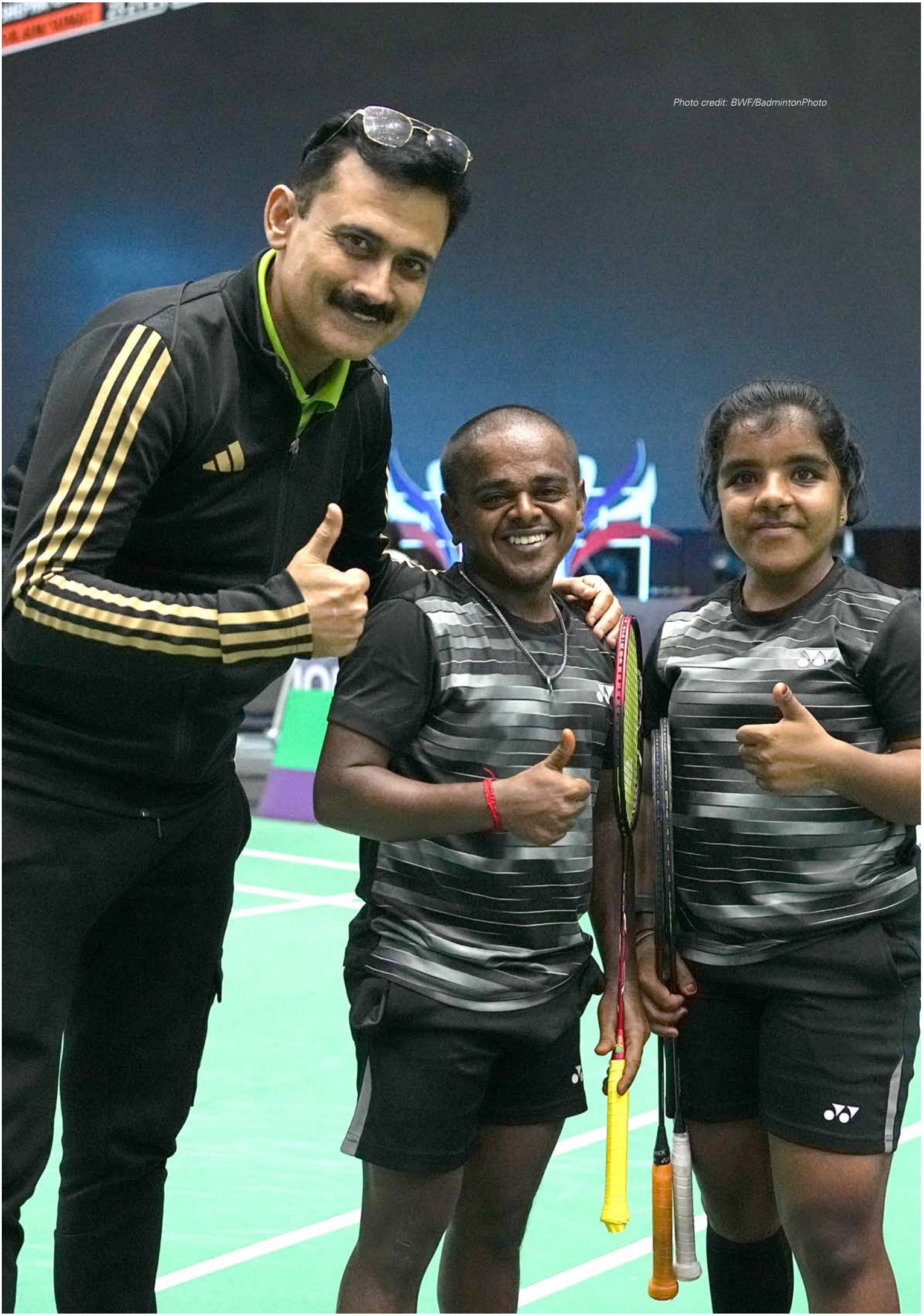

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SECTION FOUR

SPORT SCIENCE IN ACTION

SECTION INTRODUCTION

Level 3 candidates need to have a broad understanding of the pathway within which they are working and along which their players will progress. At the same time, they also need to have an in-depth understanding of the underpinning principles of sport science that will allow them to apply these concepts effectively in their work with players. These principles will form the basis for choosing or designing the training exercises that will best serve the needs of their players. They will also be useful in making informed decisions about assessments, whether in the application of appropriate testing protocols or in reaching a clear understanding of what programme-mandated tests are actually measuring.

Because an understanding of sport science can be useful at any level of training, along any point along the player pathway, this section is addressed separately. The idea of this section is to provide coaches with the knowledge they need to make the best possible decisions, based on sound scientific principles, no matter what their area of work. Specifically:

- **Module 11** will examine the physiological development that occurs in various body systems during human development, in order to help coaches understand the implications of physical development on training.
- **Module 12** will present the basic concepts involved in biomechanics, before moving on to examples of how coaches can apply these to their on-court work with players.
- **Module 13** will look at the workings of the nervous system and the processes involved in motor learning, in the interest of helping coaches create the conditions for optimum learning to take place.

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BADMINTON COACH EDUCATION

COACHES' MANUAL

LEVEL 3

MODULE 11
PHYSICAL DEVELOPMENT AND IMPLICATIONS FOR WHEN TO COACH

MODULE 11
PHYSICAL DEVELOPMENT AND IMPLICATIONS FOR WHEN TO COACH

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01. INTRODUCTION

The progress of young players through different stages in their development was examined from a coaching point of view in Module 5. The emphasis there was on how coaches could best support young players' changing needs for coaching, training, and competition, as well as in relation to the different performance factors. This module will complement the view of player development presented there, providing coaches with a deeper understanding of young players' physical growth and development, in order to help them further shape their coaching practice. Three main systems will be examined here in terms of the significant changes that take place from development in the womb through adulthood:

- Skeletal system
- Muscular system
- Endocrine system

In addition, there is a thorough overview of the structure and function of the nervous system, as well as how these relate to motor learning, in Module 13 of this Level 3 manual.

It is worth pointing out that the different body systems were introduced in detail in the Level 2 Coaches' Manual, where the focus was on deepening coaches' understanding of these systems and helping them apply this knowledge to high-level badminton training. In contrast, this Level 3 module looks specifically at physical maturation and the underpinning aspects that coaches need to consider when working with young players.

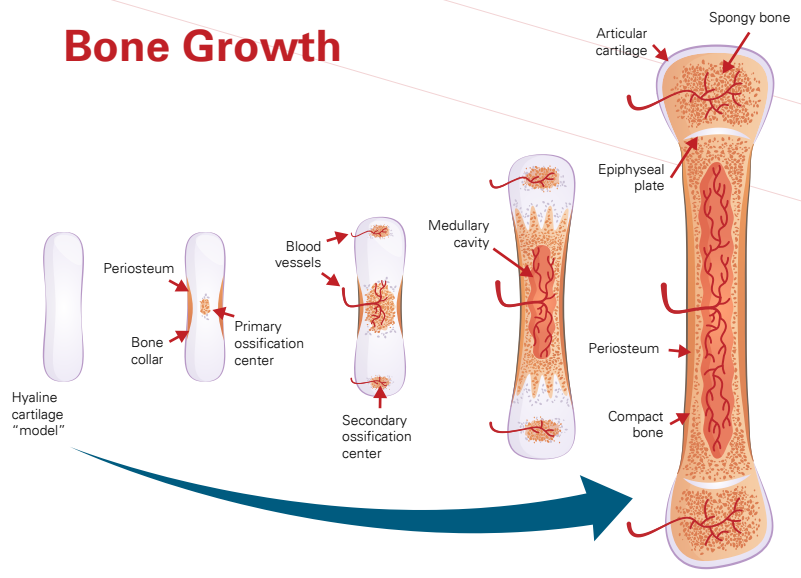
LEARNING OUTCOMES

By the end of this module, coaches will be able to:

- identify the main age-related changes that occur in each of the body systems discussed
- explain physical development issues that should be considered when working with young players
- demonstrate awareness of growth and development issues for young players in their session planning

02. SKELETAL SYSTEM

In the early stages of embryo development, the skeleton is a cartilage model. Cartilage is a more pliable tissue than bone. Two months into embryo development, bone formation (ossification) begins in centre of long bones such as the humerus and the femur. These central sites are known as sites of primary ossification. Bone growth occurs outwards, increasing both length and width of bones until, at birth, the entire shafts of long bones have changed from cartilage to bone tissue.



After birth, secondary ossification centres are created at the end of long bones, separated from the primary ossification sites by epiphyseal plates consisting of cartilage. These areas are responsible for controlling the future length of bone development. Future bone growth that increases the width of bones occurs below the periosteum, or outer surface of the long bone.

Bone growth is usually fully complete by the late teenage years, with all the epiphyseal plates being turned from cartilage into bone.

From the mid-twenties onwards, overall bone mass begins to decline at an average rate of 1% per year (Smith, Semsos and Purvis, 1981). The composition of bones also changes during a person's lifespan. Children tend to have an equal balance of organic (carbon-based fibres) and inorganic (minerals such as calcium) materials, giving the ability to deal effectively with both bending and compressive forces. In older adult years, this can change to a ratio of 1:7 (organic to inorganic) making adults' bones brittle and susceptible to fracture.

Osteoporosis, a disorder characterised by loss of bone mass, increases the chances of bone fracture and reduces the effectiveness of the body in repairing those fractures. The hip is an area that is particularly vulnerable to this condition.

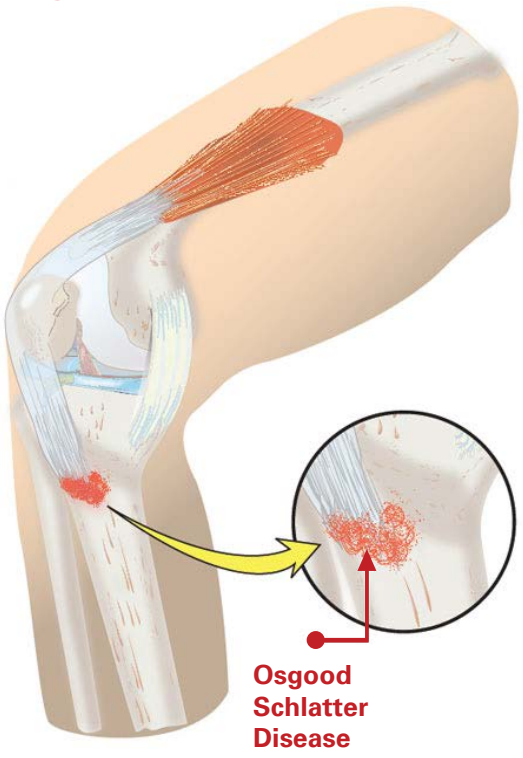
Bone loss with age is influenced by:

- diet
- hormone levels
- exercise

Exercise stimulates bone formation, whereas hormone (e.g., oestrogen) and mineral (e.g., calcium) supplementation can help to reduce bone loss.

IMPLICATIONS FOR COACHING PRACTICE ("WHEN TO COACH")

- There should be regular variation in practices for children in order to avoid excessive, repetitive loading on bones during the growth process, as this can damage the epiphyseal plates and inhibit bone growth.
- Particularly during the growth spurt, some children are vulnerable to Osgood-Schlatter's disease, which causes pain at the point of insertion of the patellar tendon on the tibia (just below the front of the knee). In this case, coaches should once again avoid excessive, repetitive loading of the knee joint (e.g., excessive jumping, squatting, and lunging) and prolonged participation on uneven, hard and/or slippery surfaces.
- Diet should look at the correct levels of mineral intake throughout the different stages of life.
- An emphasis on balance training, particularly for older adults, is helpful to reduce risk of falls and subsequent damage to the skeletal system (wrist and hip).



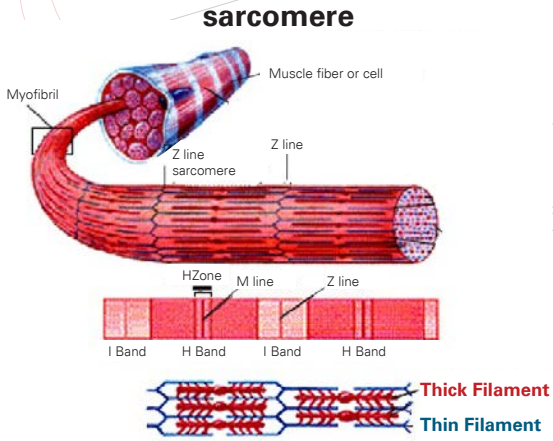
03. MUSCULAR SYSTEM

MUSCLE GROWTH: BIRTH TO YOUNG ADULT

Whilst in the womb, muscles can grow in size by two methods:

- hyperplasia (an increase in the *number* of muscle cells)
- hypertrophy (an increase in the *size* of muscle cells)

At birth, muscle mass accounts for approximately one quarter of bodyweight. After birth, increase in muscle mass is predominantly due to hypertrophy (increase in muscle cell size).



Gains in muscle mass are the result of increases in both the diameter and length of the muscles. Muscle diameter increases naturally with growth; however, this effect can be increased by the intensity of exercise that these muscles undertake during growth. On the other hand, muscles increase in length by:

- the addition of contractile units (sarcomeres) within the muscle cell
- an increase in the length of those sarcomeres

Prior to puberty, boys tend to have only a slightly greater amount of muscle mass than girls. After puberty however, young adult males tend to have an average muscle mass of 54% of their bodyweight, whereas young adult females have an average muscle mass of only 45% of their bodyweight. Due to the earlier onset of puberty, females can reach these muscle mass proportions by the age of 13, whereas males can expect to reach these muscle mass levels by the age of 17. These gender differences can generally be observed in the higher muscle mass in the upper bodies of males as compared to females.

MUSCLE FIBRE TYPES

Muscles consist of three different types of muscle fibre:

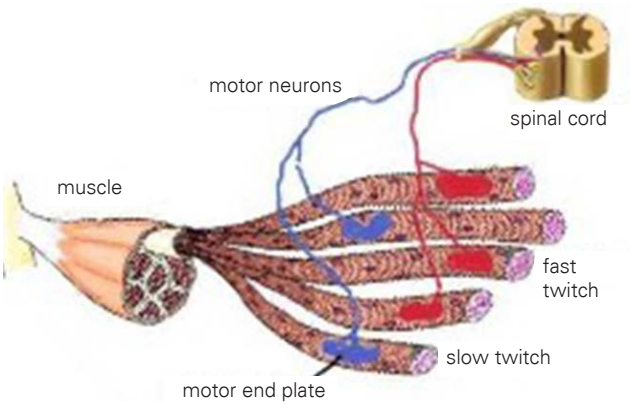
- Type I fibres, also known as slow-twitch fibres, which are more suited to endurance activities
- Type IIa and IIb fibres, also known as fast-twitch fibres, which are more suited to high-intensity activities of short duration

Twelve months after birth, the percentage of type I fibres is fixed. The situation with regards to type IIa and IIb is less clear. However, it is recognised as a general principle that, from a muscle-type perspective, some adults may be more predisposed to aerobic activity, whereas others may be more suited to high intensity, anaerobic activity.

Muscle biopsy procedures can be used to take samples of muscle tissue to analyse the relative percentages of muscle fibre types.

MOTOR UNITS

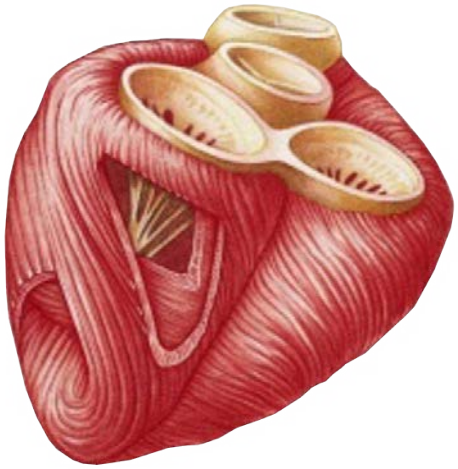
A single nerve cell and all the muscle cells it "fires" are known as a motor unit. All the muscle cells within a motor unit are either slow-twitch or fast-twitch.



CARDIAC MUSCLE

The heart is made up predominantly of cardiac muscle cells. The heart can grow via both hyperplasia (increase in number of cells) and hypertrophy (increase in size of cells). The heart grows proportionally with the body, meaning for example that when the body experiences a growth spurt during puberty, the heart responds in similar proportional fashion.

In old age, the heart copes less well when exposed to heavier workloads. This is thought to be due to a loss in cardiac muscle mass, a reduction in the elasticity of the heart as a whole, and possibly changes in the heart valves. Major blood vessels close to the heart also lose elasticity. Many of these reductions in performance can, however, be attributed to a decrease in activity as a person ages.



ADULTHOOD AND AGING

From the mid-20s up to around the age of 50, an average loss in muscle mass of approximately 10% can be expected. This can increase to as much as 30% by the age of 80. Appropriate diet and the maintenance of a consistent exercise regime can do much to arrest this reduction.

The reduction in muscle mass can be attributed to decreases in both the number and size of muscle cells. In the case of the number of muscle cells, initial losses are low (around 5% up to the age of 50), but this can then increase to as much as 35% by the age of 80. Muscle size will also decline with age, especially if an exercise regime is not maintained.

IMPLICATIONS FOR COACHING PRACTICE ("WHEN TO COACH")

Bearing in mind the comparable muscle masses of boys and girls in pre-puberty stages, it is interesting to consider whether boys and girls should compete against each other in the younger age groups (for example, U11 events).

As leg muscle mass values for males and females are also comparable, another interesting question is whether jumping should become more of a feature of female play. Certainly, recent changes in the women's singles game would point to a more athletic approach, including more explosive jumping in the rearcourt.

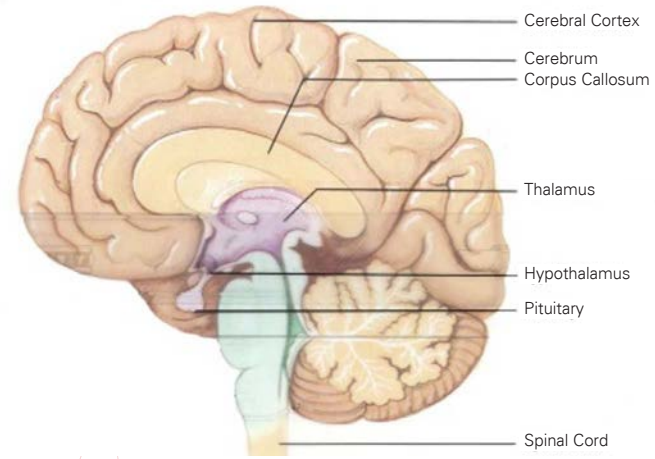
Finally, looking back at the player pathway concept explored earlier in the manual, the question could be raised as to whether an evaluation of fast/slow twitch fibres (using muscle biopsy techniques) should be used as part of a selection process for elite badminton players.

04. ENDOCRINE SYSTEM

The endocrine glands of the body, plus the hormones (chemical messengers) they secrete, play a major part in controlling the actions of the cells of the body. The workings of these glands and hormones are highly complex and a full appreciation of all the complexities is beyond the scope of this publication. The section will, therefore, provide an overview and focus on the particular aspects of function that may be relevant for coaches in relation to sports performance.

The endocrine system has a close working relationship with the nervous system. Both systems have a controlling influence over the workings of the body, but the nervous system tends to be ***fast acting*** (via nerve impulses), whereas the endocrine system is relatively ***slow acting*** (hormones travelling via the bloodstream).

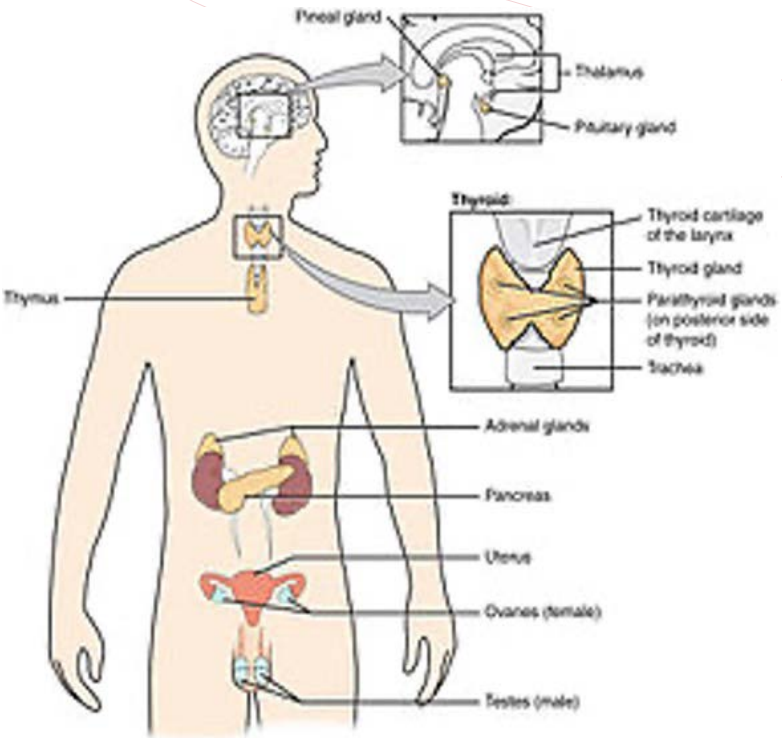
THE HYPOTHALAMUS



The hypothalamus is the most significant example of the interaction between the nervous and endocrine systems. It is a section of the brain that interprets the sensory information it receives and interacts with the pituitary gland, which in turn influences other glands in the endocrine system. Although the hypothalamus is technically a part of the nervous system, the close functional relationship with these glands means it is often included as part of the endocrine system.

