Motor Learning and Motor Development: A Special Emphasis in Children’s Motor Behavior

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Motor learning – Motor development

A process of change

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Motor learning – Motor development

A process of change

Different time-scales

... and (traditionally)

two separate research areas
Fifty years of changes

dramatic changes in the principles and applications of motor learning and motor development
Fifty years of changes

dramatic changes in the principles and applications of motor learning and motor development

but still

a gap between theory and practice

with deep implications for sports professionals and other human movement related applications
Fifty years of changes

and also:

A limited body of knowledge

A bunch of theoretical contradictions

A set of beliefs that keep on ruling practice with no consistent scientific background
Motor learning in the sixties

Memory as a “storage department”: the memory drum theory

What happens during the storage process?
Motor learning in the sixties

Memory as a “storage department”: the memory drum theory

What happens during the storage process?

Bilodeau & Bilodeau: The acquisition of skill
(“buy” a skill and place it in memory)
Motor learning in the sixties

Memory as a “storage department”: the memory drum theory

What happens during the storage process?

Bilodeau & Bilodeau: The acquisition of skill (“buy” a skill and place it in memory)

The amount of practice paradigm

The power law and the (soft) learning curves

Feedback is good – more feedback is better
Motor learning in the sixties

Stability, stability, and more stability

Error = central instability + peripheral imperfection

Error can be reduced
therefore
Error can be eliminated !!!

The solution for the “error problem”? 

Good models, good feedback and 
lots of practice
Motor learning in the sixties

First models to describe motor learning

Keele and Adams
the first closed-loop theories to motor control
Motor learning in the sixties

First models to describe motor learning

Keele and Adams
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The manipulation of feedback

The sacred trilogy: Demonstration, Feedback and Amount of Practice
Motor learning in the sixties

Common theoretical approaches to learning (in general) and to motor learning?

Is it possible to look at motor learning in a non-cognitive way?
Motor learning in the sixties

Common theoretical approaches to learning (in general) and to motor learning?

Is it possible to look at motor learning in a non-cognitive way?

Nikolai Bernstein (who is this guy?)
The co-ordination and regulation of movements

First ideas about self-organization

Learning motor skills is not simply a mind’s problem: it is a body-mind problem
Motor learning in the sixties

perception as a brain’s reconstruction of the information from the senses
- the indirect perception mode -

James Gibson (Who is this guy ??)

The first experimental approaches to perceptual information guidance in motor skills.

The seminal contributions of John Whiting and David Lee
Motor learning in the sixties

Perception as a brain’s reconstruction of the information from the senses - the indirect perception mode -

James Gibson (Who is this guy ??)

The first experimental approaches to perceptual information guidance in motor skills.

The seminal contributions of John Whiting and David Lee

Is it possible to regulate movements without a heavy cognitive load ?

This is surprising but ... Yes, we can...

We do it all the time, like the worms, the bees, the rats, the monkeys ...
Motor learning - Present and future

Learning is not a matter of “how much” practice

Performance curves are long memory series with intrinsic noise
Motor learning - Present and future

Learning is not a matter of “how much” practice

Performance curves are long memory series with intrinsic noise

The theoretical impossibility of repeating a movement

The importance of enhanced variability

The leading role of error during the learning process
Motor learning - Present and future

How valuable is error?

Promoting error – better learning?

Changing practice conditions leads to long term stability of movements?

How much variability?

What kinds of variability?
Motor learning - Present and future

How valuable is error?

Promoting error – better learning?

Changing practice conditions leads to long term stability of movements?

How much variability?

What kinds of variability?

Learning phases: are they useful to organize the learning process?

Is it necessary to break stability? (the traditional third phase in a learning process)
Motor learning - Present and future

What is the nature of peripheral adaptations?

What do we really control in the execution of movements?
Motor learning - Present and future

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What do we really control in the execution of movements?

What is the relevant information for movement control?

Can athletes and coaches detect the information that is really useful?
Motor learning - Present and future

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What do we really control in the execution of movements?

What is the relevant information for movement control?

Can athletes and coaches detect the information that is really useful?

How do we manage the perception-action cycle?

What is “motor memory” after all?

What is the anticipation of movement execution?
Motor development in the sixties

The predictable sequence of motor development

Biological maturation leads the process

Development as a lawful process: find the laws and you’ll guess the future

All children follow the same path (developmental sequences are universal)

... and at the same time (chronological invariance)
Motor development in the sixties

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Cognition – Emotion – Movement: different domains of human development

The body is a mechanical system that grows
Motor development in the sixties

Strength, Flexibility, and Endurance

Biological determinants of human performance

Growth and development: infancy and adolescence
Motor development in the sixties

Strength, Flexibility, and Endurance

Biological determinants of human performance

Growth and development: infancy and adolescence

The development of physical fitness

Physical education programs and the education of fundamental skills

Ralph Wickstrom’s description of fundamental motor patterns
Motor development in the sixties

Performance standards at different ages

Gender differences

Black & White

Is it possible to detect talent for sports?

Is it possible to predict future performance?

What is the meaning of physical fitness?
Motor development: present and future

Skill: a never ending process

Biological and cultural determinants of skill
- This seems a really complex topic -
Motor development: present and future

Skill: a never ending process

Biological and cultural determinants of skill
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Important things happen at very early stages

A dynamical systems approach to motor development

(Esther Thelen’s legacy)
Motor development: present and future

Motor development as an independent variable, not just a consequence of biology and environment

Secular trends in motor development: breaking the Gesell’s milestones
Motor development: present and future

Motor development as an independent variable, not just a consequence of biology and environment

Secular trends in motor development: breaking the Gesell’s milestones

Social, cognitive, and emotional correlates of motor development

Forget the population: we are individuals (single case research)
Motor development: present and future

Virtual environments are so attractive....

--- and movement activities are so boring
Motor development: present and future

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--- and movement activities are so boring

The new paradigm of video games and computer interaction.

The fabulous development of visual perception using graphic interfaces and the development of finger dexterity and visuo-motor coordination.
Motor development: present and future

The tremendous reduction of movement games and play during infancy

The urban stress
The lack of free spaces for play
The waste of critical periods of development
The reduction of social play
Danger: prevent accidents – prevent movement activities
Stay quiet and watch TV
Motor development: present and future

Obesity:

- Minimal physical activity
- Health problems
- Altered body image
- Motor control problems
- Reduced participation in sports
Motor development: present and future

The increasing interest in movement disorders

Is this just a scientific and pedagogical fashion?

Is this a real problem?

What is the real dimension of this problem?

Movement therapists for the kids?
Thank you for your attention

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