Book of Abstracts

European Workshop On Movement Science

Faculty of Human Movement Sciences
VU University Amsterdam
May 31 – June 2, 2007
www.ewoms.eu

Organizing Committee

Peter Beek (Amsterdam, the Netherlands)
Wolfgang Schöllhorn (Münster, Germany)
Willem Verwey (Enschede, the Netherlands)

Scientific Committee

Peter Beek (Amsterdam, the Netherlands)
Axel Cleeremans (Bruxelles, Belgium)
Sten Grillner (Stockholm, Sweden)
Marc Jeannerod (Bron, France)
Wolfgang Schöllhorn (Münster, Germany)
Gregor Schöner (Bochum, Germany)
Willem Verwey (Enschede, the Netherlands)

The conference organization gratefully acknowledges the support of our sponsors.
See pages 209 – 216.

Bibliografic Information of the German Library
The German Library includes this publication in the German National Bibliography;
detailed bibliografic data are available at http://dnb.ddb.de

European Workshop On Movement Science
Mechanics – Physiology – Psychology
Book of Abstracts
VU University Amsterdam
Faculty of Human Movement Sciences
May 31 – June 2, 2007
Köln: Sportverlag Strauß, 2007
ISBN 978-3-939390-73-2

Olympiaweg 1 - 50933 Köln
Telephone: +49(0)2 21 8 46 75 76
Fax: +49(0)2 21 8 46 75 77
Email: info@sportverlag-strauss.de
Cover design: Hopf Kommunikation & Service, Berlin
Print: buch bücher dd ag, birkach
Printed in Germany

Conference Program

Thursday, May 31, 2007

10.00 – 11:00	Registration (registration desk) & Coffee Reception (foyer)	
11.00 – 11.15	Welcome (aula)	Peter Beek, Wolfgang Schöllhorn, Willem Verwey
11.15 – 12:30	**Keynote Lecture 1** Chair: Wolfgang Schöllhorn (aula)	**Daniel Wolpert** Probabilistic models in human sensorimotor control
12:30 – 13:30	Lunch (behind / around aula)	Posters & Industrial Presentations (behind / around aula)
13:30 – 14:45	Symposia (parallel sessions)	1 (aula), 2 (auditorium), 3 (2A05)
14:45 – 15:00	Break (foyer)	
15:00 – 16:15	Free Communications (parallel sessions)	1 (aula), 2 (auditorium), 3 (2A05)
16:15 – 17:45	Poster Session 1 (behind aula)	Industrial Presentations (around aula)
17:45 – 19:00	**Keynote Lecture 2** Chair: Willem Verwey (aula)	**David Rosenbaum** The problem of serial order in behavior: Lashley's legacy
19:00	Boat Trip with Dinner	(busses leave from VU campus parking lot)

Friday, June 1, 2007

08.45 – 10:00	**Keynote Lecture 3** Chair: Peter Beek (aula)	**Jeffrey Hausdorff** Gait dynamics, fractals and falls: Finding meaning in the stride-to-stride fluctuations of human walking
10.00 – 10:15	Break (foyer)	
10.15 – 11.30	Symposia (parallel sessions)	4 (auditorium), 5 (2A05)
11:30 – 11:45	Break (foyer)	
11:45 – 12:30	Plenary Industrial Presentations (auditorium)	
12:30 – 13:30	Lunch (behind / around aula)	Posters & Industrial Presentations (behind / around aula)
13:30 – 14:45	Symposia (parallel sessions)	6 (auditorium), 7 (2A05)
14:45 – 15:00	Break (foyer)	
15:00 – 16:15	Free Communications (parallel sessions)	4 (auditorium) , 5 (2A05), 6 (2A06)
16:15 – 17:45	Poster Session 2 (behind aula)	Industrial Presentations (around aula)
17:45 – 19:00	**Keynote Lecture 4** Chair: Willem Verwey (aula)	**Scott Grafton** Motor control is built on scaffolding of goal hierarchies: Insights from functional imaging and magnetic stimulation studies
20:00	Dinner & Entertainment (Zuiderkerk, Amsterdam)	