ENDOCRINE GLANDS

The endocrine glands influence the workings of the body by secreting hormones into the bloodstream. There are a number of different endocrine glands, as can be seen in the diagram below, including the:



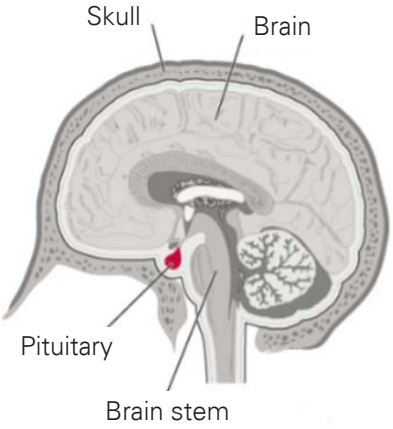
- pituitary gland
- thyroid gland
- parathyroid glands
- adrenal glands
- pineal gland
- pancreas
- ovaries (in females)
- testes (in males)

A brief overview of the location and function of each of the endocrine glands is offered below.

PITUITARY GLAND

The pituitary gland is located at the base of the brain, close to the brain stem. The pituitary gland is regulated to a large degree by the hypothalamus. In turn, the pituitary gland regulates many of the other glands within the endocrine system, such the adrenal and thyroid glands.

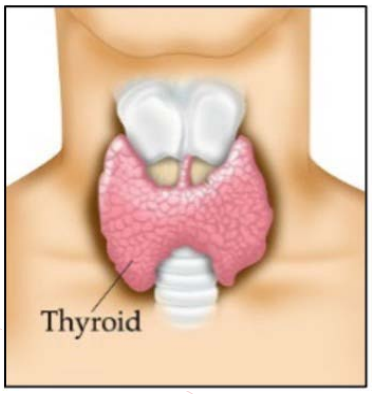
Growth from birth to early adulthood is highly influenced by growth hormone (GH), which is released by the anterior (front) pituitary gland following stimulation from the hypothalamus in the brain. GH is responsible for encouraging proteins to form new tissues within the body.



THYROID GLAND

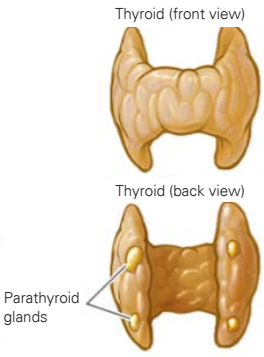
The thyroid gland is located in the throat. Its function is heavily influenced by the hypothalamus and pituitary glands. The thyroid gland secretes hormones that:

- stimulate the use of oxygen in tissues
- support skeletal growth



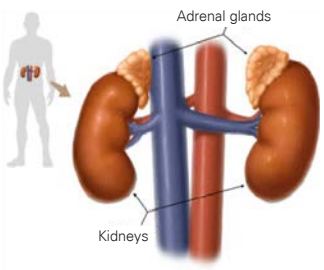
PARATHYROID GLANDS

The parathyroid glands are located at the back of the thyroid gland. The main function of the parathyroid glands is to keep the body's calcium and phosphate at optimum levels, so that the nervous and muscular systems can function properly.



ADRENAL GLANDS

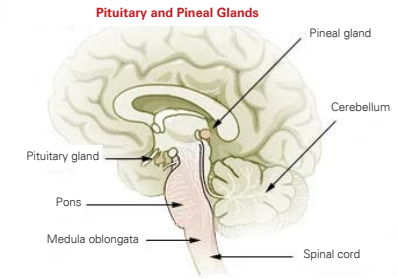
There are two adrenal glands, located on top of the kidneys. The main hormones secreted by the adrenal glands, along with the functions they perform, are outlined in the table below.



NAME OF ADRENAL HORMONE			KEY FUNCTION
Overall Category	**Sub-category**	**Example**	
Corticosteroids	Mineralcorticoids	Aldosterone	Regulate mineral balance and blood volume
	Glucocorticoids	Cortisol	Increase levels of glucose and free fatty acids
Catecholamines	Adrenaline (also known as epinephrine)		Stimulate increase in heart rate and blood pressure ("the fight or flight" response)
	Noradrenaline (also known as norepinephrine)		
Androgens		DHEA	"Metabolic intermediates", or put simply, a stage in the formation of testosterone and oestrogen

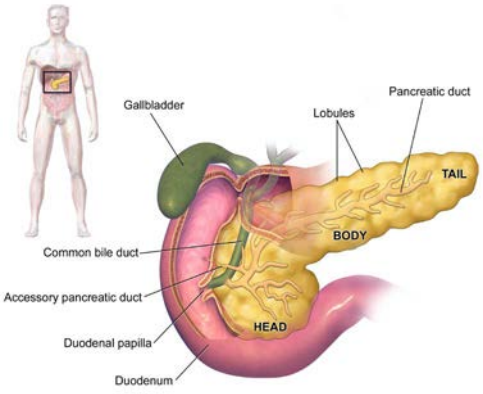
PINEAL GLAND

The pineal gland is situated in the centre of brain. Its main function is to produce and release melatonin, a hormone responsible for the regulation of sleep patterns.



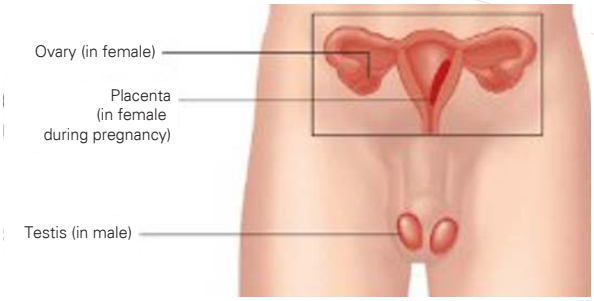
PANCREAS

The pancreas is located in the abdomen, just behind the stomach. Its role is to secrete hormones that regulate blood sugar levels – in particular, the hormones glucagon and insulin. Glucagon is responsible for increasing blood sugar levels, whereas insulin is responsible for reducing blood sugar levels.



GONADAL HORMONES

Hormones secreted from the testes (male) and ovaries (female) affect sexual maturation, especially during puberty with the development of the sex organs and secondary sex characteristics (such as breast size in women and facial hair in men).



Testosterone from the testes and oestrogen from the ovaries speed up the maturation of the skeletal system. They do this by promoting the fusion of the epiphyseal growth plates at the end of bones. The consequences of this are that early maturers tend to be shorter than late maturers. Testosterone also helps stimulate an increase in muscle mass during adolescence, whereas oestrogen promotes fat accumulation, mainly in the hips and breasts.

Note that although men have more testosterone in the bodies than women, this does not mean that women have no testosterone in their bodies, as there are other potential sources of testosterone besides the testes. Likewise, women have more oestrogen in their bodies than men, but this does not mean that men have no oestrogen in their bodies, as there are potential sources of oestrogen other than ovaries.

IMPLICATIONS FOR COACHING PRACTICE ("WHEN TO COACH")

A basic understanding of the role of the different glands and hormones in the endocrine system can provide coaches with insight as to how players' bodies are developing. These functions affect growth, sleep, and the regulation of other biological conditions, which in turn have an effect on other body systems.

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Muscle growth:
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Muscle biopsy:
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Pancreas:
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Gonadal hormones:
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BADMINTON COACH EDUCATION

COACHES' MANUAL

LEVEL 3

MODULE 12
BIOMECHANICS

MODULE 12
BIOMECHANICS

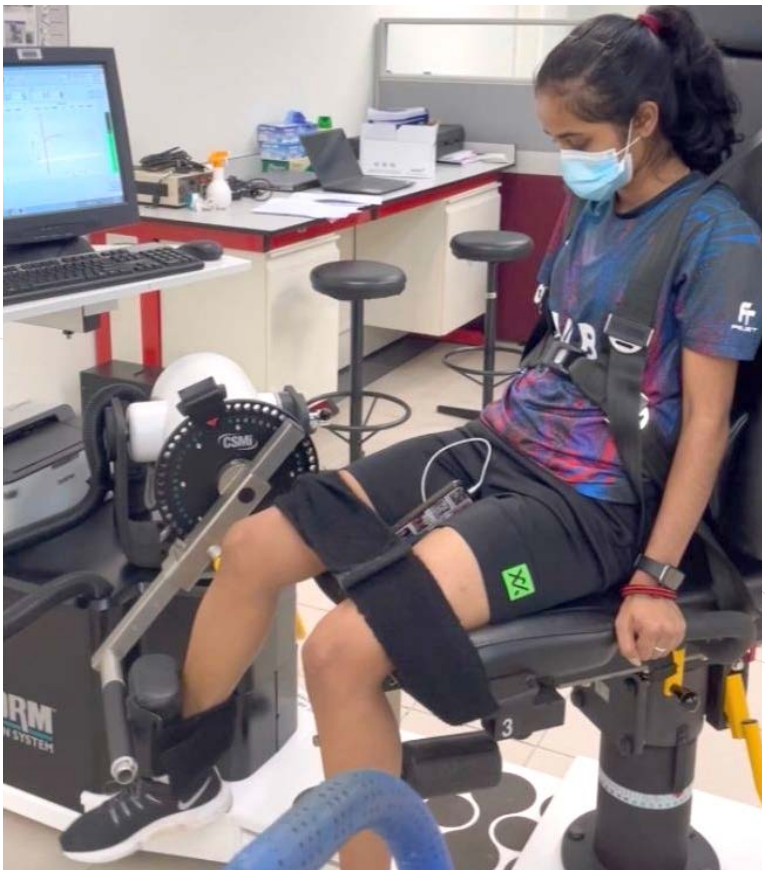

Photo credit: BWF/BadmintonPhoto

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01. INTRODUCTION

In order to fully understand and apply the information included within this section it is important that coaches revisit the Physical Performance Factor sections of the BWF Level 1 and 2 manuals. This Level 3 Biomechanics module will build on those concepts and includes:

- learning outcomes for the section
- theoretical information to aid in achieving the learning outcomes
- practical examples of biomechanical principles applied to badminton
- questions to help coaches measure the extent of their learning

LEARNING OUTCOMES

By the end of this module, coaches will be able to:

- define biomechanics and kinesiology
- list and explain the key terminology and units of measurement used in biomechanics
- explain the key principles of motion
- apply the principles of motion to badminton techniques in practical sessions

DEFINITIONS

Kinesiology can be defined as:

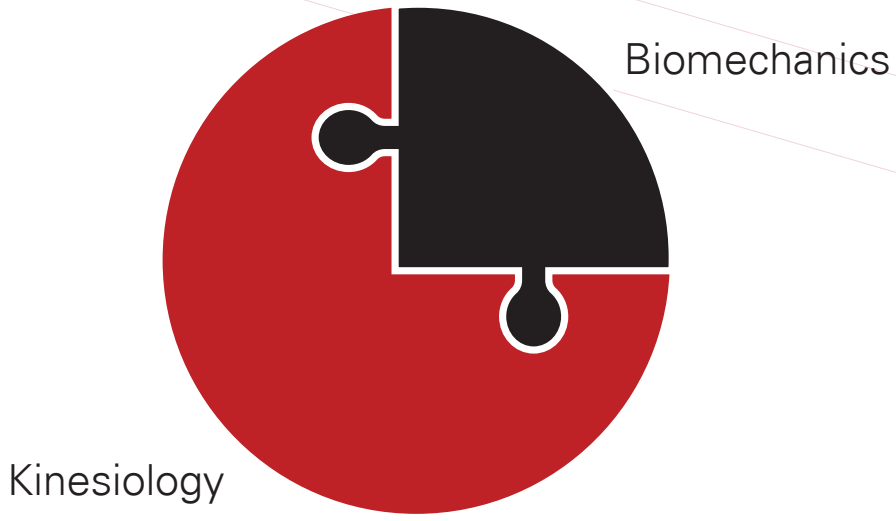
"the scientific study of human movement."

Biomechanics, on the other hand, can be defined as:

"the understanding of forces and their effects on (and by) the human body and implements."

(Dictionary of Sport and Exercise Science and Medicine: Churchill Livingstone © 2008 Elsevier Limited)

From these two definitions, it can be seen that kinesiology is a much bigger area of study, with biomechanics being a sub-section of this.



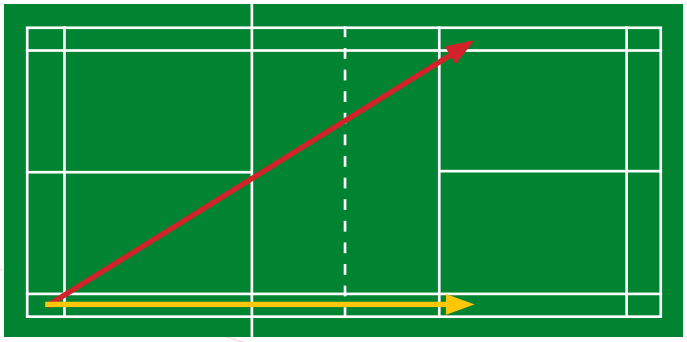
02. KEY TERMINOLOGY AND UNITS OF MEASUREMENT

In order to understand the principles of motion, which will be discussed in the following section, it is first useful to define the terms used in this area of study, along with some practice examples.

DISTANCE

Distance can be defined as *"a numerical measurement of the pathway between two points"*. The basic unit of measurement of distance is the metre (m).

In some cases, the distance between points A and B is simply a straight line between those two points. However, the distance can be greater if the pathway used between those two points is not a straight line.



One application of distance to badminton is to compare the distances travelled for straight and crosscourt strokes. A crosscourt dropshot (shown by the red line) has to travel a horizontal distance of 10.60 metres, compared to a straight dropshot (shown by the yellow line) with a horizontal distance of 8.68 metres, which is a difference of 22%.

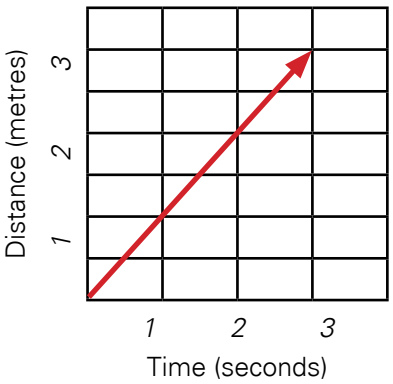
TIME

Time can be defined as *"a measure of duration"*. The basic unit of measurement is the second (s).

VELOCITY

Velocity can be defined as *"the rate at which an object covers distance"*. Velocity is calculated mathematically by dividing distance by time. The basic unit of velocity is metres/second (ms^{-1}). Technically speaking, there is a difference between speed and velocity. Both have the same units (ms^{-1}), but velocity should contain an element of direction, whereas speed does not. However, for our purposes, the terms speed and velocity will be used interchangeably.

As an example, a shuttle travelling 2 metres in 0.5 seconds will have an average speed of 4m/s (2m/0.5s = $4ms^{-1}$).



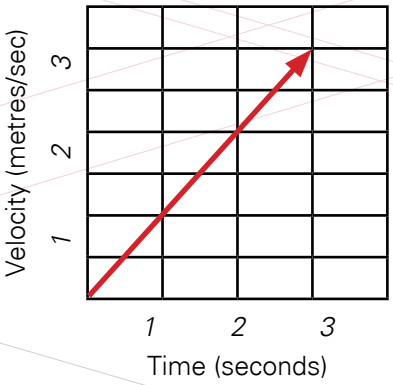
Velocity/speed can be represented using a distance/time graph.

The image to the left illustrates a distance/time graph for an object travelling at 1ms^{-1}. After 1 second, the object has travelled 1m, after 2 seconds the object has travelled 2 metres, etc. Note, however, that the above calculations are for *average* speed. In reality, a shuttle will be gradually slowing down throughout its flight, due to its design and air resistance.

ACCELERATION

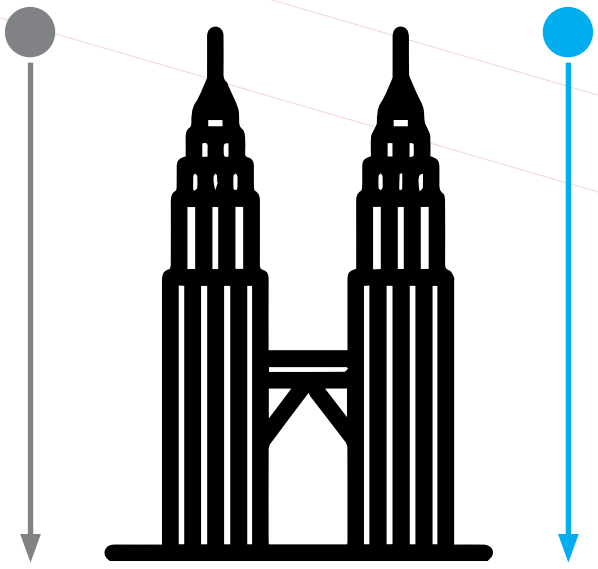
Acceleration can be defined as *"the rate of change of velocity"*. It can be calculated mathematically by dividing velocity by time. The standard unit of acceleration is metres/second/second (m/s^{-2}).

For example, if an object is travelling at 1 metre/second and 1 second later it is travelling at 2 metres/second, then it has an acceleration of 1 ms^{-2}. The object has increased its velocity by 1/m^{-1} in 1 second.



ACCELERATION DUE TO GRAVITY

Acceleration due to gravity can be defined as *"the rate of change of velocity experienced by free-falling bodies due to the attractional pull of the Earth"*. Although the value of acceleration due to gravity can vary (mainly due to changes in altitude), for our purposes acceleration due to gravity can be regarded as having a numerical value of 9.81ms^{-2}. This means that acceleration due to gravity will be the same for two objects of the same shape and size. For example, a rubber ball and a lead ball dropped from the same height will hit the ground at the same time. This is because they are both being acted upon by gravity which accelerates objects at 9.81ms^{-2}, whatever their weight.



MASS

Mass can be defined as:

1. *"A property of an object which determines that object's resistance to being accelerated by a force"*. Put simply, an object with a larger mass will have greater resistance to being accelerated by a force than an object with a lower mass. A simple example is that a racket with more mass will require more force to reach a particular acceleration than a racket with less mass.
2. *"The strength of that object's mutual gravitational attraction with other bodies"*. For example, a large mass object will exert a large gravitational attraction on other objects. Thus, during a jump smash, the large mass of the Earth will exert a gravitational attraction on the player, causing the player to move downwards back to the Earth.

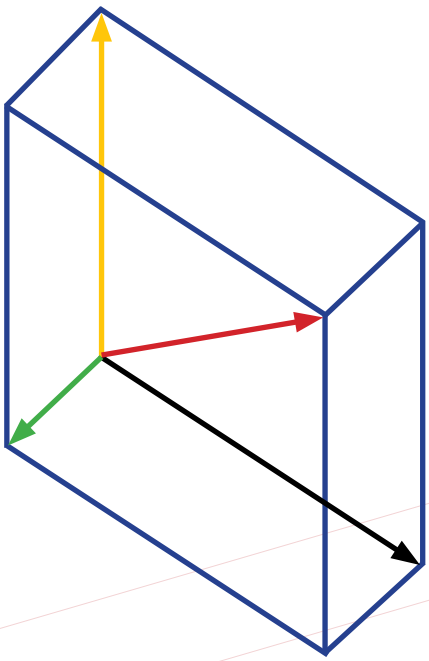
The basic unit of measurement of mass is the kilogramme (kg). A typical shuttle weighs around 0.00482kg (4.82 grammes).

FORCE

Force can be defined as "*any influence that causes an object to undergo a change in movement, direction, or structure*". Force can be calculated by multiplying mass by acceleration (F = m x a). The basic unit of force is the newton (N).

If a racket applies a force to a shuttle, it can bring about a change in movement (accelerating the shuttle), a change in direction (hitting a straight shot crosscourt), or a change in structure (deforming the shuttle base on impact).

Forces are often represented by lines with arrow heads, giving an indication of the direction in which that force is being applied.



COMPONENTS OF FORCE

Forces can be divided into components that are perpendicular to each other. For example, in the diagram to the left the force represented by the red arrow can be split into 3 components:

- The yellow line illustrates that part of the red force will act in an upwards direction.
- The green line illustrates that part of the red force will act in a sideways direction.
- The black line illustrates that part of the red force will act in a forwards direction.

In badminton terms, a player jumping diagonally backwards (the red line) will do so by pushing off the floor in such a way that:

- the green component of force means the jump is partly sideways
- the black component of force means the jump is partly backwards
- the yellow component of force means the jump is also upwards

CENTRE OF MASS

The centre of mass can be thought of as the point at which the mass of an object is concentrated. One way to understand the concept of the centre of mass is to think of it as the balance point of an object. Because the mass is evenly distributed around that balance point, if we support that object at that point then the object will remain in balance.

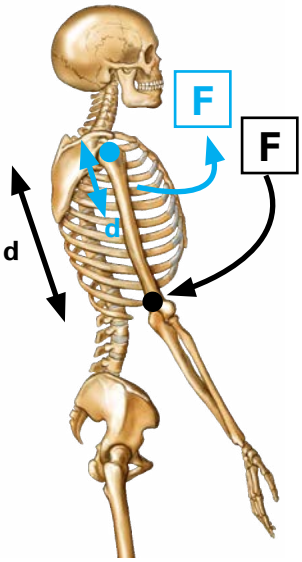
CENTRE OF GRAVITY

The centre of gravity can be defined as *"a point through which the weight of a body or system may be considered to act"*. For our purposes, the terms centre of gravity and centre of mass can be thought of as the same. The centre of gravity of an adult standing normally would be around the navel (●). Note that the location of the centre of gravity of the body can change depending on the position of the body or of the limbs. For example, raising the arms above the head raises the centre of gravity above the navel.

This is important in badminton because the centre of gravity position is linked to balance. For example:

- a player will lose balance more easily if acted upon by a force in the direction where the centre of gravity is closest to the edge of the base of support. In badminton, in some situations it is better for the centre of gravity to be positioned close to the edge of the base of support, as movement in that shorter direction can be easier to initiate.
- lower centres of gravity are often associated with enhanced balance. This can have particular relevance for badminton movement, especially when defending.

