Skill acquisition

To support the coach there is a wealth of scientific information based on research conducted with athletes. Information is available to support the coach and athlete in all areas of training and development including nutrition, biomechanics, psychology, physiology & medicine. There are a number of scientific methods to measure and analyse the athlete's performance e.g. computer aided analysis of VO2 max, lactate levels, running technique etc.
The art of coaching comes when the coach has to analyse the scientific data and convert it into coaching and training programmes to help develop the athlete. This analysis process relies heavily on the coach's experience and knowledge of the event/sport and the athlete concerned.

By understanding the science, which is the foundation of training, a well designed training program can be developed that will help an athlete reach their full potential. The art is understanding the science and then applying it.

Skill is a commonly used word, widely interpreted across a variety of subjects; however, in sport we tend to use skill as more of a concept rather than just a word. The term skill is referred to in terms of existing within a sport (i.e. a tennis serve or a golf shot), or as sport itself being a skill.

Within sport, skill is seen as a co-ordinated act, often involving complex movements brought together in a consistent and ultimately smooth manner. The interpretations of what constitutes a skilful movement is based upon our own experiences and, perhaps past performance, it is in this way that an intermediate performer may have a different view from an expert performer.

Skill to the untrained sporting eye can be if a particular play or manoeuvre in essence 'looks good'; to some extent this may be true, a skill performed correctly should look acceptable but the real litmus test is the end product if you are to be successful.
In fact respected scientist Alan Traviss Welford described skill as; "An organised co-ordinated activity in relation to an object or situation which involves a whole chain of sensory, central and motor mechanisms".
There are a number of qualities widely regarded as essential for a performance to be classified as skilful;

- Consistency
- Accuracy
- Control
- An intention
- Fluidity

The broader meaning of skill has become open to classification, the need to classify stemming from the over exuberance of a new breed of coaches to tackle the ever increasing influence of technology in sport, and to embrace this new haven rather than fight against it. The so-called 'old school' methods are becoming more prehistoric as time passes, skills are now assessed using high powered computer programmes, although the role of coach is still key in the overall appraisal of performance. This new brand of classification means that certain areas of a coaches program can be set aside and broken down in a way that is easier to evaluate, to a certain extent focusing

on the testing finer points of the skill acquisition of the athlete, with the notion being that the 'bigger picture' will be sorted out in transition.

Cognitive skills, or intellectual skills, involve thought processes e.g. adding up the score cards in golf, or measurement of a golf drive off the tee, this can also be applied to tactics within a game itself, changing tactics to take advantage of a weakness in the opponent (e.g. if you are facing an immobile opponent in tennis you may use the drop shot more often, similarly if the opponent is small you may utilise the lob shot more, or returning a shot to the opponents 'weaker' side). This classification of skill requires a deep knowledge of not just the game you are participating in but a effective understanding of your opponents game, a phrase commonly used in sports being that 'he/she knows the game inside out.'

Perceptual skills are interpretation of stimuli; this may mean interpretation of the same information by two people completely differently. A person with high perceptual skills can usually process information quicker, therefore reacting quicker; this is often called 'reading the game'. E.g. reading signs whilst a player is serving in tennis, either in their stance, their ball toss, or the position of their racket, in order to get to the ball quicker to make your return shot. Another example would be in golf whereupon the player reads the situation according to the course (hazards/obstructions), and the environment, and applies slice, swing, spin or curve to the ball to manoeuvre the course.

Motor skills involve the muscular system, concerning movement and muscular control e.g. running to the net to return a drop shot in tennis, or a golf swing. Motor skills are fundamentally co-ordinated body sequences and motor programmes

Perceptual motor skills due to the complex nature of sport, do not involve just one type of skill but many, most skills are referred to as perceptual motor skills as they involve the three above together; thought, interpretation and movement combined.

"See → Interpret → Think → Move"

In order to learn and perform any type of skill we must first have the required abilities. These abilities that you have are generally regarded as being innate – they are developed early in life, or you are simply born with them.
Some examples of specific abilities are; hand/eye co-ordination, depth perception, flexibility and speed, without these abilities it would not be possible to learn skills such as a tennis smash. In fact most abilities are vital to success in sport, for example a lack of hand-eye co-ordination in tennis would invariably lead to an embarrassing number of miss-hits due to the ball not hitting the racket in the correct position, and if that is, the ball hits the racket at all

To perform a particular skill in sport we must learn the required technique, in order to learn the technique fully, we must have the necessary abilities.

Skill = ability + technique

It is often perceived that performers at the highest level must have been born with natural abilities or develop the specific techniques for them to perform the skills at such a high level.
These abilities can be essentially perceptual, essentially motor or a combination of both. Most abilities to do with action are a combination and are referred to as psychomotor abilities. At the present time there is no definitive list of psychomotor abilities.

Stallings L M (1982) identified the following psychomotor abilities: Muscular power and endurance, flexibility, balance, coordination and differential relaxation (selective adjustment of muscle tension). Fleishman E A (1972) identified the following nine psychomotor abilities (referred to as gross motor abilities): Extent flexibility, dynamic flexibility, explosive strength, static strength, dynamic strength, trunk strength, gross body coordination, gross body equilibrium and stamina.

If you are of average height, strong, good coordination and have an abundance of fast twitch fibres in your legs then you have the natural ability to be a sprinter

If we are to apply the above terms to specific sports we see that some skills, abilities and techniques are similar in different sports, whilst completely different in other areas.

For example a comparison can be made between a golfers swing, and a top-spin shot in tennis, or a cricket shot; all three skills are similar in the fact that they involve a swing of the arm to make contact with a ball, they each of course, have different techniques, a golf swing hits a stationary ball whilst tennis and cricket deal with a moving ball.