Saturday, June 2, 2007

09.15 – 10:30	**Keynote Lecture 5** Chair: Wolfgang Schöllhorn (aula)	**Art Kuo** The six determinants of gait and the inverted pendulum analogy: A dynamic walking perspective
10.30 – 10:45	Break (foyer)	
10.45 – 12.00	Symposia (parallel sessions)	8 (auditorium), 9 (aula), 10 (2A05)
12:00 – 13:00	Lunch (behind / around aula)	Industrial Presentations (around aula)
13:00 – 14:15	Free Communications (parallel sessions)	7 (aula), 8 (auditorium), 9 (2A05)
14:15 – 14:30	Break (foyer)	
14:30 – 15:45	Symposia (parallel sessions)	11 (aula), 12 (auditorium), 13 (2A05)
15:45 – 16:00	Break (foyer)	
16:00 – 17:15	**Keynote Lecture 6** Chair: Peter Beek (aula)	**Michael Turvey** Action and perception at the level of synergies
17:15 – 17:30	Concluding Remarks (aula)	Peter Beek, Wolfgang Schöllhorn, Willem Verwey

Contents

Book of Abstracts....1

Conference Program....3

Contents....7

Keynote Lectures....17

1. Probabilistic models in human sensorimotor control....17

2. The problem of serial order in behavior: Lashley's legacy....17

3. Gait dynamics, fractals and falls: Finding meaning in the stride-to-stride fluctuations of human walking....18

4. Motor control is built on scaffolding of goal hierarchies: Insights from functional imaging and magnetic stimulation studies....19

5. The six determinants of gait and the inverted pendulum analogy: A dynamic walking perspective....19

6. Action and perception at the level of synergies....20

Symposia....21

1. Movement Sequences 1: Insights from various tasks....21

Effect of hand used and hand position on the discrete sequence production (DSP) task....21

Sequential effects on awareness of simple motor acts....22

Activity in prefrontal cortex during dynamic selection of action sequences....23

Motor programming for speech sequences....23

Learning by observation: an EEG study....24

2. Neural Synchronization....25

Assessment of normal and disturbed functional connectivity with EEG and MEG....26

Amplitude and phase dynamics of brain and muscle activation in rhythmic movements....27

Neuronal coherence as a mechanism of effective corticospinal interaction....28

Amplitude and phase synchronization during learning – changes in the neural dynamics accompanying perceptual-motor integration 29

3. Energetic constraints on human gait 30

Methodological issues in measuring metabolic energy expenditure during gait 30

The relationship between running economy and the moment arm of the Achilles tendon: Energy storage in the tendon is more sensitive to muscle moment arm than to mechanical properties of the tendon 31

Oxygen cost of gait before and after knee replacement in patients with osteo arthritis of the knee 32

Biomechanical modeling and analysis of the energy cost of amputee walking 34

Mechanical and metabolic energy effects of reduced ankle motion in human gait 35

4. Long-range dependence in human movements: detection, interpretation, and modeling perspectives 36

Exploring the origin of long-range dependence in human timing: Effects of sensory feedback and relations between synchronisation and production 37

Fractal modeling of synchronization tapping in line with continuation tapping 38

Synchronisation and syncopation: A common timing model. 39

Models for 1/*f* noise in psychological time series 40

5. Perception, cognition, and action in skilled performance 41

The processes underpinning skilled recognition and anticipation in soccer 42

Game-reading skill in youth soccer: Investigating underlying mechanisms 43

Low dimensional dynamic information underlies anticipation skill in tennis 44

Current insights into the visual basis of basketball shooting 45

6. Movement Sequences 2: Insights from the serial reaction time task 46

Disjoint chunks vs. graded statistics: learning is continuous in the SRT task 46

Contextual dependent motor learning in a static environment 47

Implicit learning of sequences: discretness versus continuity 48

How incidental sequence learning creates reportable knowledge: The role of unexpected events 48

7. Noise and adaptive behaviour 49

Self-organisation of the VO_2 dynamics in exercise physiology 50

Movement pattern variability: Neurobiological noise or adapative behaviour during motor learning 51

Non-linear stochastic map models of motor learning 52

System identification strategies and time scales in motor learning 53

Fluctuations in classical learning theories provide evidence for an underlying principle 54

8. From perception to action: A re-appraisal of the Milner/Goodale model 55

The Milner/Goodale model and inconsistent perception 56

The perception/action model: Revisiting the evidence from patient DF 57

The Brentano illusion influences movements of the left and right hand to the same extent 58

Diagonistic apraxia, anarchic hand and bimanual incoordination due to an anterior callosal lesion 59

9. Invariants of discrete and continuous movements 60

Threshold position control and its timing in discrete and rhythmical actions 61

Discrete movements as a special case of continuous motion: Fitts' aimed movement paradigm 62

Towards an appropriate analysis of the dynamics of human movement 62

Distinct mechanisms underwrite human timing 63

10. Horse-rider interaction 64

Comparison of learning approaches in horse dressage riding 65

The measurement of pressure forces created by the contact of a rider's body on the horse's back during hippotherapy 66