It is also possible to identify the centre of gravity of particular parts of the body, such as the arms and legs (●).



MOMENT OF FORCE (TORQUE)

Moment of force can be defined as *"the tendency of a force to rotate an object about a pivot"*.

Moment of force is calculated by multiplying the perpendicular force applied to the lever arm by the length of that lever arm. The basic unit of moment of force is the newton metre (N m).

There are two moments of force to consider in the above illustration. The moment of force anticlockwise is provided by forces from muscles attached to the upper arm **(F)**, acting through a point of attachment a distance **(d)** from the pivot point (●). The moment of force clockwise is provided by the downward force from the weight of the arm **(F)** acting through the centre of gravity of the arm, which is a certain distance **(d)** from the pivot point (●).

If the clockwise moment is equal to the anticlockwise moment, then the arm will remain stationary. This can be represented by the mathematical equation:

Force x distance = **Force x distance**

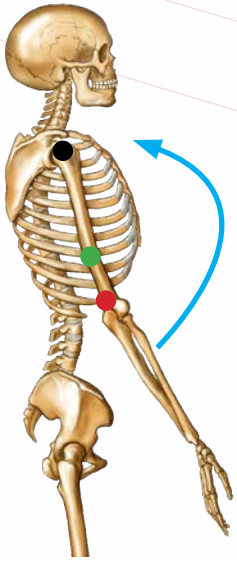
If the clockwise moment is greater than the anticlockwise moment, then the arm will move upwards. This can be represented by the equation:

If **(Force x distance)** › **Force x distance**, then the arm will move upwards

Note that because the distance **d** is much greater than the distance **d**, then the force exerted by the muscle has to be much greater than the force of the arm in order to allow the arm to be raised. However, the advantage of this situation is that a small amount of movement at the point of attachment of the muscle will bring about a large amount of movement at the end of the arm.

INERTIA

Inertia can be defined as *"an object's resistance to motion"*. There is a close link between an object's inertia and its mass – i.e., the greater an object's mass, the greater its inertia (resistance to movement). This means that lighter players will use less energy moving around the court, although this has to be balanced with those lighter players having sufficient muscle mass to create the necessary force for movement to occur.



MOMENT OF INERTIA

The moment of inertia can be defined as *"the measurement of an object's resistance to angular (rotational) movement"*.

This principle is explained using the illustration to the left. Note how as the arm bends (as shown by the **blue arrow**), the centre of gravity (●) moves along the arm (●), closer to the pivot point (●). This decrease in distance from the pivot point to the centre of gravity of the limb reduces the turning force required to move that limb (i.e, the arm's moment of inertia has reduced). Thus, bent limbs generally require less effort to move, as they have a smaller moment of inertia. In badminton strokes, there are many examples where the arms are bent during the preparation, backswing and early stages of the forward swing. These will be looked at in more detail later in this section

MOMENTUM

Momentum can be defined as *"a measure of the motion of a body equal to the product of its mass and its velocity"*. This can be represented as:

momentum = mass x velocity (kg m/s)

Thus, a shuttle weighing 0.00482kg leaving a racket at 115m/s has a momentum of 0.00482 x 115 = 0.5543kg m/s.

IMPULSE

Impulse is defined as *"the application of force over a particular interval of time"*. Impulse can be calculated as follows:

impulse = force x time (Ns)

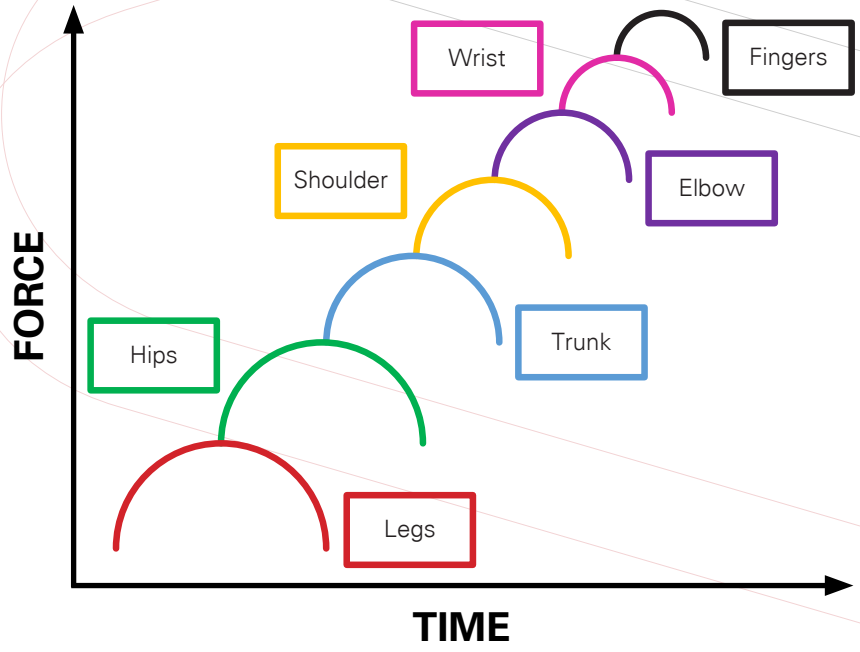
For example, a player pushing off the ground as quickly as possible has to apply as much force as possible to the floor in a short period of time in order to:

- not remain on the ground for too long
- move off as quickly as possible

OPEN KINETIC CHAIN

The open kinetic chain is the name given to describe the sequential movement of a series of body parts, resulting in the forceful striking of an object (such as a shuttle, in the case of badminton). In order to be at its most efficient, the open kinetic chain should display the following characteristics:

- Forces begin from the ground and are then generated in sequence through different segments of the body, including legs, hips, trunk, shoulder, elbow, wrist, and fingers.
- Each segment should be at its maximum velocity when the movement of the next segment begins. If this is achieved, the maximum force from each segment is passed on to the next segment. The forces add together (summate) to provide a forceful strike of the shuttle.



A forehand smash, starting from a sideways stance and using a whole body, kick-through movement, is a good example of using the kinetic chain to generate force efficiently.

ENERGY

Energy can be defined as *"the capacity of a physical system to perform work"*. A standard unit of energy is the joule (J). One joule is equivalent to the work done when a force of 1 newton is applied through 1 metre. This can be explained mathematically by the equation:

joules = newtons x metres (Nm)

A key concept regarding energy is that it cannot be created or destroyed – it can only be converted from one form to another.

Different types of energy include:

- Chemical energy, released for example when food is broken down in the body
- "Internal" movement energy, for example when a muscle contracts
- "External" movement energy, for example just as a player leaves the ground
- Potential energy, which results from the body's position (for example, at the peak of a jump)

Movement (or kinetic) energy can be calculated by the mathematical equation shown below:

$$\text{kinetic energy (joules)} = \tfrac{1}{2} \text{ mass} \times \text{velocity}^2$$

Thus, a 78kg player leaving the ground at 3.13ms^{-1} will have kinetic energy of ½ x 78kg x 3.13ms^{-1} x 3.13ms^{-1}= 382 joules.

Potential energy can be defined as *"stored energy due to a body's position in space"*. A frequently used equation for potential energy is:

$$\text{potential energy (joules)} = \text{mass} \times \text{acceleration due to gravity} \times \text{height}$$

As such, a 78kg player who is at the peak of a 0.5-metre jump in the rearcourt will have potential energy of 78kg x 9.81ms^{-2} x 0.5m = 382.6 joules.

03. PRINCIPLES OF MOTION

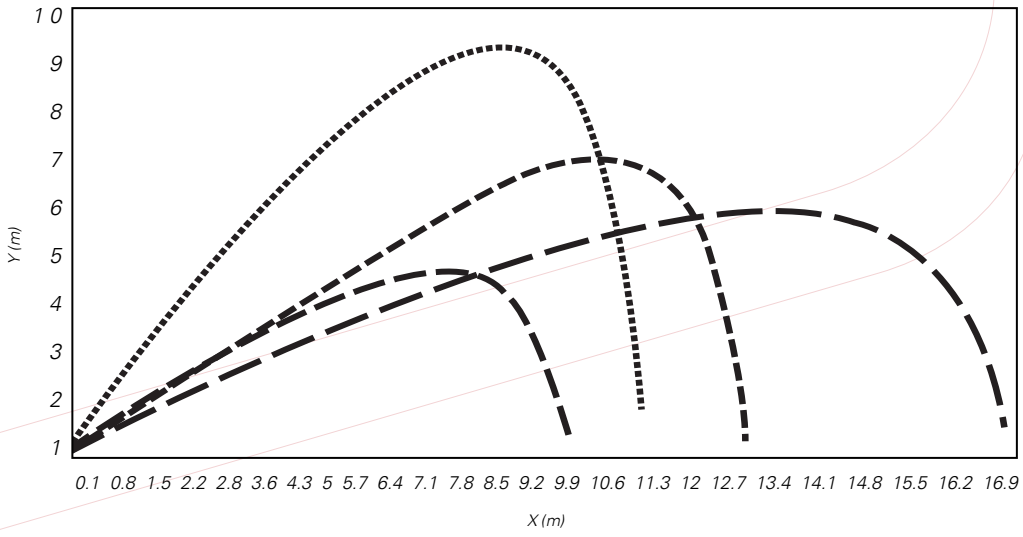
The principles of motion are based on the work of Sir Isaac Newton.

NEWTON'S FIRST LAW

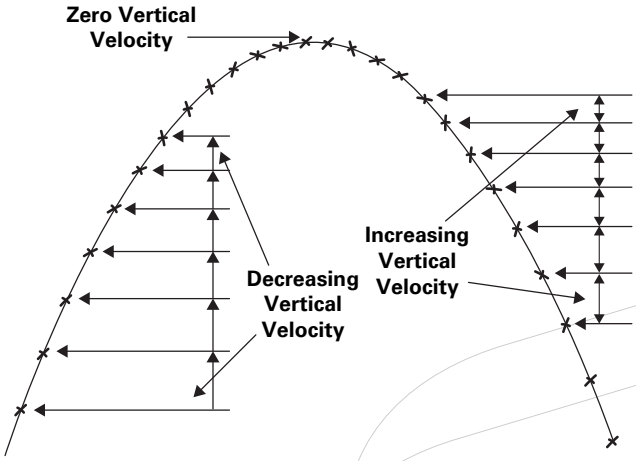
"Objects continue at rest, or to move in a state of constant velocity, unless acted upon by an external force."

As such, this law would argue that a shuttlecock:

1. will remain on the floor unless acted upon by an external force (e.g., someone picking it up)
2. will fly at a constant velocity (speed and direction) unless acted upon by an external force



Lung-Ming Chen, Yi-Hsiang Pan and Yung-Jen Chen (2009)



http://archive.ncsa.illinois.edu/Cyberia/VideoTestbed/Projects/Sports/path2.jpg

The second point above may at first appear to disprove Newton's First Law, as a shuttle will clearly slow down and change direction (following a curved path). However, the slowing down and curved path are the result of external forces such as gravity and air resistance acting on the shuttle, so the second example actually reinforces rather than contradicts Newton's First Law. The graph to the left indicates the types of trajectories displayed by a shuttlecock in flight when struck at different angles and with different degrees of force.

It is interesting to note how this differs from the flight path of a ball, which follows a parabolic, symmetrical pattern of flight.

NEWTON'S SECOND LAW

"The acceleration of an object is proportional to the force applied and inversely proportional to its mass."

This means that:

1. the more force you apply to an object, the more it will accelerate
2. the greater the mass, the harder it is to accelerate

Thus, a heavier player will have to apply more force to the ground in order move away at the same acceleration as a lighter player.

More force required to move off with a given acceleration			Less force required to move off with a given acceleration

This law can be represented mathematically by the following equation:

- Force (N) = mass (kg) x acceleration (m/s/s)

NEWTON'S THIRD LAW

"To every action there is an equal and opposite reaction."

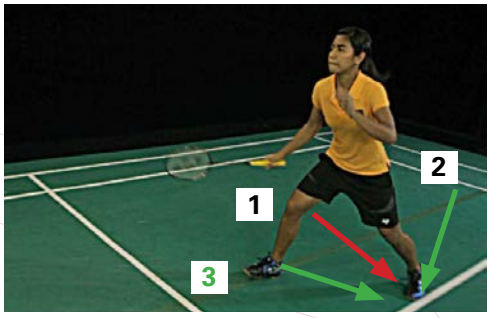
Thus, a player who exerts a force against the ground will experience an equal force in the opposite direction.

The player exerts a force downwards against the ground.		The ground exerts an equal and opposite force on the player, enabling him to jump upwards.	

In the illustration above, the player has exerted a force down into the floor, and a reaction force is exerted by the floor in an equal and opposite direction, which raises the player into the air.

Reaction forces can help the player not only to move upwards, but also to move across the floor.

1. The player exerts a force diagonally into the floor. This force can be split into two components.
2. A small downward component (2) will produce an upward reaction force from the floor, which allows the foot to be lifted from the floor.
3. A larger sideways component (3) will produce a sideways reaction force from the floor, which will move the player across the court.



04. ON-COURT APPLICATION

The next few sections will look at how coaches can apply biomechanical principles/concepts to badminton to inform their coaching practice.

This section examines two basic biomechanical principles and how these can be applied to different aspects of badminton movement. The following sections will then consider:

- application to specific strokes
- application to court movement
- application to fitness testing

1. APPLYING FORCE OVER DISTANCE

It is possible to improve performance (for example, increasing the velocity of a ball upon release when throwing, or generating racket head speed when hitting) by applying forces over greater distances. These distances can be linear (straight line) distances or rotary (curved) distance. Some examples in badminton are shown below.

Increasing the linear distance over which a force is applied Stepping back to increase the distance between the feet in preparation for a forehand overhead increases the linear distance over which force can be applied. This, in turn, can produce a greater racket head speed.	
Increasing the rotary distance over which a force is applied A backswing which makes full use of rotation allows forces to be applied over greater distances in the forward swing. This, in turn, can produce a greater racket head speed.	

Some care should be taken, however, when trying to maximise the distances over which forces can be applied. For most skills, there is an ideal compromise of force production and distance over which that force is applied. Excessive attempts to increase the distances over which a force is applied can reduce rather than improve overall skill production, by making:

- the player off-balance, or
- a joint unstable by creating excessive flexibility.

2. ROTATING AND EXTENDING LIMBS TO PRODUCE FORCE

There is obviously a close relationship between the speed of the racket head on impact and the resulting speed of the shuttle leaving the racket. Applying the concepts of impulse, the racket strikes the shuttle with a force for a short period of time (impulse = force x time). This creates momentum in the shuttle (momentum = mass of shuttle x velocity of the shuttle). Hitting generally involves the rotation and bending of joints on the backswing, followed by rotation in the opposite direction and straightening of joints on the forwards swing. There are sound biomechanical reasons for this.

Backswing Less force has to be applied (and hence, less energy expended) when the arm is bent on the backswing of a stroke. In biomechanical terms, this is because by bending the limb, the centre of gravity of that limb is moved closer to the pivot point, meaning less force has to be exerted by the muscle to move that limb. In technical terms, it also means the racket can be taken back quickly. Note also the use of rotation (upper and lower arm) in the backswing.	
Forward Swing On the forward swing, rotation occurs in the opposite direction to the backswing and the arm is also extended. From a technical point of view, this is necessary in order to take the shuttle early. From a biomechanical point of view, this allows muscle force to be applied over a greater distance, giving the option for the shuttle to be struck more powerfully, if desired.	

05. APPLICATION TO SPECIFIC STROKES

BIOMECHANICS AND GRIPS

This section will look at the biomechanics of particular hitting actions.

GRIPS

It is generally accepted that gripping the racket in a relaxed way is helpful to badminton performance, with a tightening of the grip happening prior to impact with the shuttle. A relaxed grip can help because:

- the arm muscles are less fatigued over the period of a match
- the chance of repetitive strain injury to the muscles of the forearm and elbow is reduced in the long term
- it allows for the tightening of the hand on the racket upon impact to contribute to greater racket head speed
- it makes it easier to change the grip

It is the last point above that we will look in more detail.

Simple lever systems, which were introduced in the Level 2 Coaches' Manual, involve:

- a point where effort is applied
- a pivot point
- a load (for example, the racket)

Looking at the thumb grip first:

The fingers represent the point at which the effort is applied on the racket hand.		
The upper part of the thumb represents the pivot.		
The rest of the racket represents the load.		

As the fingers of the racket squeeze down on the racket, the pivot point created by the thumb helps create a movement of the racket head. Because the distance from the thumb to the racket head is 4-5 times greater than the distance from the thumb to the fingers pulling down on the racket, any movement of the racket head is 4-5 times greater than that at the handle. Thus, a 5mm movement of the racket handle will cause a 20-25mm movement of the racket head.

It will only take a fraction of a second for the racket handle to move a few millimetres. Within that same time period, however, the racket head will move 4-5 times further. Mathematically, this means that the velocity of the racket head will be 4-5 times greater than the velocity of the racket handle. This is what allows the best players to hit deceptive backhand lifts and net kills with a minimum of backswing – by using a relaxed grip and squeezing the racket handle on impact.

Applying a similar concept to the basic grip:

The fingers represent the point at which the effort is applied on the racket hand.		
The index finger creates a pivot point.		
The rest of the racket represents the load.		

Whilst in theory the same squeezing of the racket handle as on the backhand side can be used to impart racket head speed, it can be argued that this technique is less important on the forehand side, with the movement of the wrist being more crucial.

DISCUSSION POINT

One point to debate is exactly how relaxed the grip should be to allow this "squeezing" technique to be effective. For example, it is possible for a player/coach to stand statically and hit lifts/net kills with a highly exaggerated loose grip, squeezing the racket handle to impart racket head speed. There is a point at which such a loose grip becomes impractical in a game-like situation because:

- when moving across the court with too loose a grip, you are likely to drop the racket
- racket head control can become more difficult if the grip is too loose

For these reasons, it is probably better to describe grips as "relaxed", rather than "loose".

COACHING SUGGESTION

1. Ask players to hold their rackets as lightly as possible. The rackets should be almost slipping out of their hands. Call this a "zero" grip.
2. Then ask the players to hold their rackets as tightly as possible. The rackets should be gripped maximally, as though the intention were to crush the rackets. Call this a "ten" grip.
3. Now ask the players to try to find a "four" grip and perform some relaxed hitting practices where the aim is to establish this level of grip after each stroke.

FOREHAND LIFT

PREPARATION The racket is held out in front of the body (relaxed reach) with the frame of the racket at 90° to the ground. In biomechanical terms, to achieve this position: • **Grip**: A relaxed basic grip should be established. • **Shoulder**: The arm is flexed at the shoulder (reaching forwards in a relaxed manner). • **Shoulder**: The wider the shuttle, the more the arm is abducted at the shoulder (reaching sideways). • **Elbow**: The elbow is slightly bent (relaxed reach). • **Radio-ulnar**: The lower arm is "semi" pronated.	
BACKSWING • **Shoulder**: The racket arm extends (drops back slightly) at the shoulder. • **Radio-ulnar**: The forearm supinates. • **Wrist**: The wrist hyperextends and abducts.	
FORWARD SWING • **Shoulder**: The arm flexes at the shoulder (reaches forwards). • **Radio-ulnar**: The lower arm pronates slightly. • **Wrist**: The wrist reduces (moves towards a neutral position).	
FOLLOW-THROUGH • **Radio-ulnar**: The forearm pronates further due to racket head momentum. • **Wrist**: The wrist returns to a neutral position.	

From this analysis, it can be seen that supination of the forearm and hyperextension of the wrist are used to help present the strings of the racket to the shuttle. A combination of reduction at the wrist plus pronation is used on the forward swing. Much of the pronation on the follow-through of the forehand lift can be attributed to relaxation of the muscles and momentum of the racket, with the possible exception here being the crosscourt lift.

COACHING SUGGESTIONS

1. Allow players to experiment with the stroke and discuss the relative contributions of wrist and pronation to the production of this stroke.
2. Hand feed shuttles along the singles or doubles side-line and encourage the striker to hit along the line when practicing straight forehand lifts (i.e., the racket head travels along the path of the side-line during the forward swing).
3. Place the emphasis on the finish position of the racket, pointing the racket where you want the shuttle to go at the end of the stroke.

BACKHAND LIFT

PREPARATION The racket is held out in front of the body (relaxed reach) with the frame of the racket at 90° to the ground. In biomechanical terms, to achieve this position: • **Grip**: A relaxed basic grip should be established. • **Shoulder**: The arm is flexed at the shoulder. • **Radio-ulnar**: The lower arm is "semi" pronated. • **Elbow**: The elbow is slightly flexed. • **Wrist**: The wrist is kept in a neutral position.	
BACKSWING • **Grip**: The thumb is more committed to the back of the racket handle, but the grip remains relaxed. • **Shoulder**: The arm extends (drops down slightly) and adducts slightly (moves sideways across the body). • **Shoulder**: The arm then: » flexes again (lifts slightly) » abducts (moves sideways across the body in the opposite direction to previous bullet point) » rotates inwards • **Elbow**: The elbow bends. • **Radio-ulnar**: The forearm pronates. • **Wrist**: The wrist abducts (it bends sideways, so the thumb moves closer to the side of the forearm) and hyperextends slightly.	
FORWARD SWING • **Shoulder**: The arm continues to flex (lifts away from the body). • **Elbow**: The elbow straightens. • **Radio-ulnar**: The forearm supinates. • **Wrist**: The wrist adducts. • **Fingers and Thumb**: The fingers tighten on the racket handle on impact. • On a crosscourt lift, there may be a slightly increased contribution from supination on the forward swing.	
FOLLOW-THROUGH • **Radio-ulnar**: The forearm pronates. • **Wrist:** The wrist returns to a neutral position.	

