

Badminton training.

Skill acquisition

The goal of motor training is for the player to learn movement patterns that can be produced automatically without having to 'think about them' (*automatic processing*). A learnt movement pattern is a motor skill. To acquire a new skill or modify (improve) a pre-existing skill the brain has to go through two stages:

1. players have to process new information consciously. (*controlled processing*)
2. after a time these new skills then imprint new or modified actions into the automatic regions of the brain

The actions will then become automatic and do not require conscious thought to execute and can be regarded as an automatically processed skill.

Brain overload!

The brain has a limited capacity to perform controlled processing which in turn limits the first stage of skill acquisition. The controlled processing load on a player can be described as the number of variables and decisions that they have to take into account consciously during training. These can be:

- Stimuli - such as shuttle movements, opponent actions, or feedback from the coach
- Decision-making - what to do and when
- Modifying or learning new actions

Controlled processing overload comes when there is too much information to be processed. This results in a rapid reduction in training ability. Coaches should therefore look to minimise controlled processing load. A general rule of thumb is to get players to **learn only one thing at a time**.

Mental processing and training

During a rally the player performs three mental processes:

- stimuli acquisition - obtaining information from the environment
- motor control - executing actions
- decision-making - linking stimuli to motor control

Stimuli acquisition involves identifying and processing important stimuli which include the position and movements of players on court and the movement of the shuttle.

Motor control involves activating the muscles in a sequence to produce an action. This includes shots and movement.

Decision-making is based on the stimuli. In response to a situation (and history via memory) the player will decide on which actions to execute. Therefore decision making is the 'glue' between stimuli acquisition and motor control.

To avoid controlled processing overload, these three mental processes should be trained in isolation. This means either the only one mental process is present in a training situation or the other processes have already be trained to an automatic state.

Methods of training the mental processes:

Stimuli acquisition:

- The player hits to the coach (or another player).
- The coach then hits a shot of his choosing
- The player must call out what shot was played. This can be conditioned so that the player identifies direction, depth, trajectory etc.
- The player must not respond physically to the shot as this involves motor skills and decision making.

An alternative is to use video clips and computer technology. Video clips can be recorded from the point of view of the player and processed so that a computer knows what type of shot is being played and when. The player can the practice identifying shot types on the computer. The computer can record how accurately information is processed and how quickly.

Motor control:

- The player should be presented with a repeating situation that changes as little as possible (in order to avoid the necessity for decision-making).
- This requires accurate feeding to one or more known locations, or shuttles should be positioned statically such as on top of the net.
- The player then repeats the shot or movement.

Decision-making:

Once a player can recognise a set of situations and has the motor skills to use in response, the player can then train to associate the correct response action with the stimuli presented. For example:

- The player hits to the coach (or another player)
- The coach then hits a shot of his or her choosing
- The player then responds with the correct actions (motor skills)

Variation at the heart of motor skill training

It has been found that instead of practicing one action repeatedly, it is better to vary the action continuously. Even if there is one desired outcome, practicing actions that give different but similar outcomes (e.g. varying by speed or distance) enables the brain to learn more about the action in general.

For example, in one study (Shea & Kohl 1991) two groups of participants trained to be able to precisely exert a given force on a stress gauge. One group trained solely on the target force whilst the other group trained at four different forces as well as the target force (total number of practices was the same so they had fewer practices at the target force). The group that trained exclusively at the target force initially acquired the skill faster. However, when tested later, the varied group had retained their skill much better and outperformed the static group.

Several studies have confirmed this type of result. In the short term, single item or blocked practices acquire the skill faster. However over the long-term (and not that long term at that), the varied practices result in greater skill retention and better performance. **Variation should therefore always be used in motor skill training.**

For badminton this means that when first learning shots they should be grouped. For example, instead of coaching a smash, coach over-arm actions in sequence - smash, fast drop, half smash, slow drop, smash, fast drop, etc. Later, to perfect accuracy, have one shot but vary the angle each time or vary the court position from where the shot is hit. Note that if court position is varied, care must be taken to avoid overloading controlled processing with stimuli and response training. Do this by either accurately feeding to known positions or by training accuracy after stimuli and responses have been trained to an automatic level for this situation.

When using variation initial progress may be slower but the varied practice will ultimately prove better in skill retention.

References and suggested further reading

Shea, C.H., & Kohl, R.M. (1991). Composition of practice: Influence on the retention of motor skills. *Research Quarterly for Exercise and Sport*

Extract from article on Badmintology