Motion pattern analysis of gait in equitation by means of Karhunen-Loève transform 67

Evaluation of pressure distribution under a fitting and a too wide saddle with different saddle pads 67

Effect of head and neck position on temporal and force parameters in the unridden and ridden horse at the trot 68

11. Goal−directed actions: From function to movement 69

How do experts exploit the redundant degrees of freedom of the arm to achieve the functionality of the task? The case of stone knappers in India 70

Adapting the movement to the properties of the tool: the case of hammering in chimpanzees 71

Looking for 'search variability': the case of a highly skilled bowing technique in violin playing 72

Squatting: a specific postural system 74

Interpersonal distance modeling: The case of fighting activities 75

12. Constraints on interlimb coordination 76

Synchronisation of hand-foot coupled movements does not need interlimb feedback interactions 77

Teasing apart sources of interlimb interactions 78

Different strategies in coping with amplitude versus directional interference during bimanual movements 79

Optimal control theory predicts task-dependency of bimanual feedback control and feedforward adaptation during reaching movements 80

13. Clinical coordination dynamics 82

Sway regularity depends on the amount of attention invested in postural control: findings from patients recovering from stroke 82

Intra-limb coordination during gait in children with CP 83

Identifying pathological gait patterns using principal component analysis 84

Sensitivity of an inertial motion analyse tool for clinical gait evaluation. 85

Free Communications 87

Session 1 87

Rhythmic instruction and motor learning 87

The ambivalence of self-controlled (motor) learning: A model-guided psychological analysis 88

Action as cognition and the status of psychology as a natural science 90

The influence of stress and muscle fatigue on implicitly and explicitly learned motor skills 90

Shift, shuffle, and shrink: Three components of performance improvement in a throwing task 91

Session 2 92

Prehension of an object placed at a large distance 92

Recalibration of arm movement planning 93

Signal-dependent and -independent noise in precision aiming 94

The effect of visual context on grip planning 95

Prehension is really reaching and grasping 96

Session 3 97

Balance and vibrating insoles 97

A neuromusculoskeletal model of spinal reflexes during posture control 99

The neuromuscular control of voluntary fall techniques during a fall 100

Sensory-motor integration for path navigation and postural stability 101

Elderly use different strategies than young adults when viewing a target away from the heading direction during gait 102

Session 4 103

Some factors that influence how we intercept moving targets 103

Why fielders track the ball 104

The contribution of stereo vision to the control of braking 105

The detection of optical acceleration 106

Exploiting new perception-action solutions in ball bouncing: dynamics of learning and perceptual basis 107

Session 5 108

Negotiating expected and unexpected level changes in gait 108

A simple control for balance in walking 109

The effect of arm movements on balance recovery after tripping 110

A dynamical perspective on the realization of the walk-to-run transition 111

Involuntary locomotion in healthy humans 113

Session 6 114

Coordination dynamics of discrete and rhythmic bimanual movements 114

Computational load as a source for coupling of bimanual movements 115

Information shapes behavioural dynamics: The example of reciprocal aiming 116

Planning and execution of bimanual object manipulation 117

Informational and musculoskeletal underpinnings of anchoring 118

Session 7 119

Brains in Space I - Effects of stress onto sensorimotor adaptation 119

Does the brain predict the consequences of fast movement corrections? 121

Latent movement imitation in professional dancers and non-dancers: an ERD study 122

Impairment of isometric force control in altered gravity: effects of central motor commands, segmental excitability and stress level 122

Error correction but not adaptation is impaired in patients with cerebellar degeneration 123

Session 8 125

Strength scaling in human musculoskeletal models 125

Modulation of muscle force feedback to affect human ankle admittance 126

COM mechanical energy during a cyclical working task 128

The advantage of handedness in a force control task performed by children between 6 and 12 years old 129

Equilibrium point control cannot be refuted by experimental reconstruction of equilibrium point trajectories 130

Session 9 131

Movement strategies associated with an obese group 131

How dynamic properties can explain artistic dance situations 132

Signs of interpersonal coordination while walking in pairs 133

Determination of area of maximum functionality in selected equine muscles through a combination use of dissected specimens, ultrasonography and surface electromyography..... 134

Development and validation of prototype instrumentation for measurement of equine radial hoof strain *in vitro* 134

Poster Presentations 137

Session 1 137

Learning upright stance with externally rotated foot position 137

Different cortical activation patterns due to two different proprioceptive modalities in ACL reconstructed patients 138

Joint angles during stair climbing compared using two different measurements devices. 139

Gaze behavior and unwanted effects in aiming actions: Further evidence for Wegner's theory of ironic processes 140