In contrast to the forehand lift, forearm rotation plays a bigger role in this stroke, as does bending/straightening of the elbow and abduction/adduction of the wrist.

COACHING SUGGESTIONS

1. Differentiate between shorter and longer hitting actions (relate this to defensive and attacking situations).
2. Draw arrow heads on the upper and lower arms when demonstrating, to let the visual learners appreciate the role of upper and lower arm rotation in the stroke.

FOREHAND DRIVE

PREPARATION

The racket is held out in front of the body (relaxed reach) with the frame of the racket at 90° to the ground.

- **Grip**: A relaxed basic grip is established.
- **Shoulder**:
  - » the arm is flexed at the shoulder (reaching forwards in a relaxed manner)
  - » the wider the shuttle, the more the arm is abducted at the shoulder (reaching sideways)
- **Elbow**: The elbow is slightly bent (relaxed reach).
- **Radio-ulnar**: The lower arm is "semi" pronated.

BACKSWING

- **Grip**: The grip is adjusted depending upon the anticipated impact point of the shuttle (e.g., panhandle grip if the impact point is in front of the body).
- **Shoulder:** The arm abducts (moves sideways away from the body).
- **Upper arm**: The upper arm externally rotates.
- **Elbow**: The elbow flexes (bends).
- **Forearm**: The forearm supinates.
- **Wrist**: The wrist hyperextends and abducts.

FORWARD SWING

- **Shoulder**: The upper arm externally rotates.
- **Elbow**: The elbow extends (straightens).
- **Forearm**: The forearm pronates.
- **Wrist**: The wrist adducts and reduces (goes from hyperextended to normal).
- **Grip**: The grip tightens on impact.

FOLLOW-THROUGH

- **Shoulder**: The upper arm internally rotates.
- **Forearm**: The forearm pronates

BACKHAND DRIVE

PREPARATION

The racket is held out in front of the body (relaxed reach) with the frame of the racket at 90° to the ground.

- **Grip**: A relaxed basic grip is established.
- **Shoulder**: The arm is flexed at the shoulder (reaching forwards in a relaxed manner).
- **Elbow**: The elbow is slightly bent (relaxed reach).
- **Radio-ulnar**: The lower arm is "semi" pronated.

BACKSWING • **Grip**: The grip is adjusted so the thumb is more involved (e.g., if the anticipated impact is in front of the body, then a full thumb grip could be used). • **Shoulder**: The racket arm flexes (bends) at the shoulder joint – the arm reaches up and out from the body. • **Upper arm**: The upper arm adducts (arm is moved across the body) and rotates internally. • **Elbow**: The elbow flexes (bends). • **Forearm**: The forearm pronates. • **Wrist**: The wrist abducts and hyperextends.	
FORWARD SWING • **Grip**: The grip tightens on impact. • **Shoulder**: The racket arm remains flexed (bent) at the shoulder – the arm reaches out from the body. • **Upper arm**: The upper arm abducts (moves off the body) and rotates internally (slightly). • **Elbow**: The elbow extends (straightens). • **Forearm**: The forearm supinates. • **Wrist**: The wrist returns to a neutral position.	
FOLLOW-THROUGH Options include: • Striking with a tapping action where the racket "rebounds" after impact. Note this rebound should be a consequence of relaxation and racket recoil rather than being forced back by deliberate muscle action. • After impact, relaxing and allowing the momentum of the racket to continue to supinate the forearm.	

COACHING TASKS

- You are coaching a person who drops his/her elbow and head considerably during the production of a backhand drive. Much of this issue is caused by over-rotation of the upper arm on the forward swing.
  - » Select and describe three coaching methods you might use to help resolve this issue *other than the coach showing and telling*.
- Compare and contrast the biomechanical differences between straight and crosscourt drives, both backhand and forehand. Your analysis should use:
  - » the structure applied in the above tables (preparation, backswing, forward swing, and follow-through)
  - » extensive use of biomechanical terminology (flexion, extension, etc.)

FOREHAND OVERHEAD

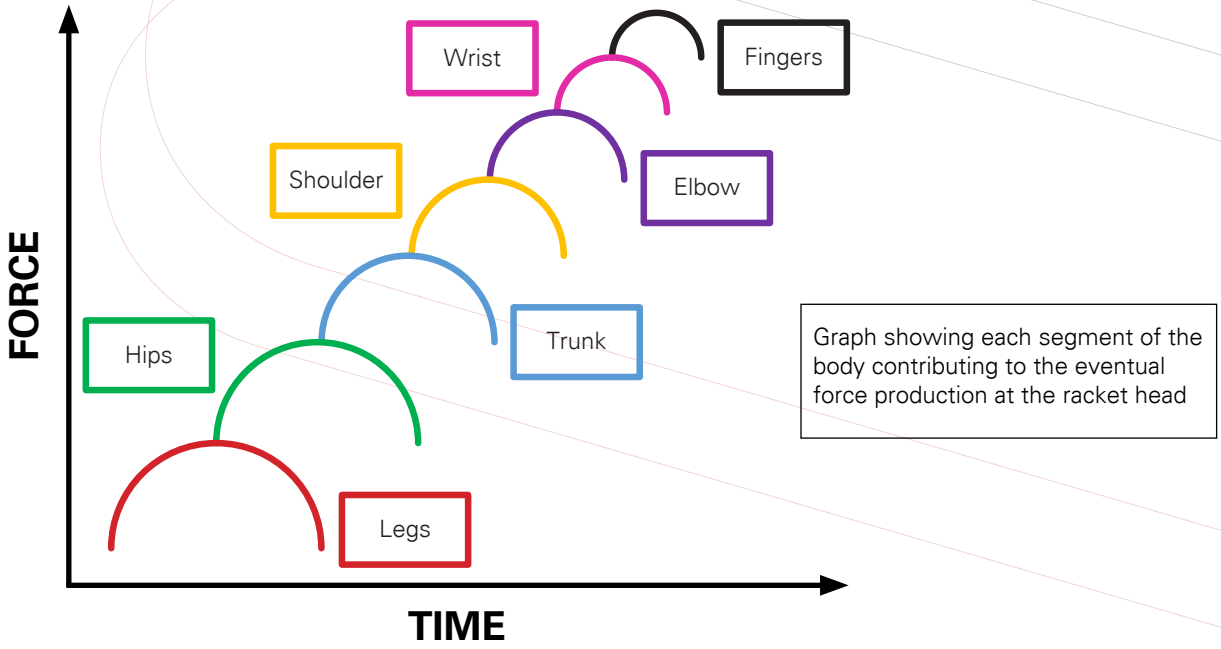
A forehand overhead hitting action has as its basis a throwing action, with an additional lever added to the end of that action (i.e., the racket). The effectiveness of the action is influenced by:

- the whole body's throwing action, with force generation being dependent upon effective segmental recruitment of body parts, from large to small. The last three segments to be recruited would be:
  - » the lower arm, by the use of forearm rotation
  - » the hand, by the bending and straightening of the wrist
  - » the fingers tightening on the racket handle

- the way the player grips the racket. A basic grip is generally recommended, as it allows the racket head to be accelerated by a combination of forearm rotation and wrist action. A relaxed grip, tightening only in the later stages of the forward swing, also helps the muscles of the forearm and wrist work more effectively.

Care must be taken when correcting a forehand overhead hitting action, as there are many body segments that need to integrate effectively. Breaking down the action too much can easily lead to a lack of flow in the hitting action.

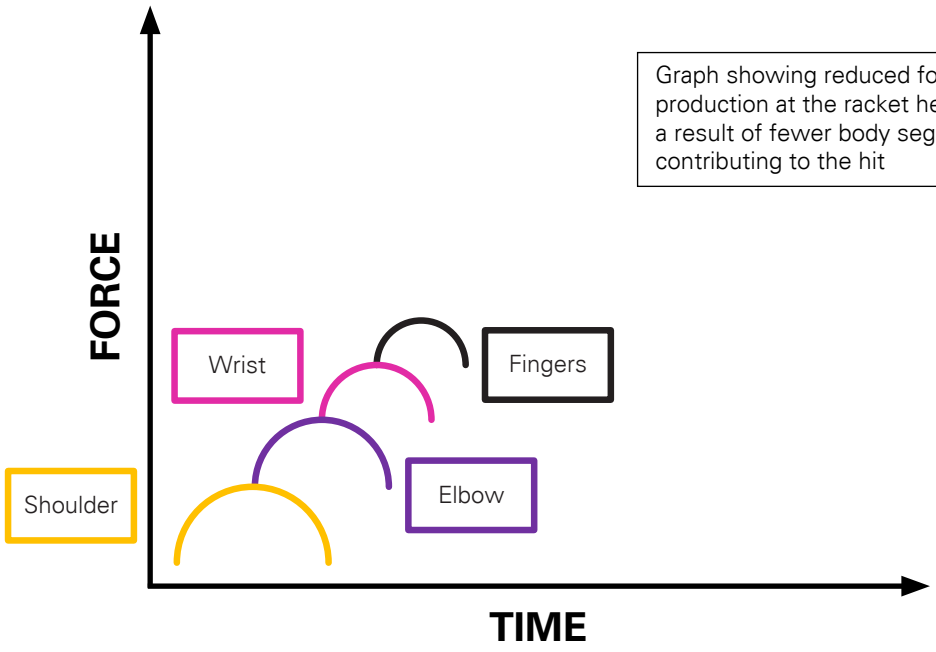
The diagram below was used in the "Terminology" section to explain how the different body segments fit into the open kinetic chain. Here it will serve to show what an ideal integration of body segments looks like, as well as to contrast with some of the more common problems seen with executing an effective forehand overhead shot, as discussed below.



Graph showing each segment of the body contributing to the eventual force production at the racket head

Two of the most typical issues surrounding force generation on the forehand overhead include:

1. Lack of involvement of the lower body and trunk. This is often seen in beginner players, who mainly rely on an arm action to hit the shuttle. The diagram below shows how there are fewer body segments involved than in the ideal sequence shown above.

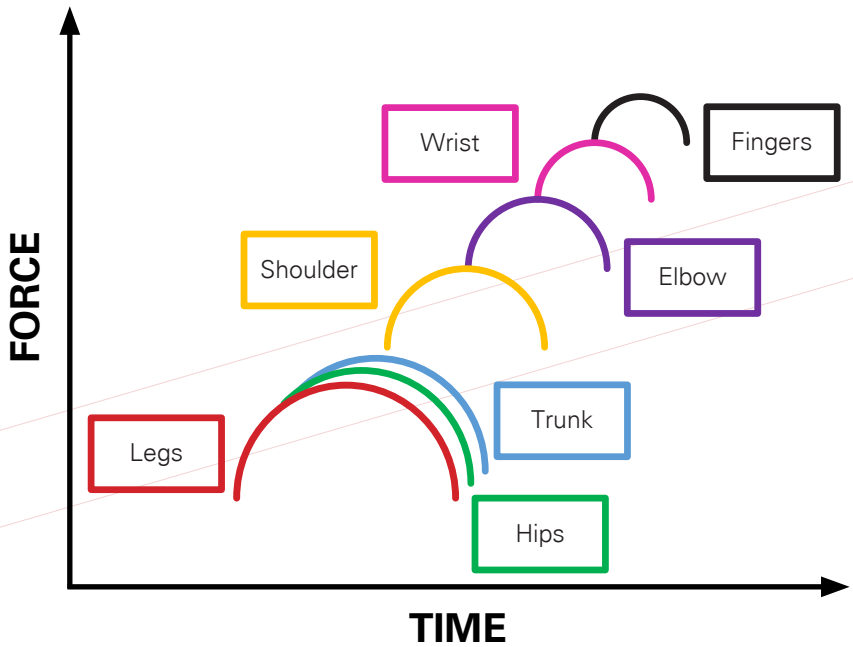


Graph showing reduced force production at the racket head as a result of fewer body segments contributing to the hit

The issue of lack of involvement of the body can be addressed by:

- encouraging a more sideways stance in preparation for striking the shuttle
- bending ("loading") the rear leg, then straightening it to start the overhead hitting action
- using the straightening of the rear leg to push the rear hip forwards
- encouraging the player to "be brave". Beginners tend to hit with a short, arm-dominated action as it gives a good chance of success. Involving the body increases the difficulty (makes the whole movement longer) and decreases the chance of successfully striking the shuttle in the initial stages, although the eventual rewards of striking the shuttle more effectively make the learning process worthwhile. Be brave!

2. Moving the larger segments of the body forwards at the same time. The diagram here illustrates the lack of proper timing in the involvement of certain body segments, in contrast with the ideal diagram above.



Graph showing the larger segments of the body moving forwards in a more overlapping manner

In real life, this would look like:

- the legs, hips and trunk appear to be moving forwards at the same time, meaning one segment is not passing on its force contribution to the next
- the shoulders and arms are introduced to the movement when the forces generated by the lower extremities are already declining

Both the above factors mean there is a reduction in the total force produced.

The issue of "mistiming" the contribution of the larger segments of the body can be solved by:

- encouraging a more sideways stance in preparation for striking the shuttle
- bending ("loading") the rear leg, then straightening it to start the overhead hitting action
- using the straightening of the rear leg to push the rear hip forwards

Note that any "stepping through" of the racket leg, if it does occur, should happen well after the shuttle has been struck. In effect, that leg "catches" the body as it moves forwards.

DISCUSSION QUESTIONS:

- Coaches often encourage that the throwing elbow come upwards and forwards at the same time as the hip. Do you feel this is good practice/helpful for players?
- Sometimes (such as in the case above of beginners learning to involve the whole body rather than using shorter, arm-dominated movements) a solid learning process may mean that learners experience less immediate gratification (actually hitting the shuttle more often) but greater long-term gains (eventually more effective hitting). How can coaches deal with this?

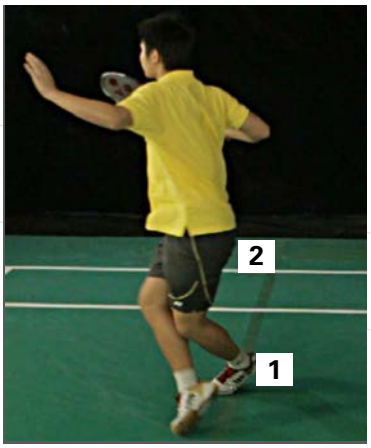
06. APPLICATION TO COURT MOVEMENT

The purpose of this section is to provide:

- examples of biomechanics applied to specific court movements
- tasks that challenge coaches to apply their biomechanical knowledge to different court movements

MOVEMENT DIRECTLY BACKWARDS

One suggestion for moving directly backward is, from a sideways stance, to cross the non-racket leg behind the racket leg, then step back with the racket leg to complete the movement, finishing in a sideways stance. Possible advantages of this method of approach are:

1. the length of step taken back by the non-racket leg is increased as it passes beyond the racket leg – effectively it hyper-adducts. This means the player can move back further on that step than by chasseing backwards.	
2. as the non-racket leg moves behind the racket leg, the abductor muscles (e.g., gluteus maximus) are stretched rapidly, creating a stretch reflex action that strengthens the subsequent contraction of the adductor muscles. This stronger contraction helps to propel the player backwards, increasing the stride length.	

The disadvantage of the cross-behind movement is the potential strain on the hip joint.

LANDING FROM A JUMP-OUT (FOREHAND REAR COURT)

Landing effectively from a jump-out in the forehand rear court is always a compromise between landing on balance (wider stance, two-footed landing, etc.) and landing in a less stable stance that allows the player to move off quickly. Landing with the feet slightly closer together means the body's centre of gravity has to travel a shorter distance to move outside that base of support. Effectively this means the player is able to move more quickly back to his or her base.	

DISCUSSION QUESTIONS:

1. Two coaches disagree on a particular aspect of the split-step. The first coach believes that the split-step should always be coached so both feet land at the same time. The second coach believes one foot should land before the other foot. Using relevant biomechanical concepts and terminology, discuss the advantages and disadvantages of each approach.

2. Two coaches disagree on a particular aspect of the split-step. One coach prefers a high action where the player leaves the ground with more of a jumping action in preparation for the split-step, whereas the second coach prefers more of a "dropping" motion into the split-step. Using relevant biomechanical concepts and terminology, discuss the advantages and disadvantages of each approach.

3. Using relevant biomechanical terminology, analyse the use of the non-racket arm during:

    a. lunging to the net
    b. all phases of a forehand smash

07. APPLICATION TO FITNESS TESTING

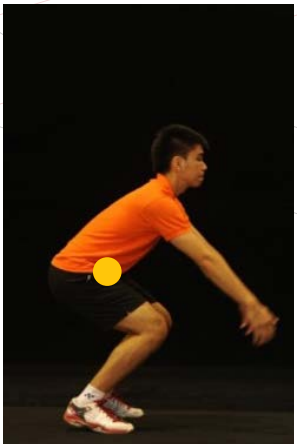
The aim of this section is to apply biomechanical principles to a specific fitness test – the vertical jump. One guiding principle that underpins this analysis is that:

"energy cannot be created or destroyed, it can only be converted from one form to another".

FITNESS TESTING: VERTICAL JUMP

A typical fitness test used in badminton is the vertical jump test, which is covered in the Level 2 Coaches' Manual in some detail. A measure of leg power, the test involves a player jumping vertically as high as possible, and that measurement is then recorded.

The vertical jump test is an easy way to measure improvement in jump height, which will affect the power of a player's jump smash, for example. As such, it is often used to determine the effectiveness of a training programme. The idea of this section is to help coaches understand the biomechanical basis behind the test and what elements contribute to the eventual height of a player's jump.

		
• Standing still at the start of the test, the body contains chemical energy stored in the bonds between molecules.	• The body relaxes, allowing gravity to push down on it. The ankles, knees and hips bend. • Towards the end of the bending phase, the chemical energy in the body begins to be released and muscles start to contract (eccentrically). The bending phase slows and then stops. • The contractions strengthen and the muscles contract, with the chemical energy converting to movement energy (i.e., the body starts to straighten up). • At the point of leaving the ground, the body will have kinetic energy, which can be calculated by the equation introduced earlier in this section: *" ½ x mass x velocity^2 ".*	• At the peak of the jump the body will be momentarily stationary in mid-air. The potential energy can be calculated by the equation introduced earlier: *"mass x acceleration due to gravity x height".*

Biomechanics can help us to calculate the force being generated by the player.

Using the equations above, it is possible to determine the take-off velocity of the player.

Assume that:

m = mass of the player = 75kg
g = acceleration due to gravity = 9.81m/s/s
h = height jumped = 0.7m

Referring back to the idea that energy cannot be created or destroyed, but can only be converted from one form to another, this means that kinetic energy on take-off = potential energy at the peak of the jump.

$\frac{1}{2}mv^2 = mgh$
$\frac{1}{2} \times 75kg \times v^2 = 75kg \times 9.81m/s/s \times 0.7m$
$37.5 \times v^2 = 515.025$
$V^2 = 13.734$ m/s
V = 3.70 m /s

Thus, the velocity at take-off is 3.7m/s, which will dictate the height of the jump.

BADMINTON COACH EDUCATION

COACHES' MANUAL

LEVEL 3

MODULE 13
MOTOR LEARNING

MODULE 13
MOTOR LEARNING

Photo credit: BWF/BadmintonPhoto

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01. INTRODUCTION

The aim of this module is to introduce a variety of key motor learning concepts to coaches and provide opportunities for coaches to apply these concepts to their own coaching practice.

LEARNING OUTCOMES

By the end of this module, coaches will be able to:

- define "motor learning"
- describe a variety of concepts that underpin motor learning
- apply motor learning concepts to their own coaching practice
- reflect on the effectiveness of applying different approaches to motor learning

MOTOR LEARNING DEFINED

Motor learning was defined by Schmidt and Wrisbert (2000) as:

"changes in the internal processes that determine an individual's capability for producing a motor task".

It is useful to look at this definition in a little more detail in order to improve our depth of understanding. For example, "changes in the internal process" is a broad term that could include the functioning of many body systems. For our purposes, however, it is useful to narrow this down to the structure and function of the nervous and muscular systems. "A motor task" can alternately be replaced by the word "movement".

Thus, an alternative definition might be that motor learning consists of:

"changes in the nervous and muscular systems that control the production of a movement".

Motor Learning

Changes to the nervous system and muscles

Photo credits: James Varghese (left) and BWF/BadmintonPhoto (right)

02. ABILITY AND SKILL

The concepts of ability and skills have been addressed previously in the BWF Coach Education resources. This Level 3 resource will review these two concepts and will also provide a deeper analysis of each.

ABILITY

In the study of motor learning, the term "ability" is frequently used. It is useful, therefore, to look more closely at this word to ensure that it is used consistently.

Ability has been defined in the BWF Coach Education resources as a *"consistent, long-lasting attribute that is largely genetically determined and underpins a player's sporting performance"*. The key points to highlight from this definition are that abilities:

- are inherited
- remain relatively the same through life

Initially there was support for the concept of a single, all-round ability that underpinned excellent sporting performance (Brace, 1927). This was perhaps not surprising, as even today we often point out people who we regard as all-round athletes that appear to be able to play any sport with apparent ease. To test whether an all-round sporting ability truly existed, experiments were conducted to see if there was a correlation between performances in different sporting tasks. For example, researchers might look at a person's ability to throw a tennis ball and then kick a football accurately. If there was a general all-round sporting ability, then you would expect those with a high sporting ability would be good at both, whereas those with a low sporting ability would be poor at both.

However, the reality was that experiments conducted using these methods did not show these results. An athlete being good at one motor activity did not necessarily mean they were good at another. Drowatzky and Zuccato (1967) also demonstrated that an athlete's performance in a variety of balance tasks was inconsistent, even when those tasks appeared to be related. Thus, the concept of an all-round athlete born with single highly developed motor ability has little historical scientific support.

