Transfer and schema

Two similar theories of learning

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 overhead 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 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!

Key box 1

Subroutines Parts of the task that can be practiced independently and which improve to make the whole skill.

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.
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 them. 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
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 cur-
rently 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 gradu-
ally added together in sequence until the
whole task is completed.

The effects of transfer can be tempo-
rary. In the case of negative transfer the
performer can, in time, adapt to the
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,
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 basket-
ball 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.

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 recipi-
ent 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 spec-
fications — could be recalled from
memory, especially since an experi-
enced player will have faced similar situa-
tions 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 environ-
ment. The sensory consequences and
the response outcome are therefore
termed 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 reinforce-
ment 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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