Changes in actions when learning to use a new tool 141

The use of strategies in motor learning: Validation of a new questionnaire 142

Relationship between menarche and anthropometric factors in 14 female athletes of the age 15-17; longitudinal and correlation study. 144

Classical and probabilistic dimension analysis of the Edinburgh Handedness Inventory 144

Comparison of neuronal activity in external cuneate nucleus, spinocerebellar cortex and interpositus nucleus during passive limb movement. 146

Intra-limb anticipatory postural adjustments prior to index flexion in man 147

Directionally specific preparatory activity 148

Neuro-muscular failure as a self-organizing phenomenon 148

Preparatory heart rate deceleration and focus of attention during balance beam performance 149

Disentangling the effects of attention and amplitude on interlimb coordination asymmetry 150

The effect of triceps brachii prefatigue on biceps brachii fatigue: an electromyographic study 151

Does low and high contextual interference lead to different levels of noise? 153

Neural correlates of visual adaptation: An fMRI study 154

Why is manual performance with an isometric joystick impaired in hypergravity? 155

Optical flow stabilizes locomotion at transition speed 156

The importance of vision in the control of walking in children: Preliminary results 157

Neuromonitoring in a golf putting task: Discrimination of skill level in different conditions 158

Effects of in-patient rehabilitation on the metabolic system and physical capacity of obese children and adolescents 159

Computer simulation of the functioning of a gait simulator for neuro-motor disabled persons 160

Simultaneous processing of visual information and planning of hand movements in a visuo-manual search task 160

Dynamic balance performance facilitates supra-postural activity 161

Centric relation and rotation: an evaluation during mandibular border movements in healthy subjects 162

Grasping partly occluded objects 163

Cycling as a culturally formatted act 164

Attentional influences on normal and pathological gait 165

Adaptation of prehensile movements to distorted object orientation 166

Recognition of jumping patterns in volleyball after traditional and differential strength training by means of artificial neural nets 167

Session 2 168

Postural constraints to hand-foot coupled movements 168

Center of mass movements during the execution of traditional karate techniques 169

Mental inducement of cognitive and motor tasks in a multiple-sender multiple-receiver design 170

Effects of spatial and temporal constraints on the dynamics of rhythmical aiming 171

Adaptation of grasping movements to inverted object size 173

The association between motor unit synchronization and fatigue induced force tremor and its dependency on recording location 174

Acoustically paced treadmill walking following stroke 175

Fascia is able to actively contract and thus may influence musculoskeletal dynamics 175

Multijoint arm movements in parkinson's disease: The effect of deep brain stimulation on movement kinematics and dynamics 177

Special training gait for locomotion disabled persons 178

Are limb properties tuned in anticipation of a dynamic event? 178

GM fascicle length changes during stair descent at different velocities 179

Measuring Partial Motor Programs 180

The effect of cardan sequence on knee joint kinematics 181

Adaptation to visual and mechanical distortions is governed by one common process 183

Active head and neck range of motion in healthy women 184

Semantics for action: An electrophysiological investigation of semantic processing in preparing meaningful actions 185

Resistance to slow motion: strategies for moving near preferred speeds 185

Grasp selection in children with and without neurodevelopmental disorder (DCD and ASD) 187

Age effects on variant and invariant patterns of whole-body coordination during dual-tasked walking 187

Comparing the latencies with which various visual attributes can be used to guide the human hand 189

The influence of metabolic and cognitive fatigue on reaction time 189

Unstable sitting in Parkinson's disease: postural control of the trunk 190

Unimanual and bimanual adaptation to visuomotor rotation 192

Spontaneous visuomotor directional mapping 193

Changes of grip force prediction in a size-weight illusion paradigm following brain damage 194

Empirical and theoretical exploration of the dynamics of learning: Transfer from 120° to 240° 195

The elastic function of the lumbar fascia in human gait 196

Acoustically paced treadmill walking requires more attention than unpaced treadmill walking in healthy young adults 198

The implication of mechanical invariants in dynamic touch depends on their contribution to the muscular torques 199

Different representations of adaptation in the sensorimotor system 200

The way to gait transitions: Spatiotemporal characteristics of the spontaneous overground walk-to-run transition 201

Inter-segmental coordination of the torso during the transition from sitting to standing 203

Authors 205

Sponsors 209

References
Babler, TG, Dannemiller, JL (1993). Role of image acceleration in judging landing location of free-falling projectiles. Journal of Experimental Psychology: Human Perception and Performance, 19, 15-31.
Zaal, FTJM, Bongers, RM (2006). The detection of optical acceleration: It is not the velocity ratio that the visual system is sensitive to. Manuscript submitted for publication.