In contrast, Henry (1968) suggested that rather than a single motor ability there are thousands of underlying abilities. Thus, a world champion badminton player may have been born with a lot of the abilities required for excellence in badminton, but those abilities would not necessarily guarantee excellence if they had attempted to succeed in another sport.

Fleishman (1964) developed the available knowledge surrounding abilities, resulting in the identification of a number of abilities, listed below.

Ability Name	Ability Description ("The ability to…")
Multi-limb Coordination	co-ordinate the movement of a number of limbs simultaneously
Control Precision	perform highly controlled movement adjustments, particularly where larger muscle groups are involved
Response Orientation	make quick choices among numerous alternative movements
Reaction Time	react in tasks where there is a single stimulus and a single response
Rate Control	produce continuous anticipatory movement adjustments in response to changes in the speed of a continuously moving target or object
Manual Dexterity	manipulate relatively large objects with the hands and arms
Finger Dexterity	manipulate small objects
Arm-Hand Steadiness	make precise arm- and hand-positioning movements where speed and strength are not required
Wrist-Finger Speed	perform rapid movement of the wrist and fingers with little or no accuracy demands

Aim	produce accurate hand movements to targets under speeded conditions
Explosive Strength	expend a maximum amount of energy in one explosive act
Static Strength	exert force against a relatively heavy weight or immovable object
Dynamic Strength	repeatedly or continuously move or support the weight of the body
Trunk Strength	exert dynamic strength that is particular to the trunk and abdominal muscles
Extent Flexibility	extend or stretch the body as far as possible in various directions
Dynamic Flexibility	perform repeated, rapid movements requiring muscle flexibility
Gross Body Equilibrium	maintain total body balance in the absence of vision
Balance with Visual Cues	maintain total body balance when visual cues are available
Speed of Limb Movement	perform tasks in which the arms and legs must be moved quickly, but without a reaction time stimulus to minimise movement time
Gross Body Co-ordination	perform a number of complex movements simultaneously
Stamina	exert the entire body for a prolonged period of time

Keele and Hawkins (1982); Keele, Ivry & Pokorny (1987) and Keele, Pokorny, Corcos & Ivry (1985) have identified several additional abilities which are listed in the table below.

Ability Name	Ability Description ("The ability to…")
Movement Rate	perform a series of movements at maximum speed
Motor Timing	execute accurately timed movements
Perceptual Timing	make accurate judgements about the timing of perceptual events
Force Control	apply forces of varying degrees in order to achieve the desired outcome

ASSESSING ABILITIES AS A MEANS OF IDENTIFYING FUTURE CHAMPIONS

There are many problems associated with using a range of tests in order to try to spot young children with necessary underpinning abilities to become future badminton champions. These issues include:

- The research of Fleishman (1964) and Keele et al. (1982, 1985, 1987) mentioned earlier in this section provides a useful basis for further research and discussion. However, these studies have not focussed on more "real-life" movements, particularly those involving co-ordination of the whole body. It is therefore not advisable to regard the abilities in the tables as a final list, but rather as a work in progress requiring much additional investigation.
- When testing children to measure underpinning *abilities*, it is important to keep in mind that all the children will have had differing levels of exposure to playful activities which may have led them to develop sporting *skills* to different levels. Rather than measuring their underpinning abilities, you could be simply measuring how much one set of parents has played with their children as compared to another set of parents!
- Even if you could precisely measure underpinning, genetically determined abilities, it is highly questionable that such measures would be an accurate predictor of a child's capability to become a badminton champion. You would be, in reality, measuring that child's performance in a task, rather than potential to perform at the highest level in 20-25 years' time.
- Most "ability-based tests" are physical in nature and do not address more psychological issues (rate of learning, personality, determination, etc.) that could also be key areas for future champions.

For the reasons stated above, it can be argued that early selection of children on the basis of ability-led testing is more likely to de-select future champions than to select them.

SKILL

The terms "ability" and "skill" are often used interchangeably, as though they were same thing. However, with regards to motor learning, they are actually very different concepts. As ability has already been addressed, this section will focus on the concept of skill.

Skill was defined in the Level 2 Coaches' Manual as:

"a learned movement, or sequence of movements, that allow for the completion of a particular task".

It can also be defined as:

> *"Proficiency, facility, or dexterity that is acquired or developed through training or experience".*
> *http://www.thefreedictionary.com/skill (2016)*

SKILL CLASSIFICATIONS

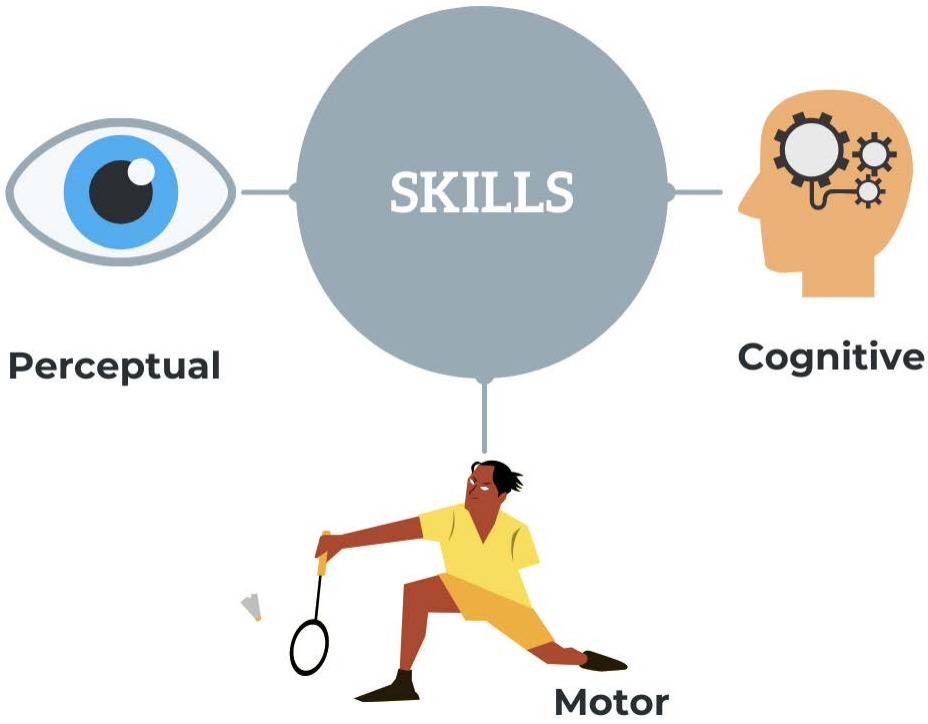
There are different ways in which skills can be classified and these are outlined below.

CLASSIFICATION OF SKILLS AS PERCEPTUAL, COGNITIVE OR MOTOR

Skills can be classified by what they allow the person to do.

- *Perceptual* skills can be defined as "the capacity to be aware of information provided by the senses".
- *Cognitive* skills can be defined as "the capacity to process information".
- *Motor* skill focuses on "the quality of the movement".

Perceptual, cognitive, and motor skills are represented diagrammatically below.



In reality, skills are a combination of perceptual, cognitive, and motor elements. We see, hear, and feel information from the environment, make sense of it, and then perform a physical response. Badminton certainly involves all three elements. For example, a player:

- sees the stroke played by an opponent
- makes sense of the stroke from previous experience
- responds with an appropriate movement and stroke selection

CLASSIFICATION OF SKILLS AS DISCRETE, CONTINUOUS, OR SERIAL

Skills can also be classified by the nature of the task being performed.

DISCRETE SKILLS

Discrete skills involve movements that have a definite start and finish and very often take place within a short period of time. Potting a ball at snooker or pool is a good example of a discrete skill.

CONTINUOUS SKILLS

Continuous skills involve the same movement, repeated over a long period of time. Examples would be running, cycling, and swimming.

SERIAL SKILLS

Serial skills involve putting together different movements to create more complex actions. Badminton consists of players performing serial skills, as both strokes and movement patterns are constantly changing.

Photo credits: BWF/BadmintonPhoto

CLASSIFICATION OF SKILLS AS OPEN OR CLOSED

Skills can also be classified according to the environment in which they are being performed.

CLOSED SKILLS		OPEN SKILLS
Skills executed in an environment that is consistent and predictable		Skills executed in an environment that is inconsistent and unpredictable
(e.g., bowling) ◄	———	► *(e.g., badminton)*

In reality, skills are rarely performed in a completely closed or open environment. Skills are usually performed in environments that have varying amounts of predictability and consistency. For example, whilst ten-pin bowlers are largely performing closed skills, they may have to bowl with a crowd creating a lot of noise, other players in the adjacent lanes, etc. Badminton is largely played indoors in a closed environment, protected, for example, from the weather. However, even in these circumstances, players may have to cope with environmental factors that are more open in nature, such variable playing backgrounds and air currents in the hall that cause the shuttle speed to vary depending on the direction of the drift.

CLASSIFICATION OF SKILLS BY LEVEL OF PROFICIENCY

Guthrie (1952) suggested that high levels of proficiency in skills were characterised by:

• Maximum certainty of goal achievement, meaning the skilled performer demonstrates a consistently high level of skill. *For example, a skilled player may perform a jump smash consistently well, even under the pressure of competition.*	
• Minimum movement time, meaning a skilled performer executes a particular skill much more quickly than an unskilled performer. *For example, a skilled player may be able to play a backhand crosscourt net shot accurately despite having little time to execute the stroke.*	
• Minimum energy expenditure, meaning a skilled performer will be able to perform a skill with more much economy of effort than an unskilled performer. *For example, a skilled player would be able to maintain balance even under extreme pressure.*	

Photo credits: James Varghese (3rd) and BWF/BadmintonPhoto (1st and 2nd)

SKILLS AND ABILITY

In summary, the key differences to keep in mind between skills and abilities are:

- skills are learnt, whereas abilities are genetically endowed
- skills can develop or decline, whereas abilities remain at a relatively stable level

03. NERVOUS SYSTEM

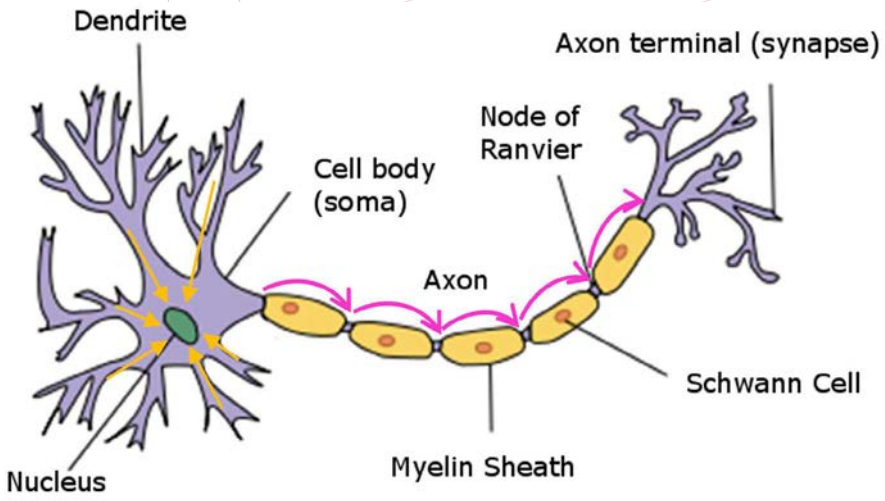
Because there is a close link between motor learning and the nervous system, a greater understanding of the nervous system's structure and function can therefore help us to develop our knowledge of motor learning.

NERVE CELLS: THE BUILDING BLOCKS OF THE NERVOUS SYSTEM

The building blocks of the nervous system are individual nerve cells. Another name for nerve cells is neurons. The characteristics that distinguish nerve cells from other types of cells are their ability to:

- respond to electrical signals
- pass on signals to other cells via "junctions" known as synapses

Although there are many variations in both the structure and function of different types of nerve cells, it may help our basic understanding to start by reviewing the structure of a "typical" nerve cell. *It is important to keep in mind that this is a very simple version of a nerve cell, presented to familiarise coaches with the key structural components. In reality, there are many variations.*



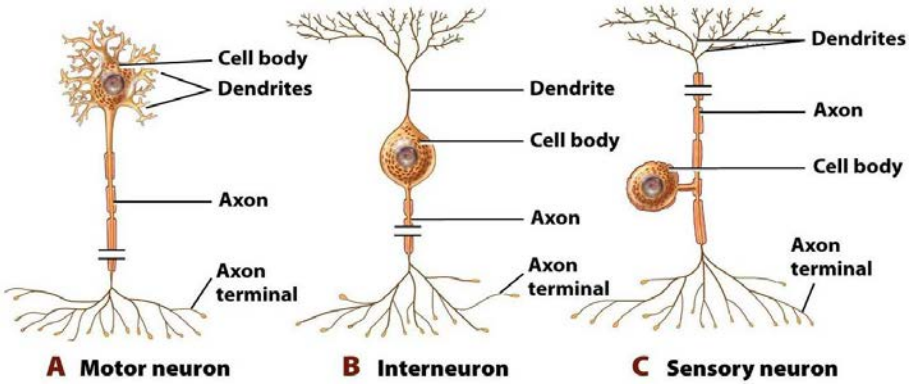
http://nervecell-assesment.weebly.com/2d-labelled-diagram.html

In simple terms:

- The nucleus controls the workings of the cell.
- The nucleus is located within the main cell body, or soma.
- The cell body has many "branches" know as dendrites, which are responsible for receiving "messages" from other cells and sending these into the nerve cell body, as indicated by the **yellow** arrows.
- Each nerve cell body has one axon, which is a single branch responsible for transmitting "messages" away from the cell body, as indicated by the **violet** arrows
- Schwann cells produce myelin, an insulating material that helps to speed up the transmission of signals along the axon.
- Nodes of Ranvier are gaps between the Schwann cells where the axon remains exposed. These gaps also play a part in speeding up the conduction of messages along the axon.
- The axon can split and form many axon terminals. These terminals are the areas where signals are transferred into other cells – for example other nerve cells or muscle cells

NERVE CELLS: DIFFERENCES IN STRUCTURE

Nerve cells can be split into motor neurons, interneurons, and sensory neurons. Structurally, the key difference between types of neurons is the positioning of the cell body. These differences in structure are illustrated below.



https://www.studyblue.com/notes/note/n/neuroanatomy-and-physiology/deck/11801824

- Motor neurons transmit information from other neurons to the muscles, which helps to bring about movement.
- Interneurons communicate from neuron to neuron.
- Sensory neurons take sensory information (sight, sound, smell, taste, and touch) from the environment and transmit this information to other neurons.

THE NERVOUS SYSTEM: STRUCTURE AND FUNCTION

The nervous system can be split into two parts:

- The Central Nervous System
- The Peripheral Nervous System

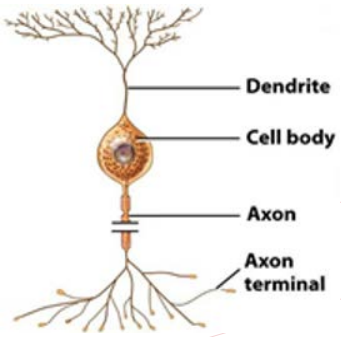
THE CENTRAL NERVOUS SYSTEM

The Central Nervous System (CNS) is made up of the brain and spinal cord.

THE BRAIN

The brain is located in the head and is protected by the bones of the skull

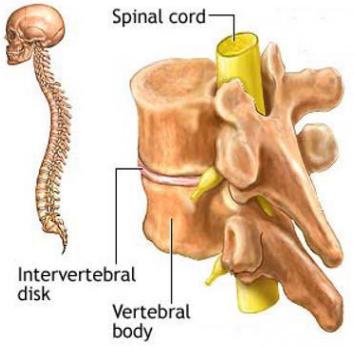
It is beyond the scope of this publication to go into great detail about the structure and function of the brain. As an overview, however:



- structurally, the brain mainly consists of interneurons – nerve cells that communicate with each other
- functionally, the brain is responsible for:
  - » receiving information from sensory nerves (e.g., sight, sound, smell, touch, balance, taste)
  - » interpreting information received from sensory nerves
  - » storing and retrieving information
  - » putting together responses to sensory information
  - » initiating the response to information received

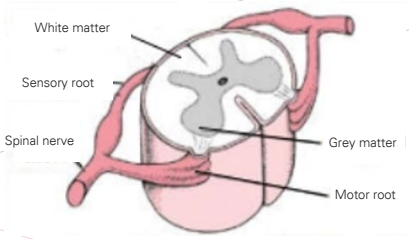
THE SPINAL CORD

The spinal cord extends downwards from the brain to the lower back. It is protected by the interlocking bones of the back known as vertebrae.



http://www.sci-recovery.org/sci.htm

- Like the brain, structurally the spinal cord is made up predominantly of interneurons – nerve cells that communicate with each other.
- Functionally, the spinal cord is responsible for:
  - » passing messages from the senses to the brain
  - » passing messages from the brain to the muscles in order to bring about movement
  - » initiating and controlling simple reflex actions, such as pulling the hand away rapidly from a hot surface



http://biology.about.com/od/Nervous-System/ss/spinal-cord.htm

THE PERIPHERAL NERVOUS SYSTEM (PNS)

The Peripheral Nervous System (PNS) is made up of the sensory and motor nerves, branching out from the spinal cord to all parts of the body.

The Peripheral Nervous System contains:

- ***sensory*** nerves, which collect information from the eyes, ears, limbs, etc. and send it to the Central Nervous System
- ***motor*** nerves, which take information from the Central Nervous System and send messages though the body to start a response (e.g., a muscle contraction)

Functionally, the nervous system can also be separated into:

- the ***autonomic*** PNS, which works without conscious control and regulates functions such as breathing, heartbeat, etc.
- the ***voluntary*** PNS, which works under conscious control (e.g., most skeletal muscle contractions)

FOLLOW-UP TASK

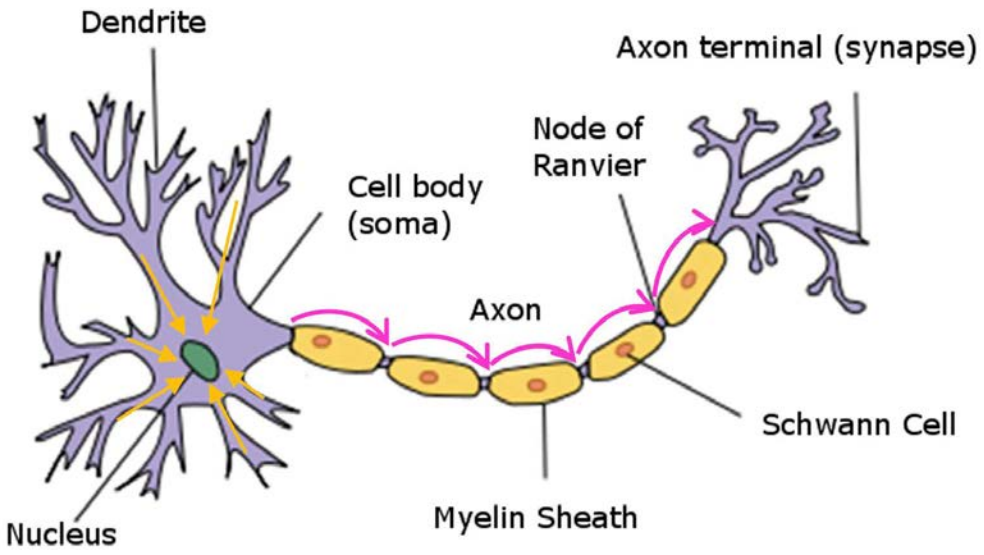
Research deeper into the basic structure and function of the brain. In particular, find out about:

- the areas of the brain predominantly responsible for the control of voluntary movement
- the relationship between the brain and the concept of a motor program

04. INTERACTIONS BETWEEN NERVES AND MUSCLES

The focus of this section is to explore the interactions between the muscular and nervous systems. It is strongly recommended, therefore, that readers revisit the information regarding the muscular system in the BWF Level 2 Coaches' Manual. This will help to reinforce their earlier learning and improve their understanding of this section.

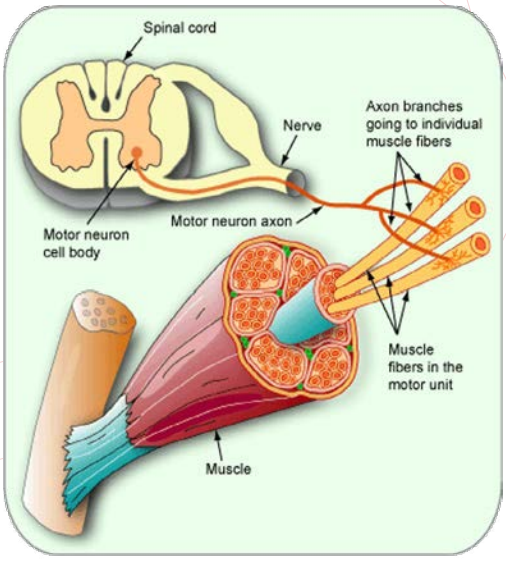
MOTOR NERVES AND SKELETAL MUSCLES



Most motor nerve impulses originate in the brain and are passed down the body via the spinal cord. Eventually those nerve impulses will reach their destination and pass into the cell body (soma) of the target motor nerve (see the **yellow** arrows above). Note that the body of a motor nerve cell is still situated within the spinal cord, so effectively at this stage the impulse has still not left that spinal cord. The impulse then travels outside the spinal cord, along the axon of that motor nerve (see the **violet** arrows) which effectively acts as the pathway to the destination muscle. Schwann cells wrapped around the axon act as insulators which help to increase the speed of conduction of the nerve impulse. As it reaches the muscle the axon branches out, so the impulse can reach not just one, but several muscle fibres.

