Motor skill learning and technology

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Sami Kalaja, PhD, director
Research Institute for Olympic Sports

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Motor learning is a set of processes associated with practice or experience leading to relatively permanent gains in the capability for skilled performance (Richard A. Schmidt)
Basic elements of skill training (Lenoir 2012)

- Repetitions
- Variation
- Feedback
Power law of practice
(Ericsson 1993)
Skill training increases the amount of brain myelin
(McKenzie 2015; Underwood 2014; Zatorre 2012)

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Variability of training (Schöllhorn 2009)

Fig. 8. Hypothetical graph for the unification of several learning approaches.
section of a stimulated brain  
section of an unstimulated brain
Feedback

- Knowledge of performance
- Knowledge of results
- Optimal frequency of augmented feedback
Transfer

• Transfer is characterized as the extent to which a response in one task or trained situation affects the response in another task or untrained situation (Adams 1987)

• Skill acquisition should occur in a practice context that is authentic and similar to those that might occur in the game (Magill 1998)
Fitts & Posner three-stage model (1967)

Cognitive stage
Associative stage
Autonomous stage

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In the cognitive stage the learner concentrates on performing the skill. The focus is on discovering what to do, and there is high variability and a large number of errors in performance because the learner is trying many different ways of solving the problem. (Mononen 2007)
In the associative stage, the learner is able to detect and considerably correct the errors of performance. The learner focuses on the dynamics of the skill in order to perform smooth and refined actions. He or she also demonstrates more consistency and efficiency in performance because strategies for skill refinement become more subtle. (Mononen 2007)
Autonomous stage

• The autonomous stage can be reached after extensive practice. In this stage, the learner does not have to concentrate on the skill and is able to perform the skill without paying attention to the movement itself. In this stage the performer only makes small errors but is now able to detect and correct them and produce an optimal performance. Performance improvements are somewhat difficult to detect during this stage, as the learner is reaching the limits of his or her capabilities. (Mononen 2007)
The needs for technology

- Not too much information
- Different information to athlete and coach (cognitive knowing vs muscle memory)
- Fast feedback
- Bio-feedback online
- Easy to use