Exploiting new perception-action solutions in ball bouncing: dynamics of learning and perceptual basis

Isabelle A Siegler [1], Antoine HP Morice [1], Benoît G Bardy [2], William H Warren [3]

[1]Laboratoire 'Contrôle Moteur et Perception', Univ. Paris Sud 11, Bât 335, F- 91405 ORSAY Cédex, Telephone: +33 1-69154315, Fax: +33 1-69156222, Email: isabelle.siegler@u-psud.fr, [2]Motor Efficiency and Deficiency Laboratory, University Montpellier-1, France, [3]Department of Cognitive and Linguistic Sciences, Brown University, USA

How do humans discover stable solutions to perceptual-motor tasks as they interact with the physical environment? We investigated this question using the task of rhythmically bouncing a ball on a racket, for which a passively stable solution is defined. Indeed, a physical model of the task showed the existence of a stable attractor when the racket impacts the ball within a specified range of negative accelerations (Schaal et al., 1996). This means that small perturbations in ball trajectory do not need to be corrected and that ball trajectories relax back to a limit-cycle trajectory within a few cycles.

Previously, it was shown that participants exploit this passive stability but can also actively stabilize bouncing under perceptual control (Morice et al., 2005). Using a virtual ball-bouncing set-up, we created new behavioral solutions for rhythmic bouncing by introducing a temporal delay, expressed also in terms of relative phase (45˚ to 180˚), between the motion of the physical racket held by participants and that of a virtual racket visible of a large screen. Two learning experiments (26 and 24 participants) were carried out to study how participants searched for and performed a new solution in presence of various delays / relative phases (Experiment 1) and whether perceptual basis of the learning process involved temporal or spatio-temporal (relative phase) information (Experiment 2).

Experiment 1 showed that in all delay conditions, participants learned to maintain bouncing just outside the passively stable region, indicating a role for active stabilization. They recovered the approximate initial phase of ball impact in the virtual racket cycle by adjusting the impact phase with the physical racket. With short delays (45˚, 90˚), the impact phase quickly shifted later in the physical racket upswing. With long delays (135˚, 180˚), bouncing was destabilized and phase was widely visited before a new preferred phase gradually emerged, during the physical downswing.

The results suggest that new behavioral solutions may be discovered and stabilized through broad irregular sampling of variable space rather than through a systematic search.

Since in Experiment 1 the increase in phase lag co-varied with the increase in absolute delay, it remained an open question whether the dynamics of discovering new perception-action solutions depended on the spatio-temporal relationship between both rackets, or on the time delay between the two. Experiment 2 was carried out to get insight into this question and showed that spatio-temporal information was more likely to be used in the process of learning a new behavioral solution than absolute time information.

References

Morice, A, Siegler, I, Bardy, BG (2005). Exploiting new perception-action solutions in ball bouncing. In H Heft & KL Marsh (Eds.). Studies in Perception and Action XIII (pp. XX-XX). Lawrence Erlbaum Ass, Publishers, London.

Schaal, S Atkeson, CG, Sternad, D (1996). One-Handed Juggling: A Dynamical Approach to a Rhythmic Movement Task. JMot.Behav., 28, 165-183

Session 5

Chair: Jaak Duysens

Negotiating expected and unexpected level changes in gait

Jaap van Dieën [1], Lennart Bron [1], Reinier Könemann [1], Marcel Spanjaard [1, 2], Mirjam Pijnappels [1]

[1]Research Institute MOVE, Faculty of Human Movement Sciences, VU University Amsterdam, the Netherlands; [2]Institute for Biophysical Research into Human Movement, Manchester Metropolitan University, UK, Telephone: +31 (0)20-5988501, Fax: 31 (0)20-5988529, Email: j.vandieen@fbw.vu.nl

While gait on even surfaces has been extensively studied, negotiation of uneven surfaces, often required in daily life, is comparatively uncharted. Stepping down an elevation in ongoing gait is a common task that can cause falls when the level change is unexpected. The aim of the present study was to determine the mechanical requirements of stepping down an elevation and to study how these are dealt with by comparing the mechanics of expected and unexpected stepping down in ongoing gait.

Ten young adult male subjects repeatedly walked over a platform wearing glasses that obstructed vision of the ground. An expected 10 cm height difference was negotiated after 6 m (indicated by a flag at eye height). In some trials, the height difference was unexpectedly encountered already after 4.7 m. Kinematics and ground reaction forces under both feet were measured during the step from the expected or unexpected encounter with the height difference.