THE MOTOR UNIT

A single motor nerve cell and all the muscle cells it connects to are collectively known as a motor unit. In the illustration below, the single nerve cell attaches to three muscle cells/ fibres. Where very fine control of muscles is required (for example, in the eye), the nerve-to-muscle cell ratio may be as low as 1:1. In large muscle groups requiring more powerful movements, the ratio could be 1:300.



http://www.gatlineducation.com/demo/PTA_Demo/images/L14-03.gif

NERVE IMPULSE SUMMATION

A single, short-lived nerve impulse would have little effect, as it would not be strong enough or sustained enough to bring about a muscle contraction. In reality, the effect of large numbers of nerve impulses, following very quickly one after another and adding together, produces an impulse of sufficient magnitude and duration to cause a muscle cell to contract.

ALL OR NONE

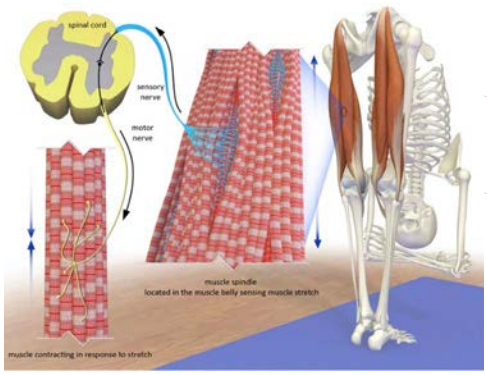
Nerve impulses are either of sufficient magnitude or not to bring about contraction in a muscle cell. If the nerve impulse is too weak, then none of the muscle fibres connected to that motor unit will contract. If the nerve impulse is of sufficient magnitude, then all the muscles cells within that motor unit will contract. A useful analogy is firing a gun. You can exert very light force on the trigger and the gun may not fire. However, at a certain point if you keep increasing the pressure the trigger will move and the gun will fire. It is all or none. So if there is a single nerve cell connected to a single muscle cell (a 1:1 ratio motor unit) then when the nerve impulse reaches a particular threshold level that single muscle cell will contract. If a single nerve cell is connected to 300 muscle cells (a 1:300 ratio motor unit) then when the nerve impulse reaches a critical threshold level all the muscle cells it connects to will contract.

HOW WE CONTROL MUSCLE FORCE

Muscle force is controlled by how many motor units are used. Thus, if we require large forces, we send many nerve impulses from the brain to many motor units, which means all the muscles cells contained within those motor units will contract. If we require less force, then fewer motor units are used, so fewer muscle cells contract.

SENSORY NERVES AND SKELETAL MUSCLES

Sensory nerves cells can also take information from inside muscle cells and return this information to the brain and spinal cord. The key sensors within muscles are "muscle spindles", which are embedded deep within muscle structures.



http://www.bandhayoga.com/images/spindle_organ.jpg

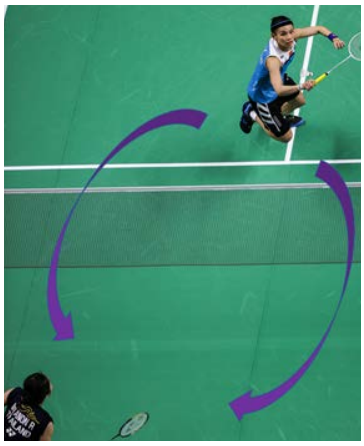
Muscle spindles are able to sense both the rate and amount of stretch within a muscle. In the illustration above, a rapid stretching of the hamstrings will be sensed by the muscle spindles, which starts a nerve impulse which travels back to the spinal cord. Since the spinal cord is able to deal with control of reflex actions, if the rate of lengthening is severe, then the spinal cord will send a message quickly back to the same muscle, via motor nerves, instructing the muscle to contract. In a sense, this stretch reflex, caused by the sensory work of the muscle spindles, helps to protect the muscle when it senses it is being stretched rapidly, by countering this with a muscle contraction. Note also, however, that the stretch reflex can be not only a source of muscle "protection" but also a fundamental means by which muscle forces can be increased.

FOLLOW-UP TASK

1. Once the nerve impulse enters the muscle cell, how does it contribute to the cell contraction process?
2. What is the relationship between muscle fibre types and motor units?
3. Explain how the action of muscle spindles can be used to enhance muscle power. Relate your answer to the action of the wrist flexors on a forehand lift and the soleus/gastrocnemius muscles during a split-step.

05. PROCESSING INFORMATION

In simple terms, we can describe how humans produce voluntary movement using a three-stage model. This is shown diagrammatically below.

Sensory input to the body	Information processing within the body	Motor output from the body
	*Interpret sensory input, select and organise a response*	

Identify information	Select response	Organise response
→	**Response time**	→

External sensory input can be provided from sight, sound, touch, smell, or taste. Within the body, we identify what sensory information is being provided, we select the response to that information, and organise what needs to be done to bring about that response. These three stages of internal processing are often referred to as "response time".

The level of skill demonstrated by a player is largely governed by the capacity to process incoming sensory information. These sensory signals can be split into two types – ***external*** and ***internal***.

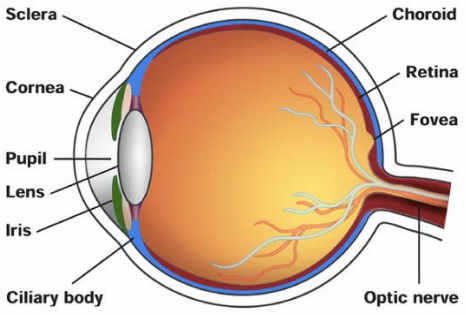
SENSORY INPUT: EXTERNAL SOURCES

The external sensory information most relevant to sporting performance is visual and, to a lesser extent, auditory.

VISUAL INPUT

Visual information enters the body through the eye. Structurally, the eye consists of:

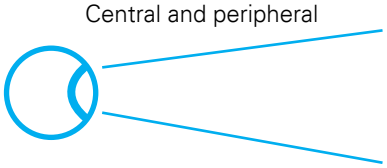
- the sclera, which is responsible for maintenance and protection of the eye, as well as for retaining its shape. The cornea is a stronger section of the sclera which helps protect the front of the eye.
- the pupil, which allows light to enter the eye.
- the choroid, which provides oxygen and nutrients to the eye.
- the retina, which helps to form the images from the light entering the eye via the pupil.



http://bms-vanessa-aveline.blogspot.co.uk/2015/06/the-eye.html

Functionally, the eye collects, focuses, and transmits light through a lens to create an image of the external environment. This information is converted into a nerve impulse, which is transported to the brain via the optic nerve.

Vision itself can be split into two sub-systems of focal and ambient vision. The characteristics of each type of vision are included in the table below.

DEFINITIONS/CHARACTERISTICS OF THE TWO VISUAL SYSTEMS		
	FOCAL VISION	**AMBIENT VISION**
Definition	Responsible for identification of objects	Responsible for spatial awareness/ movement control
Information the system provides	What is it? (e.g., a shuttlecock)	Where is the object? Where am I in relation to the object?
Size of visual field	Central 	Central and peripheral 
Level of conscious control	Conscious	Non-conscious

USE OF FOCAL VISION TO CONTROL MOVEMENT

Because focal vision (concerned with the identification of objects) is a conscious process, it is relatively slow. A badminton player will use focal vision to identify the shuttle in a rally (for example, as it is about to be struck by the opponent).

Research by Bard and Fleury (1981) has shown that expert ice hockey goaltenders tend to use focal vision to concentrate on the stickwork of the shooting player, rather than the puck, allowing them to anticipate the shot earlier and block more successfully. In contrast, novice performers concentrated their focal vision at the puck itself. Applied to badminton, with intermediate/ advanced players, coaches should therefore help them to look for the shape of strokes created by their opponents (rather than looking at the shuttle) in order to anticipate probable replies. Video analysis of specific players playing specific strokes may help this process. The kind of information that elite players use in anticipating, in contrast to lower-level players, was also discussed in Module 11 in the Elite Coaching section.

USE OF AMBIENT VISION TO CONTROL MOVEMENT

In contrast to focal vision, ambient vision (concerned with spatial awareness and movement control) is an unconscious process and is therefore very quick. Fundamental to the understanding of ambient vision is the concept of optical flow, which is a term used to describe how light reflected from objects flows across the retina at the back of the eye, forming moving images which are relayed to the brain by the optic nerve.

According to Schmidt and Wrisberg (2000), optical flow gives observers many different types of information about their movement, including:

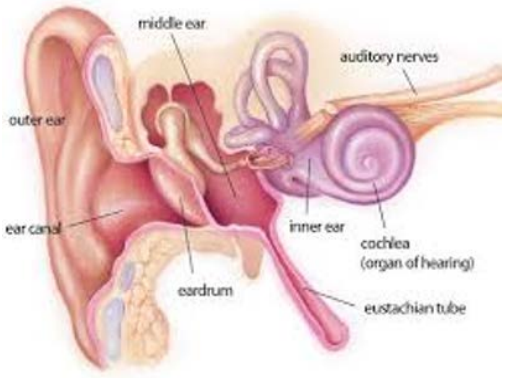
- their state of stability and balance
- their velocity of movement
- their direction of movement relative to fixed objects
- movement of external objects relative to their position
- time of contact between an object and themselves

Of the above list, stability and balance is possibly the most surprising, as these concepts are more usually associated with the balance sensors in the ear and the sensory information received from muscles and joints.

This means that unnecessary movements of the head during the production of strokes will cause an excess of sensory information from not only the ear but also from ambient vision, resulting in many compensatory movements that can affect players' balance and subsequently their production of the skill.

AUDITORY INPUT

Auditory sensory input (hearing) enters the body through the ear. The structure of the ear can be seen in the diagram below.



The ear has outer, middle, and inner sections. The outer ear (made of cartilage covered by skin) funnels sound into the ear canal, a short tube that ends at the eardrum. Sound causes the eardrum and its tiny, attached bones in the middle portion of the ear to vibrate, and the vibrations are conducted to the nearby cochlea. The spiral-shaped cochlea is part of the inner ear; it transforms sound into nerve impulses that travel to the brain via auditory nerves.

The fluid-filled semicircular canals (labyrinth) attach to the cochlea and nerves in the inner ear. They send information on balance and head position to the brain. The Eustachian (auditory) tube drains fluid from the middle ear into the throat (pharynx), behind the nose.

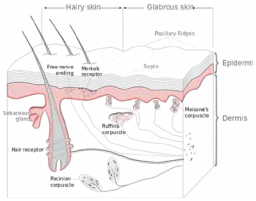
When coaching, it is easy to think of auditory information as simply being the coach providing instruction to the athlete. However, additional auditory considerations that could aid motor learning could include:

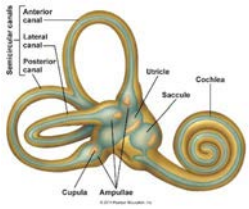
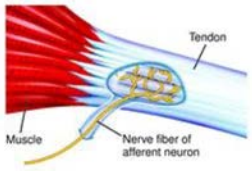
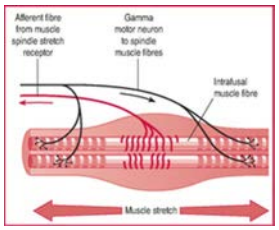
- the use of rhyming language (e.g., "tricky flicky" for a forehand lift)
- highlighting differences in sound from the shuttle racket impact (e.g., between a slice and smash)
- trigger words to prompt a particular behaviour (e.g., the word "calm" to trigger a deep breath)

SENSORY INPUT: INTERNAL SOURCES

Vision and hearing are examples of sensory input obtained from outside the body. However, the body has a number of other internal providers of sensory information. The information provided by the various internal sensors is collected, organised, and interpreted by the Central Nervous System. Such information is often referred to as "proprioceptive" or "kinaesthetic".

The structure and function of various internal sensory mechanisms are included in the table below.

STRUCTURE	IMAGE	FUNCTION
Skin receptors, including: • Merkel's receptors • Meissner's corpuscles • Ruffin's corpuscles • Pacinian corpuscles • Hair receptors		Provide information about pressure, temperature, and touch

Vestibular apparatus Located in the inner ear		Provide information about balance and posture
Golgi tendon organs Located where muscles merge into tendons		Provide information about the amount of force being generated in muscles
Muscle spindles Located within the muscles (see dark red lines wrapped around muscle fibre)		Provide information about changes in muscles' length

Kinaesthetic information sent to the brain is highly complex, as it often involves integrating different types of information from each of these receptors. This is different from visual or auditory sensory input, which can be dealt with in isolation.

FOLLOW-UP TASK

- Guided actions, where a coach physically manipulates a player's body in order to produce a desired shape of movement for the racket head, is sometimes used by coaches. Discuss the advantages and disadvantages of using this technique to coach a backhand overhead. Make sure in your answer you refer back to the internal sensory mechanisms described in the previous table.
- With reference to internal sensory mechanisms, discuss the possible advantages and disadvantages of encouraging a beginner to perform certain skills with their eyes closed (e.g., a backhand serve (striking the shuttle), a forehand clear with kick-through (shadowed), and a round-the-head movement pattern (shadowed).

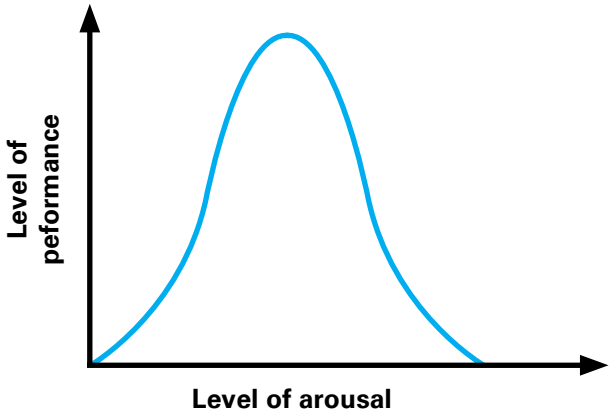
EFFECTS OF AROUSAL

The ability to process information in order to perform a sporting task can be affected by many things, including the arousal level of the participant.

Arousal can be defined as:

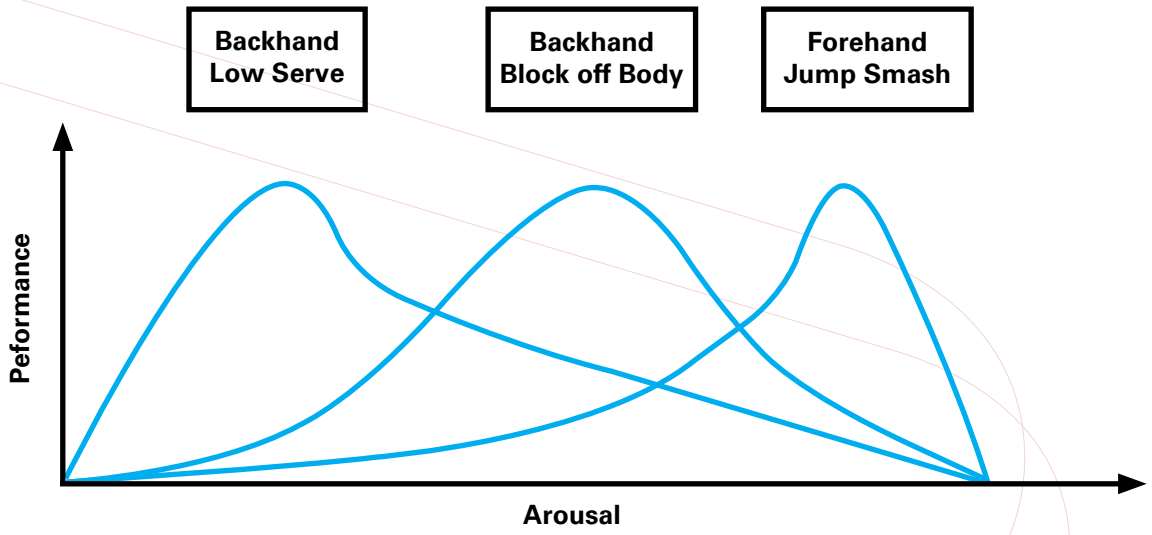
"the level of activation of the nervous system".

Yerkes and Dodson (1908) first developed the concept of the "inverted-U" principle of arousal, which established the nature of the relationship between the level of arousal and performance of a specific task. Essentially, in cases of under- or over-arousal, performance levels dropped, whilst moderate levels of arousal resulted in the best performances. This relationship is demonstrated graphically below:



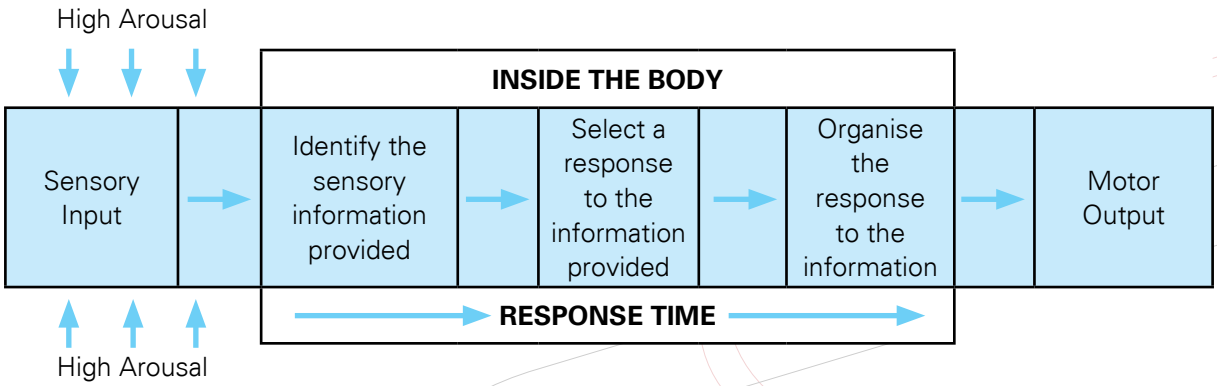
Whilst this is a generally accepted basis from which to consider arousal and performance, other factors need to be taken into account in order to get the full picture. Wrisberg (1994) suggests that in order to achieve a level of arousal suitable for optimal performance, the person, the specific task, and the situation all need to be taken into consideration.

The diagram below demonstrates how optimum arousal levels might vary, even within a single rally of badminton!



Note from the diagram how the successful completion of finer motor skills such as a low serve requires a lower level of arousal than a gross, powerful skill such as a forehand smash.

High levels of arousal can affect performance level because of a phenomenon known as "perceptual narrowing". This phrase is used to describe how the amount of information received by the senses can be reduced as arousal levels increase. This is demonstrated in the diagram below, with high levels of arousal narrowing the amount of sensory input entering the body.



At higher levels of arousal, players may naturally focus their attention on the stroke being produced by the opponent, rather than the noise from, or movement of, the crowd in the background. So perceptual narrowing can, in this sense, enhance performance. However, a highly aroused doubles player may be too focussed on returning a smash with a block to the net and fail to notice the position of the smashing player's doubles partner at the net, who intercepts the blocked return.

Lower levels of arousal can also reduce the level of performance. In these cases, the arousal level is so low that sensory input becomes too broad, with many irrelevant pieces of sensory information being included in the internal processing phase. This increases the chance of irrelevant information being processed and relevant information being missed.

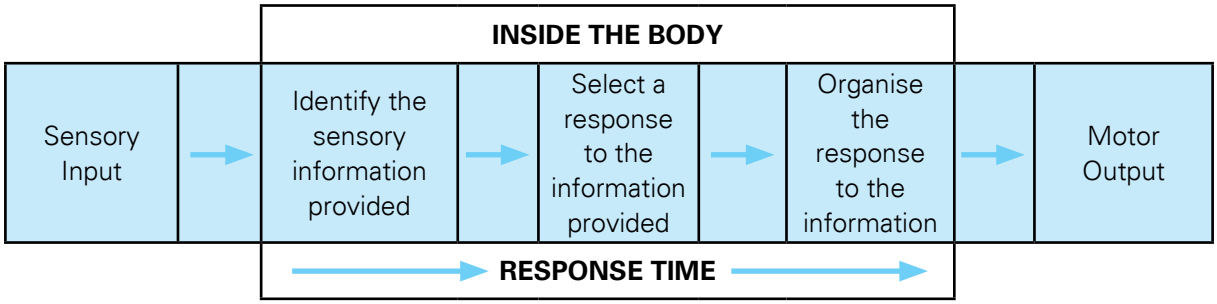
The aim, therefore, is to achieve an arousal level that allows for sufficient narrowing of attention so that unnecessary cues are cut out, but not so much that relevant cues are overlooked.

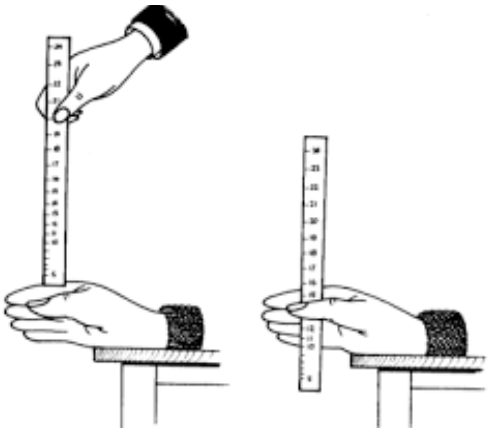
FOLLOW-UP TASK

- Read the Psychology: Control section of the BWF Level 2 Coaches Manual. From this, suggest methods by which arousal levels can be managed in order to achieve optimum arousal levels and control the potential effects (positive or negative) of perceptual narrowing.
- In terms of managing arousal, research the terms "muscle to mind" and "mind to muscle". Gives badminton examples of how you can use these techniques to manage arousal and therefore improve motor learning and performance

RESPONSE TIME

The time taken to make sense of the information, decide on a response and start that response is called "Response Time". This is represented diagrammatically in the diagram below, which is a slightly greater development of the basic information processing model presented earlier in this section.