It is in this way also that they require different abilities, since in golf the ball is stationary the manipulation of any spin onto the ball to navigate the course is solely down to the golfer themselves, in tennis and cricket the player has to return a ball, usually already spinning towards them having been manipulated by their opponent in order to beat them. The success of the reading of this manipulation of the ball towards a player can be determined by the level of the performer, with experience and knowledge a player can read these signs better and quicker by enhancing their perceptual skills.
Some sports have similar abilities required such as table tennis and tennis, where there is common ground over the aim – to beat your opponent, and in making shots, by applying and reading spin on the ball. There is however different technique involved in the two shots, partly because of the equipment used (the size of the bat in table tennis and the table being much smaller than the racket and the court in tennis), and partly because of the speed of the game being much quicker in table tennis so naturally technique differs.

In terms of abilities there is more of a coincidence between different sports than in skill and technique, as each ability tends to cover larger criteria, and therefore can be applied to a wider range. If you are comparing two sports such as tennis and golf there are common abilities such as spatial awareness; assessing space for a shot either at the pin in golf or into a position on a tennis court where your opponent cannot return, hand-eye co-ordination; in hitting the golf ball itself and making a return shot in tennis, and flexibility; this helps in technique of both, being fle xible allows a better golf swing as well as a better return of a tennis shot. There are aspects of different abilities that are not commonly shared; speed for example, whilst not essential in tennis is of great benefit, whilst there is no need for speed at all in golf. Some sports require speed as somewhat more fundamental, such as obviously sprinting, and governed by your position the games of football and rugby, showing that ability can also be applied to intricacies within specific sport rather than just the sport itself as a whole.

Since the teaching of skills has become more important so has the need to categorise them. It is regarded that if we know the general requirements of a particular skill then we can find a suitable environment and method to learn or teach them in. Many theories of classification are based on the concept of continua; skills can be classified, based on their requirements, on a sliding scale.
Most skill classification systems are based on the view that motor skills are affected by three factors:

- how precise a movement is

- whether the movement has a definite beginning and end
- whether the environment affects the performance of the skill

The Gross and Fine Continuum

This continuum is concerned with the precision of movement - gross and fine skills

Gross skills involve large muscle movements, where the major muscle groups are involved. The movements are not very precise, and include many fundamental movement patterns such as walking, running and jumping. The shot putt is an example of a primarily gross skill, as is a golf swing or a backhand swing in tennis.

Fine skills involve intricate movements using small muscle groups, tend to be precise and generally involve high levels of hand-eye coordination. A snooker shot or playing the piano are examples fine skills, as are a drop shot in a tennis match

The Open and Closed Continuum

This continuum is concerned with the effects of the environment on skills - Barbara Knapp's open and closed skills

Sports such as Netball, Football, and Tennis usually involve open skills. This is because the environment is constantly changing and so movements have to be continually adapted. Therefore, skills are predominantly perceptual. The skill is mostly externally paced, for example a pass in football or a return in tennis.

Closed skills take place in a stable, predictable environment and the performer knows exactly what to do and when. Therefore, skills are not affected by the environment and tend to be habitual. Movements follow set patterns and have a clear beginning and end. The skills tend to be self-paced, for example a free throw in Basketball, and serving in Squash or Tennis, it is in this also that we discover some sports to cover both open and closed skills. For example in a tennis match a serve would be, as stated, a closed skill, whereas the return of serve would be an open skill.

Barbara Knapp suggests that skills can fit on a continuum between open and closed.

The External and Internal Paced Continuum

This continuum is concerned with the timing of movements (and is often used with the open-closed continuum) - internal and external paced skills

Internally paced or self-paced skills: the performer controls the rate at which the skill is executed. These skills are usually closed skills. i.e. javelin throw, discus or a golf swing.

Externally paced skills: the environment, which may include opponents, controls the rate of performing the skill. The performer must pay attention to external events in order to control his/her rate of movement. These skills involve reaction, and are usually open skills. i.e. in ball games such as tennis and football the performer must time his actions with the actions of other players and the ball.

The Discrete, complex arrangements and Continuous Continuum

This continuum is concerned with how well defined the beginning and end of the skill are - discrete, serial and continuous skills.
Discrete skills are brief, well-defined actions which have a clear beginning and end. They are single, specific skills, which make up the actions involved in a variety of sports such as hitting and throwing. i.e. a penalty flick in hockey.
Serial Skills are a group of discrete skills strung together to make a new and complex movement. i.e. the sequence of skills for the triple jump.
Continuous skills have no obvious beginning or end. The end of one cycle of movements is the beginning of the next, and the skill is repeated like a cycle. These skills could be stopped at any moment during the performance of the skill. i.e. Swimming, Running, Cycling.

Individual, Coactive and Interactive skills

Individual skills are those performed in isolation. e.g. Figure Skating, high jump
Coactive skills are those performed at the same time as others but without direct confrontation. e.g. running, swimming

Interactive skills are those performed where other performers are directly involved. e.g. rugby, football, basketball, netball, where a high degree of perceptual skill, required to consider all the factors is required and often honed whilst competing in what are effectively team sports .

Self and Externally paced skills

Self paced skills are those that are instigated by the performer and externally paced skills are those where the timing of the performance of the skill is not controlled by the performer, but by an outside instigator.
The classic examples of self paced skills are that of the golf swing and the snooker shot, both require no limit on the time taken for either, although one has to take into consideration the aspect of sportsmanship, whereas a externally paced skill, a return of tennis serve for instance can often only be performed once your opponent has performed their action, a reactionary skill essentially, requiring obviously high perceptual skills.

Bibliography

Class notes, 2003-2004

Webb, D. (1986) Enhancing performance, St. George, London

Yannick, E. (1990) Technology in sport today, Deguisson, Paris

Webliography

www.sportcoachuk.co.uk