



Positive transfer may occur because these two skills have a similar form.

Transfer and schema

Two similar theories of learning

Carl Atherton looks at the effects of two theories that try to explain how sports performers can use their existing knowledge of sports skills to help them learn new activities.

Have you ever tried a new sport? In your first session did you use a skill with which you were already familiar? For example, a netball player may have used a netball pass to help in the initial stages of playing basketball. Such multi-use of skills can be explained

by the concept of **transfer** of training. An understanding of the different types of transfer can be useful to the coach and player to help in skill learning.

Proactive and retroactive transfer

In sport, transfer of training is defined as the effects of learning and performance of one skill on the learning and performance of another. The time scale in which the transfer occurs is important.

For example, in some cases, as in the case of the netball player learning to play basketball, the player is using a skill she already knows to affect the performance of a new task. This is known as proactive transfer – in other words, the learned skill of the netball pass is taken forward into basketball.

On the other hand, the effects of transfer can be taken back to a skill we already know. When the netball player returns to netball training after playing basketball, there may be some effect on her netball pass. In this instance, when the skill being learned is taken back to a skill we already know, the transfer is called retroactive.

Positive and negative transfer

Positive transfer is when one skill helps the initial learning and performance of another skill. For such beneficial effects to occur, the two skills involved must have a similar shape and form in the way that they are executed. For example, if you know how to perform a tennis serve, it may be possible to use the **subroutines** of that serve to help learn the overarm volleyball serve. Both these tasks involve a throwing action, an overhead hit and a trunk rotation. Importantly, the subroutines of both tasks are used in a similar way. So, in the early stages of learning the volleyball serve, the coach could draw on existing knowledge of the tennis serve to help. As the performer develops, the use of feedback could refine the task

Key box 1

Subroutines Parts of the task that can be practised individually, and which combine to make the whole skill.

so that the volleyball serve improves technically.

Negative transfer also occurs in the initial stages of learning, only now the learning and performance of one skill is hindered by the learning and performance of another. For negative transfer to occur, there may be a vague similarity between the two tasks. A hit in rounders and a cricket shot both involve striking actions, but if you attempted a cricket shot as you would hit a rounders ball, often one-handed and at waist height, it is likely you would be bowled out!



Negative transfer occurs when two skills have some similarities.

Negative transfer tends to occur when the two tasks involved have some similarities but are not identical. The subroutines of the tasks may be used in a different way.

Zero transfer

Zero transfer is often confused with negative transfer. Remember that for negative transfer to occur there must be

some resemblance between the two tasks. In zero transfer there are no such similarities and therefore no effects of the learning and performance of one skill on another. There is no negative and no positive transfer. Two skills such as a swimming stroke and a move in rock climbing are so different that there is no learning effect from one to the other.

Bilateral transfer

There is a type of transfer that can occur within the performer. A good basketball player who is right handed will be able to do a layup shot with her right hand. The player may wish to use this knowledge to help transfer the actions of the right-handed layup to the left

hand, so that the overall performance is improved. Transfer across the body from one limb to another is called bilateral transfer.

Positive transfer in action

The type of transfer that is most beneficial to both coach and player is positive transfer, and there are ways that the coach can encourage positive transfer.



Bilateral transfer may help the player to perform this layup shot with either hand.

Simply pointing out the concept of transfer to the player might help. The volleyball coach might inform new players that knowledge of the tennis serve is going to be used to help with

the initial actions of the volleyball serve.

One of the best ways to promote positive transfer is to offer a realistic approach to training and practice. In the

early stages of learning to dribble in hockey, the coach may use cones and no defenders to make it easy to master the task. In the later stages of learning, the players may have to transfer this skill to the real game — and there are no cones to play against then! In practice therefore the coach should introduce opponents and perhaps do drills that involve attack against the defence to simulate a real game situation. The more realistic the practice, the more likely it is to have a benefit in the game.