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The simplest example of response time is when there is only one stimulus and one response. An example would be an experiment where people are asked to respond as quickly as possible to a ruler being dropped by catching that ruler. The greater the distance the ruler drops the longer the response time.

Obviously, sport involves far more than one stimulus and one possible response. This naturally means that sport requires a lot more decision making than that involved in this simple example.

INCREASING THE NUMBER OF POSSIBLE STIMULUS-RESPONSE PAIRS

Hick (1952) demonstrated that the greater the number of possible stimulus-response pairs, the longer the response time. Thus, players who have a greater variety of strokes and produce them with a similar action will manage to increase the response time of their opponents. This can have consequences for the opponent (such as a later and/or off-balance return).

Photo credit: BWF/BadmintonPhoto

THE COMPATIBILITY OF THE STIMULUS AND RESPONSE

The more natural the link between a particular stimulus and a response the faster the reaction time. As an example, a smash played slightly to the forehand side of an inexperienced player would naturally result in a quick reaction to play a forehand stroke on that side of the body.

However, there can be disadvantages to this relationship. For example, if the smash is only slightly to the forehand side it is generally more effective to play this as a backhand as this keeps the elbow away from the body.

Photo credit: BWF/BadmintonPhoto

Although compatible and resulting in a fast response, playing a forehand on the forehand side is not always the best response.

THE RIGHT PRACTICE CAN HELP!

Practice can help players deal with many issues concerned with stimulus and response. Response times can be reduced by practice, with players learning to read the sensory information (e.g., read which stroke is being played), select and organise a response more quickly than without practice. For example, a beginner who tries to jump to the side and return a smash to the body with a forehand stroke (often an undesirable response) can be trained to respond by maintaining his/her body position and returning the shuttle with a backhand stroke.

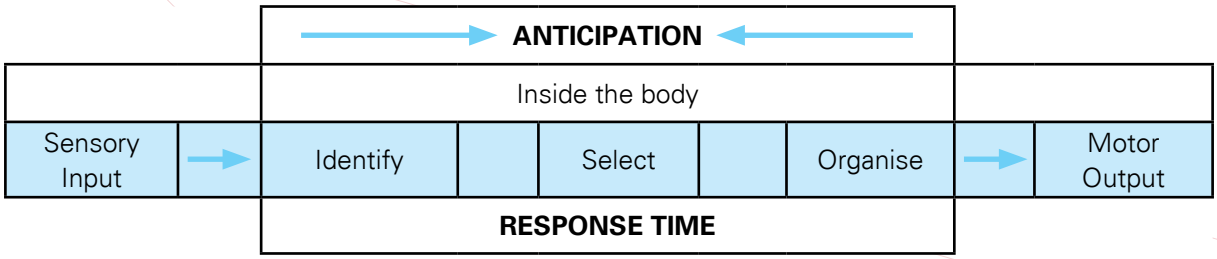
ANTICIPATION AND DECEPTION

The use of anticipation by elite players as one of the defining characteristics of elite-level play was discussed extensively in Module 10 in the Elite Coaching section. Here anticipation will be examined from a motor learning perspective.

Anticipation can be defined as *"being able to predict what event will occur and when"*. Anticipation therefore has two elements:

- What is going to occur (e.g., smash, reverse drop, held clear etc.)?
- When this will occur (take early, late, delayed, etc.)

Anticipation can be used to quicken response time. Diagrammatically this can be represented by a shortening of the response time box shown below.



THE POTENTIAL ADVANTAGES OF ANTICIPATION

Players with highly developed anticipatory skills are able to reduce their response time substantially. However, effective anticipation requires a lot of experience in order to identify aspects such as:

- a particular opponent's favourite shot (played frequently in certain situations)
- the shots they play when approaching a shot with a particular movement pattern
- the pressure their opponent is under
- their body shape in preparation for a stroke
- grip

Photo credit: BWF/BadmintonPhoto

THE POTENTIAL DISADVANTAGES OF ANTICIPATION

Photo credit: BWF/BadmintonPhoto

Whilst anticipation can be valuable there are also disadvantages if that anticipation leads to an incorrect reading of the situation, resulting for example in moving off to the wrong area of a court. For example, a player may anticipate a straight dropshot to their forehand side and prepares mentally to perform a split-step in a particular way so they move quickly to that corner as the opponent strikes the shuttle. However, if the opponent then plays a straight clear, the player may need to "re-programme" their planning and adjust the split-step accordingly. If the anticipation has been taken a stage further, the player may have already performed the split-step prior to the stroke. In this situation considerable mental and physical work would be required to readjust their feet in order to move back to the rearcourt rather than forwards to the forecourt.

COMBATING ANTICIPATION THROUGH DECEPTION

A number of methods can be used to reduce the effectiveness of an opponent's use of anticipation. These methods include:

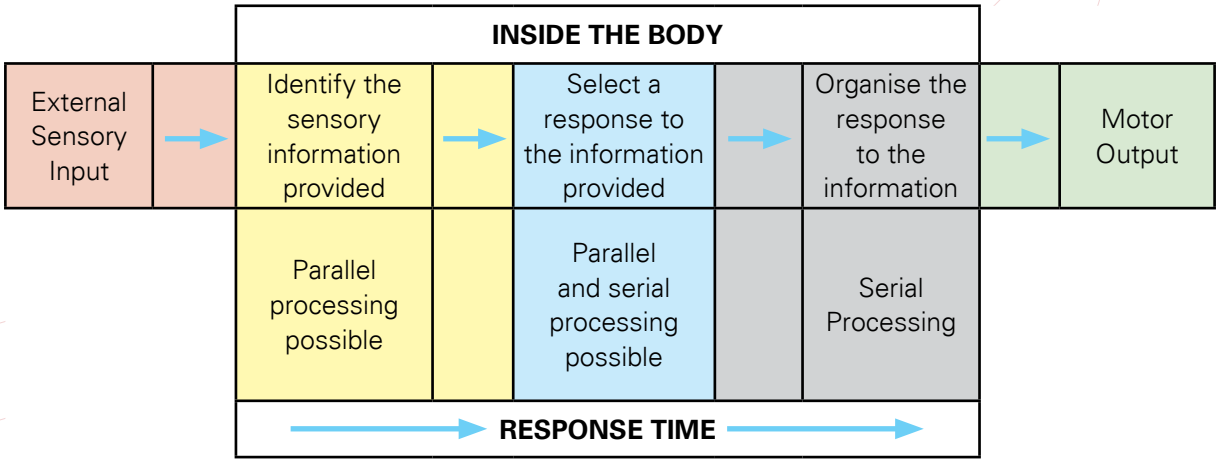
- being able to play a wide variety of strokes
- using the same preparation to play a variety of strokes
- delaying or "holding" stokes so the impact of the strokes is later than expected
- avoiding repetitious patterns of play (unless of course they are winning patterns!)
- using double motions

06. LIMITS TO INFORMATION PROCESSING

It is generally accepted that humans can only process a limited amount of information at a time. Much thought has also been devoted to the ability of humans to deal with information in a:

- serial manner (one piece of information, followed by another, then another, etc.)
- parallel form (i.e., more than one piece of information at a time)

A greater understanding of potential limitations on information processing can be achieved by relating this to the information processing model introduced earlier in this section (repeated and adapted below).



IDENTIFYING THE SENSORY INFORMATION

MacLeod (1991) suggests strongly that we can process more than one type of sensory information at a time, with that information being processed in parallel (i.e., at the same time). So a player's information processing system is capable, for example, of identifying:

- the shape of an opponent's preparation for a stroke
- an opponent's position on the court
- their partner's position on a court
- noise from the crowd
- their own position on the court
- their own state of balance

Limitations of information processing are therefore not thought to be at the sensory identification phase, where more than one piece of information can be deal with in parallel (i.e., at the same time).

SELECTING THE RESPONSE

Schmidt and Wrisberg (2000) describe two types of processing – controlled and automatic - which can occur during the response selection phase of information processing.

Controlled processing:

- is slow
- is serial in nature (only one response dealt with at a time)
- is voluntary (i.e., done under conscious control)
- requires a lot of attention

Automatic processing:

- is fast
- requires little attention
- can operate in parallel
- is involuntary

During the response selection phase, the amount of information that can be processed is likely to be dependent upon the how familiar the person is with the task. Imagine player 1 (an inexperienced badminton player) is in a rally where their opponent (player 2) is playing a forehand net shot, so the shuttle is going to travel to their backhand at the net.

Player 1 has to select from a lot of possible responses, such as:

- how to move his/her feet
- how to position his/her body
- how to carry the racket on the approach
- which stroke to play – lift, held lift, spin net shot, crosscourt net shot, held net shot, etc.

Photo credit: BWF/BadmintonPhoto

In this case, it is quite understandable that the beginner's response selections:

- are slow – with so much to think about
- require a lot of attention, with each possible response competing with another
- will most likely occur one after another, rather than all being addressed at once
- are voluntary, in the sense that the response selection is consciously controlled

In contrast, automatic processing can occur after large of amounts of practice. Thus, an expert player in the same situation will be able to select the appropriate responses:

- quickly
- with less attention
- in parallel (i.e., selecting a number of appropriate responses at the same time)
- involuntarily (i.e., so practiced that it becomes automatic)

First impressions might lead us to believe that automatic processing, brought about by much practice, is ideal for badminton. Responses to an opponent's stroke would be automatic, quick, allow for selection of a number of techniques at the same time and require less attention. This is true to a certain extent; however, it could lead to:

- problems if the opponent is able to change their stroke at the last minute (e.g., from a net shot to a lift), with the receiving player selecting an incorrect movement pattern
- predictability, with the receiving player always playing the same stroke in this situation

Therefore, training for badminton should involve a lot of practice to try to achieve an automatic processing state, however training must include choices/decision-making to reflect the open-skill, variable nature of the sport.

ORGANISING THE RESPONSE

Once the response(s) have been selected, then the brain needs to organise that response. Relating this to the structure of the nervous system, the brain will programme the response and send it through the motor nerves of the peripheral nervous system in order to contract muscles in way that results in the desired technical response. Response programming is thought to occur in a serial manner, meaning we can only organise and start responses one at a time.

The serial, one response at a time, nature of response programming can be used to advantage in sport by learning to use deception. For example, in the rally below:

- Player 1 watches Player 2 (her opponent) approaching the net.
- Player 1 predicts from the shape of the approach that Player 2 is going to play a backhand net shot and begins to programme her response, for example, by performing a split-step so she can push off explosively to the net.
- Player 2 changes the stroke very quickly at the last minute and lifts the shuttle.
- Player 1 has to allow her original response programming to finish before she can form and send a new set of instructions to the working muscles.
- The delay of processing in the previous stage causes Player 1 to move later for the lift, putting her under more pressure.

In order to maximise the effectiveness of deception, it is recommended that:

- any techniques involved in the deception have the same shape, so they are more difficult to tell apart (e.g., straight dropshot and reverse slice cross dropshot)
- any fake action and the actual performed action should happen very quickly, one after the other, meaning the receiving player has less time to readjust
- the fakes should not be over-played so they in themselves do not become predictable

07. MEMORY SYSTEMS

Memory can be defined as *"the process in which information is encoded, stored, and retrieved".*

https://en.wikipedia.org/wiki/Memory (2016)

Memory can be divided into three sections (Atkinson & Shiffrin, 1968):

- Sensory memory (SM)
- Short-term memory (STM)
- Long term memory (LTM)

These are represented diagrammatically below.

<table>
<tr><th>SENSORY INPUTS</th><th>SENSORY MEMORY (SM)</th><th></th><th>SHORT-TERM MEMORY (STM)</th><th></th><th>LONG-TERM MEMORY (LTM)</th></tr>
<tr><td>Seeing</td><td rowspan="6">• Large storage area
• Information held for a short period of time (less than 1 second) (Sperling, 1963)
• Different "sections" of sensory memory depending upon source (e.g., seeing goes to visual short-term memory)
• No conscious involvement</td><td rowspan="6">Selective attention (we choose what to focus upon)</td><td rowspan="6">• Receives selected information from sensory memory
• Small storage area
• Information retained for up to one minute
• Limited in capacity to 5-9 pieces of information (Miller, 1956)
• With practice, information transferred to long term memory
• Information can be received back from long-term memory</td><td rowspan="3">→
Information passed to LTM via rehearsal and meaningful association
→</td><td rowspan="6">• Storage size and storage duration virtually unlimited
• Memories in LTM may never be destroyed – we just have trouble retrieving some memories
• A type of LTM memory known as procedural memory ("knowing how") is most relevant to motor skills</td></tr>
<tr><td>Hearing</td></tr>
<tr><td>Touching</td></tr>
<tr><td>Proprioception (e.g., balance)</td><td rowspan="3">←
Information can be retrieved from LTM and passed back to STM
←</td></tr>
<tr><td>Smell</td></tr>
<tr><td>Taste</td></tr>
</table>

FOLLOW-UP TASK

- In terms of memory, define the term "meaningful association" and explain with examples how this might be used to enhance coaching effectiveness.

MOTOR PROGRAMS

In the previous section, different types of memory were explained. In the Long-Term Memory section, the concept of a "procedural memory" which defines how a motor skill should be performed was introduced. This procedural memory is more often referred to as a "motor program".

Put simply, a motor program can be defined as:

"a set of pre-arranged movement instructions, stored in the Central Nervous System, which defines the underpinning specifics of a movement".

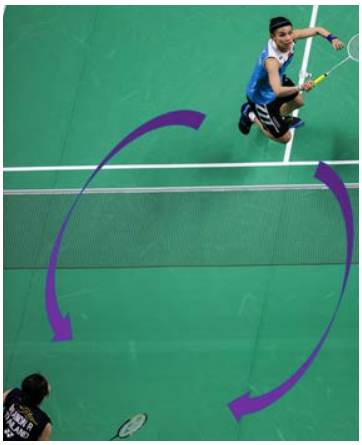
Motor programmes can be broken down into building blocks, often described as "sub-routines". For example, the sub-routines that make up the backhand doubles long defence would consist of:

- Stance
- Racket carriage
- Grip
- Backswing
- Impact
- Follow through

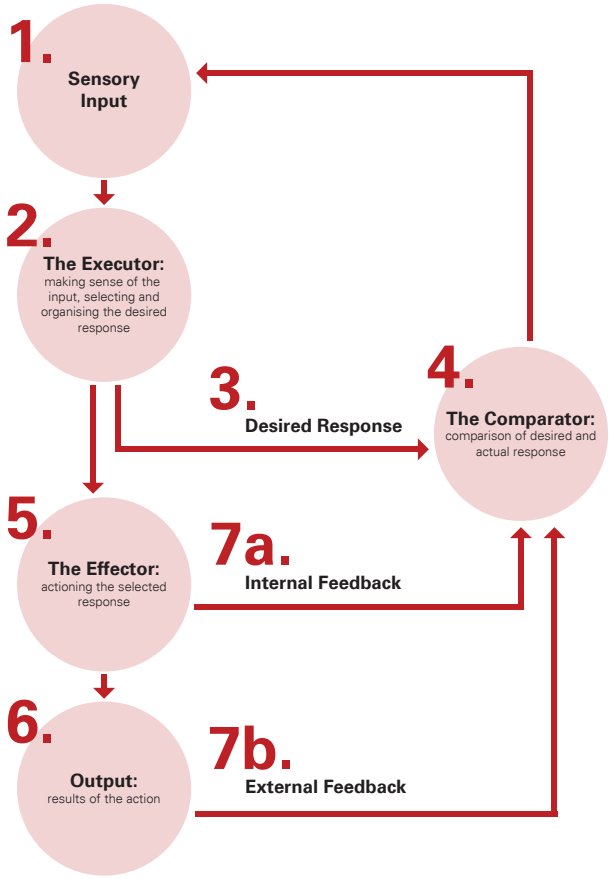
See the "Hitting Skills" modules in the Level 1 and Level 2 manuals for further examples and images.

08. CLOSED LOOP MODEL

So far, we have used a simple three-stage model to describe how motor skills are produced, the stages consisting of ***sensory input***, ***information processing*** and ***motor output***.

Sensory input to the body	Information processing within the body	Motor output from the body
	Interpret sensory input, select and organise a response	

A development of this basic model that can further help our understanding of motor control is the Closed Loop model. A simple version of this model is shown below.



In the closed loop model:

- Sensory input (1) is inputted to the executor (2) which makes sense of, selects, and organises the response. These processes take place in the brain.
- At this stage information about the desired response (3) is sent to a comparator (4) for later use.
- Information about the desired response is also sent to the effector (5). The effector's role is to take the desired response provided by the executive and uses a motor programme to produce the necessary movement instructions. These instructions are sent via the spinal cord and the peripheral nervous system to the muscles. These muscles then contract, acting on the skeleton to produce movement.
- The movement produced by the executor produces an output (6), for example a forehand lift.
- Internal feedback (7a) is provided from muscle spindles, golgi tendon organs, etc. regarding elements such as muscle length, muscle force, balance, etc. This feedback is sent to the comparator (4) for later use.
- External feedback (7b) is provided from sound and vision about the outcome (e.g., lift travels out of the court).
- The comparator compares the internal/external feedback with the desired response and sends details of errors to the input so future behaviour can be adjusted appropriately.

A badminton example using the closed loop model of motor control would be returning a low serve.

Photo credit: BWF/BadmintonPhoto

The receiver:

- watches the serve being delivered (i.e., visual input)
- the executor plans the response, which may include how the receiver's feet might move, how their racket will move, and the shot selected. Information about this desired response is sent to the comparator for later use
- the effector uses a combination of the nervous and muscular systems to initiate the necessary muscle contractions in order to move to and strike the service return. Internal feedback (regarding balance, muscle length, muscle load, etc.) is sent to the comparator
- the muscle contractions bring about skeletal movement, and the service return is performed (the output). External feedback (e.g., the sound of the shuttle on the racket, the accuracy of the return) is sent to the comparator
- the comparator compares the internal and external feedback with the desired state, providing information regarding errors which act as input to influence the executor when that situation arising again.

Although the closed loop system is useful for helping us to understand how we control skills, it does have some disadvantages, most notable of which is that the whole process is slow. Thus, a skilled server who can change their serve to a flick serve in the last part of the action may gain a significant advantage, as the receiver may not be able to change their footwork, racket carriage, etc. in time to readjust and return the flick serve.

09. OPEN LOOP CONTROL

The previous section described the structure and function of a closed loop system of motor control, which contained key aspects such as:

- the use of feedback loops
- a comparator to compare desired and actual outcomes
- the capability to detect errors and make correction in movement

The main disadvantage of the closed loop system of motor control is that because of the complexity it can only work slowly, often too slow for more rapid actions of the body experienced in sport.

However, sport shows us how skilled performers can perform these rapid actions successfully, so an alternative method of motor control, called "Open Loop Control" has been proposed to explain this.

OPEN LOOP CONTROL MODEL

Open loop control is a system used to control fast, distinct movements (e.g., a throwing action). It is a system that consists of the use of stored, pre-prepared instructions in the brain that are sent to the muscular system to bring about a particular movement pattern. The movement is pattern completed so quickly there is no chance for feedback during the movement.

Photo credit: James Varghese

Open loop control of movement is effective provided that the conditions around the production of that movement remain the same. There is no flexibility within the system to change the pre-planned movement once it has begun.

An example would be a player attempting to clear a shuttle under pressure in the forehand rearcourt, with the shuttle well behind them. In mid-stroke, the player may become aware that the shuttle is slightly deeper than first predicted. Unfortunately, because of the speed of the stroke, it would not be possible to adjust the grip position in time change the direction of the stroke, meaning the player may well hit the shuttle out the side of the court.

The open loop control model is illustrated on the next page. Note how it actually contains many of the elements of the closed loop system, apart from the absence of the comparator and feedback loops.

OPEN LOOP CONTROL AND THE MOTOR PROGRAM

The motor program is key to understanding the functioning of the open-loop system. The characteristics of a motor program include:

- a set of pre-set movement commands
- created via practice of that movement
- stored in the brain
- requires little attention when used
- can become more complicated with practice

Specifically, the motor programme exerts the following control upon the muscular system:

- selects the muscles needed to produce the movement
- decides the sequence in which those muscles should be triggered
- sets the level of force exerted by different muscle groups
- controls the time each muscle contracts

1. SENSORY INPUT

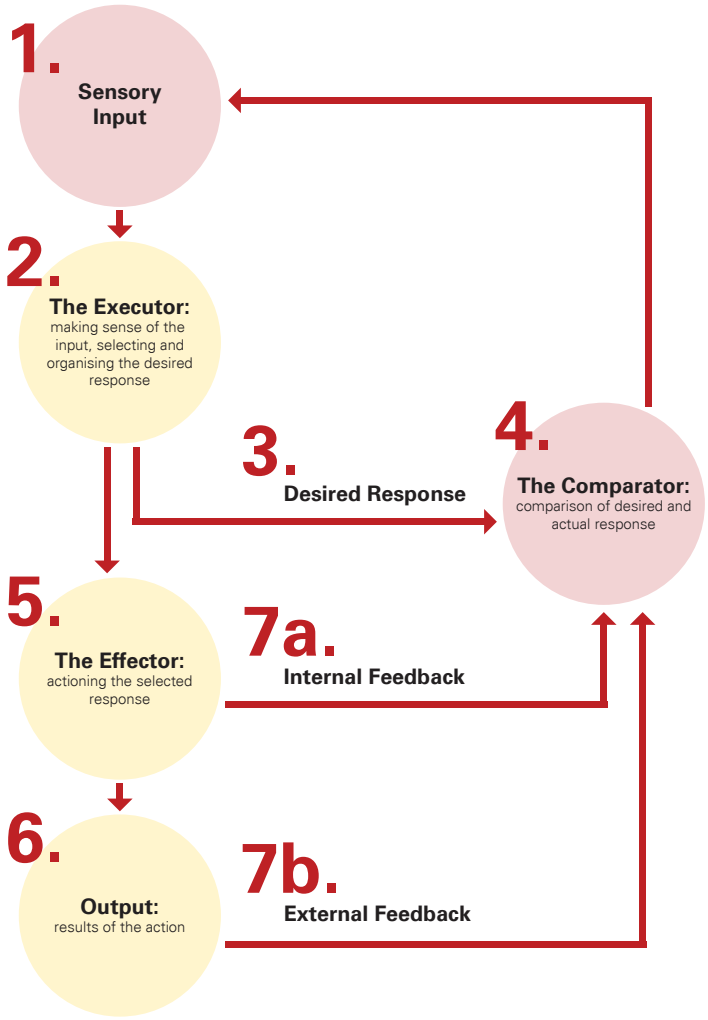
2. THE EXECUTOR	• Making sense of the input • Selecting the response • Organising the response		
3. THE EFFECTOR	• Actioning the selected response	• Motor programme (brain) • Spinal cord and nerves • Muscles	  

4. OUTPUT

10. OPEN AND CLOSED LOOP COMBINED

In the previous sections, both closed and open loop systems were used to explain how the body may control movement. The closed loop system was most appropriate for slower movements and characterised by use of feedback loops and a comparator to detect and adjust errors. The open loop system is more appropriate for faster skills, relying on pre-defined motor programs to control the skill being produced.

