Fluctuations in classical learning theories provide evidence for an underlying principle

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Established motor learning approaches such as repetition learning (Gentile, 1972), learning by means of a methodical series of exercises (Streicher, 1928), the variability of practice hypothesis (Schmidt 1985), and the contextual interference hypothesis (Magill, 1990) all purport to provide evidence for specific optimal learning strategies. Associations between these theories have been rarely discussed and conceptual deviations are typically considered as a result of noise or measurement error.

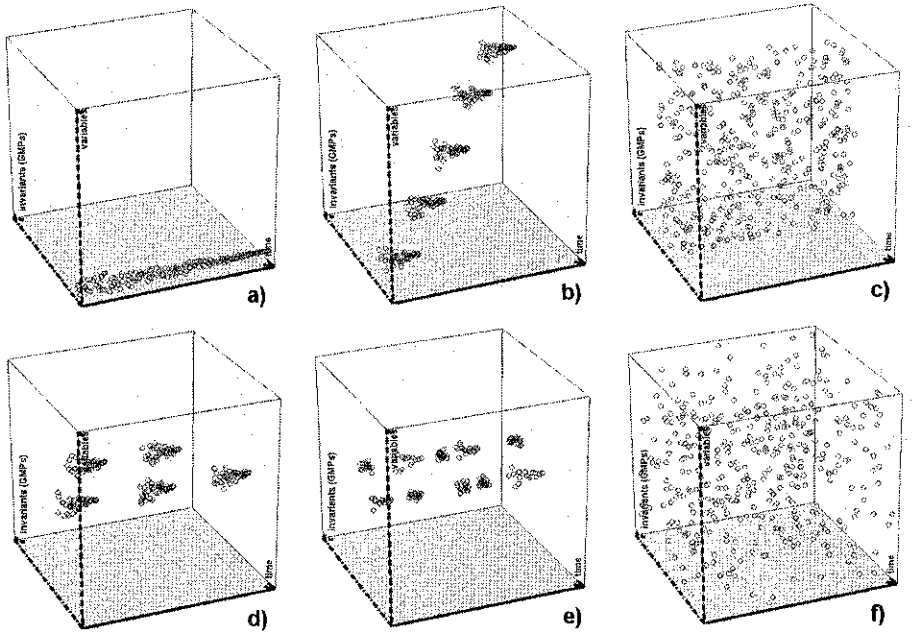

Figure 1: Depiction of invariants (dash-dotted axis) and variable parameters (dashed axis) over time (solid axis) in different motor learning approaches: a) repetition, b) Methodical series of exercises, c) variability of practice, d) low contextual interference, e) high contextual interference, f) differential learning.

However, if we consider the limited amount of applications of Schmidt's (1985) invariants on movements highly influenced by muscular forces, but less so by gravitational and inertial forces (Schneider et al., 1987), then fluctuations of invariants and variable parameters seem unavoidable when moving in complex and dynamic

performance contexts. If key concepts (i.e., invariants and variable parameters) of the variability of practice hypothesis are interpreted within the framework of other established learning approaches (Figure 1), then the major influence of fluctuations becomes obvious.

This presentation proposes that each learning approach can be considered as a small subset of the whole space of solutions in motor learning that can best be depicted by scanning the whole volume of the invariant-variable-parameter- space in the form of a lattice-like self organizing neuronal map. Such an approach emphasises the potential role of differential learning theory as introduced by Schöllhorn (1999). In conclusion, several experiments provide evidence for advantages of exploiting underlying principles in terms of fluctuation enhancement during the acquisition process. Whether the width of the lattice depends on the subject, on the subject's history or on the task, will open a new field of motor learning research.

8. From perception to action: A re-appraisal of the Milner/Goodale model

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How do we get from perception to action? In 1995 Milner and Goodale supplied a surprising answer to this question: perception does not lead to action, rather visual perception and visually-guided action are processed in parallel, anatomically distinct and largely independent streams of our visual system. According to this model visual perception is processed in the so-called ventral stream, whereas visually-guided action is processed in the dorsal stream. This model proved immensely popular: it is clear, testable and simple. However, evidence from recent studies suggests that perhaps it is too simple.

In this session we will review the evidence for the perception/action model and focus on its three main streams of evidence: studies with form agnostic patient DF, studies with patients suffering from lesions to the dorsal stream, and studies on the different effect of visual illusions on perception and action.

Jeroen Smeets will introduce the perception/action model. He will argue that this model assumes a coherent representation of visual space in the brain with regards to distance, direction and position. He will present experimental findings which challenge that assumption and he will show that if those inconsistencies between position on one hand and direction/distance on the other are taken into account the dissociation between perception/action with respect to visual illusions disappears.

Thomas Schenk will present findings from recent experiments with patient DF He will show that DF's selective perceptual deficit can be turned into a selective visuomotor deficit if the spatial format of the task is changed. On the basis of this and similar findings he will argue that DF's behaviour is better characterized as a dissociation