Key box 2

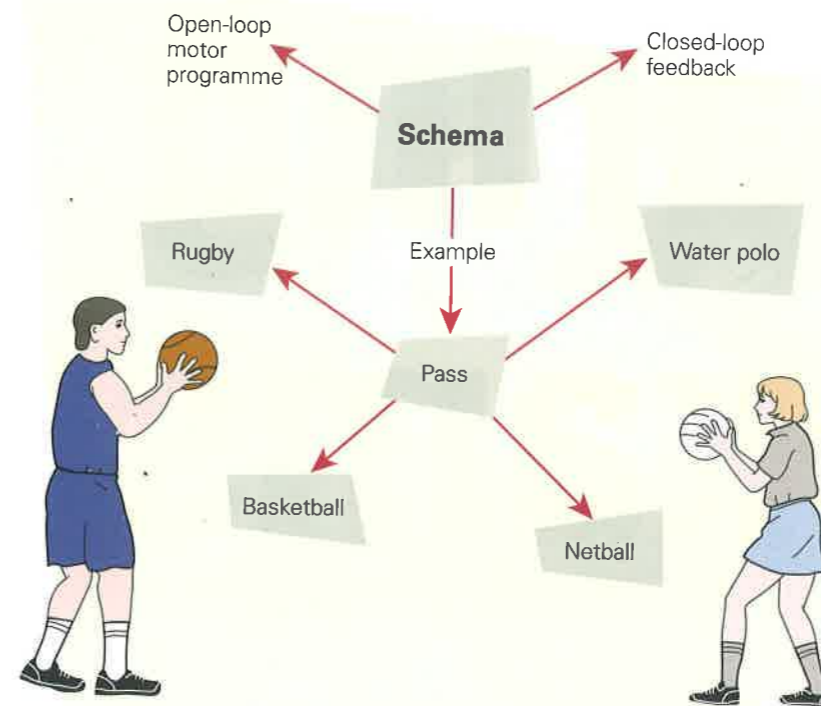
Positive reinforcement A strategy used by a coach to encourage a player to repeat a successful response — for example, by giving incentives such as praise or rewards after the successful response.

The coach could also use **positive reinforcement** to get the most out of positive transfer. When a player brings a skill from one game to another he is currently learning, and uses that skill to good effect, the coach might praise the player and say, 'We can use that to start with and then we can build on it.' One way to use the concept of positive transfer during training sessions is to make sure that the tasks are performed gradually, in a progressive manner, so that the easiest part of the skill is learned well before moving on to a more difficult aspect of the task. When learning a pass, we might concentrate on the grip of the ball before progressing to the actual passing technique, and then to passing against passive opponents.

Key box 3

Progressive part practice Each part of a skill, starting with the early part, is gradually added together in sequence until the whole task is completed.

The effects of transfer can be temporary. In the case of negative transfer the performer can, in time, adapt to the



A schema uses feedback to adapt the principles behind a skill so that it can be used in different situations.

demands of slightly differing skills and become proficient at more skills and more than one sport.

Schema theory

A more permanent method of adapting to new skills comes in the form of **schema theory**. A schema can be used by more experienced players and, in a similar way to positive transfer, the player may use his/her experience of different games and different skills to build up a bank of concepts that are the basis for effective performance.

In our netball/basketball example, there are similar principles behind the execution of a pass in both games. They both involve passing to a target player, they both involve grip of the ball, and both require an arm action and a follow-through. To initiate a pass in either game, the player could use the basic concepts of passing, stored in the memory in the form of a **motor programme**, and then adapt them with some internal feedback to suit a specific situation. In other

words, the principles of passing stored in the memory could be used for a basketball or a netball pass — and why stop there? A rugby pass and even a pass in water polo could be performed using concepts or schema, since they are all types of hand passes in sport.

Key box 4

Motor programme A set of movements stored in the memory that specify the components of a skill.

Once experience has been built up, in order for the player to use the schema effectively, there are four principles that must be adhered to. These four parts of the schema need to be used whenever schema theory is applied by a performer in sport. They are:

- The **initial conditions**. In the first instance, the player needs to gather information from the environment. In a basketball pass the player would need to know his position on court and the positions of his team mates.

- The **response specifications**. The basketball player now needs to know what he should do. He may decide on the best type of pass to use.

- The **sensory consequences**. The player needs to gather some sensory information to help in adjusting the weighting and timing of the pass. Using vision to spot the best available recipient of the ball is an example.

- The **response outcome**. The player, after the pass has been delivered, might gain information on the outcome or result. Did the pass reach its intended target for example?

The first two parts of the schema — the initial conditions and the response specifications — could be recalled from memory, especially since an experienced player will have faced similar situations many times before. These first two parts are therefore referred to as the **recall schema**.

The third and fourth parts of the schema require the performer to use sensory information to adapt the task using feedback gained from the environment. The sensory consequences and the response outcome are therefore referred to as the **recognition schema**.

The schema theory can be a useful learning tool for a coach and player, and therefore the coach should encourage the development of schema by building up the player's experience with a variety of practice and using positive reinforcement when the player uses a schema in training or playing.

The idea of using our existing sporting knowledge to help us adapt to new games and skills is one that you might have experienced without even realising it. Perhaps now that you have some idea of the facts behind the theory, you might begin to realise your own examples of transfer and schema in sport.

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