In reality, the human body controls movement by using a combination of both closed and open loop control. The diagram below represents this situation theoretically, showing the components of the closed loop system, which contains the open loop system as well (highlighted in yellow).



11. GENERALISED MOTOR PROGRAMMES

Whilst the concept of the motor program is useful, one question not immediately dealt with by the motor program theory is how totally new movements, or variations of an existing movement, can be performed successfully. Motor program theory can explain our ability to perform these new actions by describing each motor program as a "generalised motor program". This generalised motor program:

- would contain the essential instructions required to perform the basic shape of a movement. In particular, these "deep" instructions set the order of muscles used to produce the movement and the relative timing of when those muscles are used.
- has the capacity to adjust this basic programme depending on the requirements of each specific situation. The "surface" adaptations that a generalised movement program would have to be able to provide would be variations in:
  - » speed of movement
  - » force of movement
  - » muscles and limbs

An example of a generalised motor program would be overhead throwing. Deep instructions for overhead throwing would consist of the order of recruitment of muscles (from large muscles to small muscles) and the timing of when those muscles are activated relative to each other. "Surface adaptations" would include the speed of the movement, the force used, and the specific muscles/limbs used.

Photo credit: BWF/BadmintonPhoto

FOLLOW-UP TASK

A basic forehand net lift would be controlled by a motor program that contains all the "deep" instructions required to perform the technically "correct" shape of that stroke. With reference to the concept of a "generalised motor program", explain in detail the possible "surface" variations that may need to be used to play different types of forehand net lift.

Referring back to the content of the BWF Level 2 coaches' manual, describe how you might use varied practice to develop not only a simple motor program for the forehand net lift, but also a more generalised motor program that would help the player use variations of that stroke more effectively.

12. FEEDBACK AND MOTOR LEARNING

Feedback can be defined as *"knowledge of the results of any behaviour, considered as influencing or modifying further performance"*.

Feedback can be split into two subsections: ***intrinsic*** and ***extrinsic*** feedback

- *Intrinsic feedback* consists of feedback that the player experiences naturally when performing a skill. This type of feedback can be split in visual (sight), auditory (sound) and kinaesthetic (feel). An example in badminton would be a player performing a smash - the player would get visual feedback about the accuracy, auditory information from the sound of the hit and kinaesthetic information regarding the flow/balance of shot.
- *Extrinsic feedback* consists of feedback that comes from sources other than the player themselves. Often (but not always) the source of this feedback is the coach – an example being the verbal instruction, "Take your time between serves and breathe deeply". In addition, the specific dynamics of peer feedback at the elite level were discussed in depth in Module 9 (Teamwork and Group Dynamics).

Extrinsic feedback can be used with two potential outcomes in mind:

1. To help the player develop a new skill by assisting them to make choices about what to do in order to be successful.
2. To help motivate the player (e.g., via encouragement)

Great care must be taken here regarding the amount, timing, and type of external feedback to avoid creating a situation where that feedback, rather than enhancing learning, actually becomes detrimental to skill improvement.

VERBAL FEEDBACK

One of the greatest sources of extrinsic feedback is verbal feedback given by the coach to the player. Key issues to consider in this area are:

1. The amount of information given
2. The content of the information given
3. What verbal information should be prioritised
4. The explicitness of the information given
5. The timing of the verbal feedback

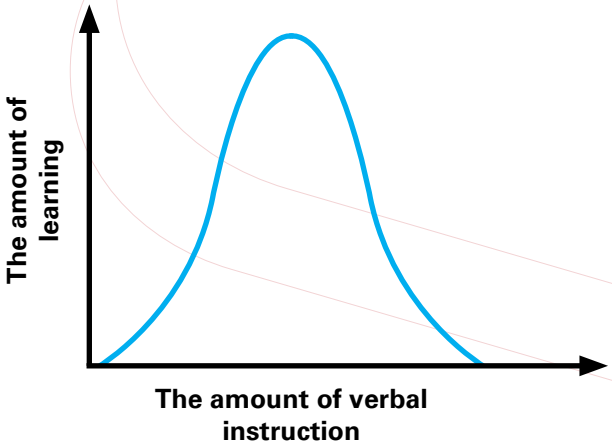
Photo credit: BWF/BadmintonPhoto

THE AMOUNT OF INFORMATION GIVEN

Many badminton skills are highly complex, so this gives great potential for many errors, both technical and tactical to occur. For example, the list below includes a few of the basic aspects that should be in place to perform a backhand net shot effectively.

• Watch the shuttle • Use a thumb grip • Take the shuttle early • Push the shuttle • Hit using relaxed reach		• Foot/ankle/knee aligned • Hips turned • Rear foot turned out • Rear arm extended • Racket head below the hand

The tendency, therefore, is for coaches to give too much information in a well-intentioned attempt to correct everything at once. Unfortunately, this approach is at odds with much research in the field of human memory and learning, which clearly demonstrates that there are severe limitations on the amount of verbal information that can be processed effectively at any one time. Indeed, MacGill and Anderson (2012) have suggested that as little as one piece of verbal information may be enough to bring about optimum improvement in a skill.



This relationship between the optimum skill development and the amount of information given can be represented hypothetically by the graph shown to the left. Note how providing *no* verbal feedback could inhibit skill development (i.e., the player has nothing to work with) whereas *too much* verbal feedback also inhibits learning by confusing the player. The key is for the coach to provide "just enough" verbal feedback for optimum learning to occur.

THE CONTENT OF THE VERBAL INFORMATION

The verbal feedback should be something that the player can relate to. For example, "look at your watch" can be a useful phrase to help the player to establish an effective preparation for a backhand drive.

Coaches should also consider whether use of "judgemental" feedback is either effective or desirable. By judgemental feedback we mean using words such as "poor", excellent", "good", "bad", etc. to describe performance. Gallwey (1974) highlights that such approach introduces great deal of emotion into the coaching which ultimate creates a deterioration rather than improvement in performance.

PRIORITISING THE VERBAL INFORMATION

The verbal feedback has to focus upon the specific aspect of the skill that will bring about the greatest improvement. In order to achieve this the following model is suggested:

- List all the aspects of a particular skill in order, with most essential components first and the least essential last
- Identify the errors being made by the player from the list and select the single, highest priority error to work on only
- Provide feedback on that part of this skill and once corrected, move down the list to the next priority

The effectiveness of this approach has been shown to be effective in developing skills in football, rhythmic gymnastics, and weight training, so a sustained look at this approach applied to badminton coaching might be worthwhile. As an example, the list used previously in this module (focussing on the backhand net shot) will be used. The suggested prioritised list below is literally that – a suggestion – which will hopefully stimulate a debate in this area.

ORDER OF PRIORITY FOR SKILLS DEVELOPMENT OF BACKHAND NET SHOT	REASONING BEHIND THE ORDER
1. Foot/ankle/knee of lunging leg in line	Safety first!!
2. Racket head below hand	It is a shot hit upwards
3. Push the shuttle	Pushing the shuttle gives control
4. Use a relaxed reach	Has potential benefits for 6, 7, 8 and 9
5. Use a thumb grip	Makes the hand more stable on racket
6. Take the shuttle early	Gives opponent less time
7. Hips turned sideways	Improves reach
8. Rear foot turned out	Should happen as hips turn sideways
9. Rear arm extended	Improves sideways stance and balance

Note some useful things to consider when compiling such a list:

- Prioritise safety first.
- Try to think about what is *absolutely* necessary to play the shot. For example, it is not absolutely necessary to play use a thumb grip, but it probably is necessary to push through the shuttle for control.
- Consider introducing a teaching point which will have related benefits for other parts of the skill. For example, a relaxed reach may have benefits to for taking the shuttle early, turning the hips, etc.

THE "EXPLICITNESS" OF THE VERBAL FEEDBACK

For beginners, it has been suggested that telling a player how to correct an error may be most beneficial as that beginner has little knowledge of potential solutions. "Push the shuttle to improve control on your net shot" would be an example of this.

More experienced performers may, however, benefit from a less explicit approach that encourages the player to find solutions to the identified errors. This is where the role of reflexion, as discussed within the elite context in Module 7, comes into play. So the coach may ask the player "how can you improve the control on your net shots", thereby encouraging them to take more ownership of their own learning and develop their own ways to correct an error.

The more skilled coach, however, may be able to enhance the learning of all players by the use of appropriate questioning, as per below:

Coach: *"When you played the shot, where did you intercept the shuttle?"*
Player: *"Hmmm – close to the net, quite high up the net."*
Coach: *"Do you think you could take it even higher?"*
Player: *"Possibly…"*
Coach: *"What would be the advantage of doing this?"*
Player: *"It would give my opponent less time to deal with my shot."*
Coach: *"Good thinking – so when you practice again, what are you going to do to give your opponent less time?"*
Player: *"Intercept the shuttle as early as possible."*

THE TIMING OF THE VERBAL FEEDBACK

The effectiveness of verbal feedback (in fact any type of feedback) should be judged by the ability of the player to perform a particular skill once that feedback source has been removed. One danger is that, if timed inappropriately, feedback becomes an integral part of the skill – i.e., that skill cannot be performed effectively without the associated feedback being present. For example, a coach may shout out the word "reach" just prior to the player striking a forehand overhead in order to encourage them to take the shuttle early.

Photo credit: James Varghese

However, once that coach input is removed, the player may still strike the shuttle from a low position, because the trigger to perform the skill (the coaching shouting out the word "reach") is no longer present.

Increased reliance on verbal feedback to perform a particular skill can occur if the feedback is:

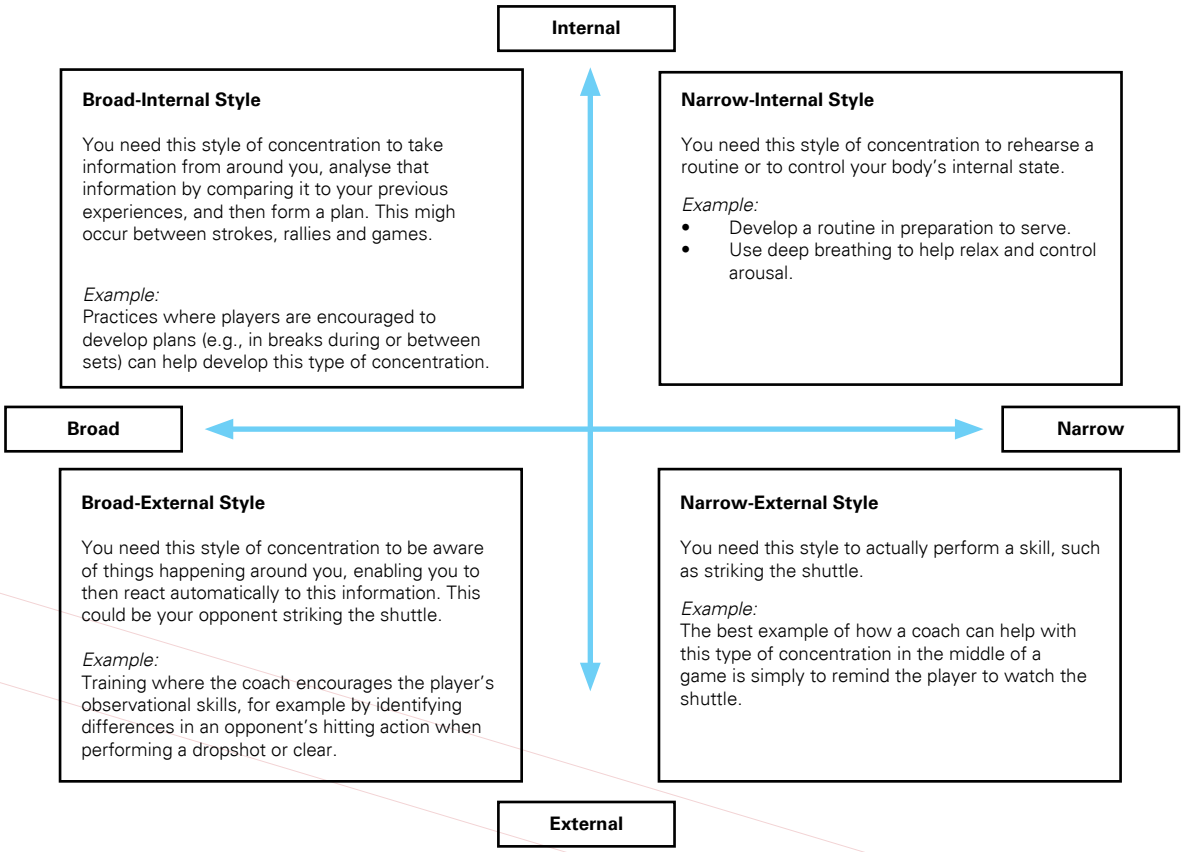
- delivered whilst that skill is being performed
- delivered too frequently
- delivered immediately after performance of the skill

Some of the above issues can be addressed by:

- reducing the amount of feedback
- delaying delivery of the feedback until after a number of practice attempts
- only giving feedback to the player when they request it

13. MOTOR LEARNING AND ATTENTIONAL FOCUS

The Level 2 Coaches' Manual introduced coaches to a model of attentional focus by Nideffer (1976). This model was presented in the context of where athletes can direct their concentration and is repeated below.



The aim of this section is to examine how using different types of attentional focus may reduce or increase the effectiveness of motor learning.

INTERNAL OR EXTERNAL FOCUS?

There is now a considerable body of evidence that motor learning and performance is more effective when participants use, or are encouraged to use, an external rather than internal focus (Wulf, 2007). Examples of studies that support the use of adopting an external focus when learning or performing motor skill are listed in the table below and are split into research that focuses on:

- the outcomes of adopting an internal or external focus
- physiological responses when adopting an internal or external focus

STUDIES SUPPORTING THE USE OF AN EXTERNAL RATHER THAN INTERNAL FOCUS WHEN PERFORMING MOTOR SKILLS		
TYPE OF EVIDENCE	**MEASUREMENT**	**AUTHOR**
Support for adopting an external focus using the *outcome* of motor skill performance	Vertical Jump Height	Wulf and Dufek (2009); Wulf, Dufek, Lozano and Pettigrew, 2010; Wulf, Zachry, Granados and Dufek (2007)
	Broad Jump Length	Porter, Ostrowski, Nolan, and Wu (2010)
	Maximum force production during elbow flexion	Marchant, Greig and Scott (2009)
	Kicking a football (accuracy)	Ford, Hodges, Huys and Williams (2009)
	Basketball free throw (accuracy)	Zachry, Wulf, Mercer and Bezodis (2005)
	Dart throwing (accuracy)	Lohse, Sherwood and Healy (2010)
	Riding a pedalo (speed)	Totsika and Wulf (2003)
	Agility run (speed)	Porter, Nolan, Ostrowski and Wulf (2010)
	Swimming performance (speed)	Freudenheim, Wulf, Madureira, Pasetto and Correa (2010), Stoate and Wulf (2011)
	Muscle endurance	Marchant, Greig, Bullough and Hitchen (2011)
Support for adopting an external focus using *physiological measures*	Electromyography (EMG) to measure muscular activity when performing sports skills	Vance, Wulf, Tollner, McNevin and Mercer (2004); Marchant, Greig and Scott (2008); Zachry, Wulf, Mercer and Bezodis (2005); Lohse, Sherwood and Healy (2010); Lohse (2012); Marchant, Greig and Scott (2009)

The reasons behind this observed behaviour have been explained using the constrained action hypothesis (Wulf, McNevin and Shea, 2001). This hypothesis proposes that adopting an internal focus produces a level of conscious control that inhibits potentially more efficient automatic motor control mechanisms. Put simple, the mind starts to interfere with skills that the body can achieve on its own if left alone. In support of this, the studies using EMG indicate that an internal focus appears to be linked to additional (unnecessary) neuromuscular activity. In comparison, adopting an external focus allows the body's automatic, unconscious motor control system to operate in an uninhibited manner, with the desired outcome being achieved almost as a bonus to this automatic process. Further development of the constrained action hypothesis by Wulf and Lewthwaite (2010) have indicated how instructions which focus internally on the body (e.g., bend your wrist, turn your body more, etc.) can easily invoke a more self-conscious state and choking during performance of that skill.

APPLYING AN EXTERNAL FOCUS APPROACH TO BADMINTON COACHING

If the research outcomes previously described are transferable to badminton coaching, then this may require coaches to think differently about how they coach skills to players.

For example, a coach may ask a player to push their hand forwards and bend the wrist back in order to prepare for a forehand lift. The previous research would suggest that this may not be the best approach to support motor learning is it encourages the player to adopt an internal focus, thereby inviting the problems identified within the constrained action hypothesis.

In this situation, reaching over a barrier and dropping the racket head would provide an alternative, external focus that theory would suggest is more conducive to learning.

Of course, this approach assumes that we all learn in the same way and there are certain variations to this approach that are worth considering. These variations include:

- How "external" should the focus be?
- How might the complexity of the skill change the coaching approach?

HOW EXTERNAL SHOULD THE FOCUS BE?

There is some evidence to support the idea that expert performers can successfully adopt a more "distant" external focus, both in terms of time and distance (Bell and Hardy, 2009). For example, an expert performer may focus on:

- performing a high serve which achieves a particular depth and height. This focus is well away from the player's body in terms of distance.
- anticipating their opponent's probable replies to the high serve. This focus is well away from the server's body in terms of time.

In contrast, a beginner might benefit from adopting an external focus, but one that is closer to their body (Wulf, McNevin, Fuchs, Ritter and Toole, 2000). For example, the beginner may be encouraged to point the racket directly upwards at the start of the backswing for the forehand high serve.

HOW MIGHT THE COMPLEXITY OF THE SKILL CHANGE THE COACHING APPROACH?

There is some support for the notion that the more complex the movement, the more relevant it is to adopt an external focus for optimal skill learning and performance (Marchant, Greig, Bullough and Hitchen, 2011; Wulf, Tollner and Shea, 2007).

14. SKILL ACQUISITION AND IMPLICIT/EXPLICIT LEARNING IMPLICIT LEARNING DEFINED

Implicit learning can be defined as *"the acquisition, modification or reinforcement of knowledge, behaviours, skills, values or preferences in an incidental manner, without awareness of what has been acquired"*. Possibly the most quoted example of implicit learning would be riding a bike, where success is achieved without reference to conscious application of concepts such as centre of gravity, base of support etc. If questioned, people who have learnt implicitly would have difficultly explaining how they achieved the task successfully.

EXPLICIT LEARNING DEFINED

In contrast, explicit learning can be defined as *"acquisition of skills and/or knowledge actively and with awareness"*. If questioned, people who have learnt explicitly would be able to explain in detail the key characteristics of what they are doing.

PRACTICAL DIFFERENCES BETWEEN EXPLICIT AND IMPLICIT LEARNING

There are several differences between implicit and explicit learning, including:

- Performers who have learnt a task implicitly are often less able to describe knowledge they have acquired about that task.
- Implicit learning is not as restricted as explicit learning, with the latter being limited by the information-processing capacity of the brain (Marois and Ivanoff, 2005).
- Tasks learnt implicitly are more robust, meaning they are less affected by other factors (e.g., time pressure, anxiety, etc.) than tasks learnt in an explicit manner (Reber, 1993; Dienes and Berry, 1997).

The latter point (i.e., robustness) is possibly of most relevance to the coaching of badminton, as it would mean that skills learnt implicitly in practice are more likely to withstand the pressures of competition.

IMPLICIT, EXPLICIT OR BOTH?

Researchers, in an attempt to study implicit learning, often used a dual-task approach where the conscious attention of the participants is taken up by one task, "forcing" the other task to be learnt implicitly. An example might be to perform a task whilst reciting the alphabet. The problem with this type of approach is that motor learning is slowed considerably.

In an attempt to rectify this, it may be worth trying to gently push the learning process towards the implicit end of the continuum, rather that forcing it completely to that end.

In reality, learning is unlikely to be purely implicit or explicit in nature, but rather a combination of both. In other words, most learning experience will lie on a continuum somewhere between purely implicit and purely explicit learning (see the diagram below).

IMPLICIT LEARNING		EXPLICIT LEARNING
◄	———————	►
UNCONSCIOUS		CONSCIOUS

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