

# 2010 North American Meeting of the International Society for Ecological Psychology



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July 2-3, 2010

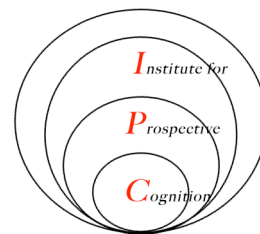
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**2010 North American Meeting of the  
International Society for Ecological Psychology  
Conference Program**

**Friday July 2, 2010**

- 8:15-9:15      **Coffee**
- 9:15-9:20      Opening Remarks  
*Jeffrey B. Wagman*
- 9:20-9:40      Affordances 2.0  
*Anthony Chemero & Rob Withagen*
- 9:40-10:00     A demonstration of the transition from ready-to-hand to unready-to-hand  
*Dobromir G. Dotov, Lin Nie, & Anthony Chemero*
- 10:00-10:20    Wild Bodies: Self-sustaining systems as embodiments of meaning  
*J. Scott Jordan*
- 10:20-10:50    **Break**
- 11:00-11:20    Apparent mass distribution and multimodal heaviness perception  
*Laura Bachus, Matthew Streit, Kevin Shockley, & Michael A. Riley*
- 11:20-11:40    Perceiving length by dynamic touch without use of limbs and without  
active exploration  
*Zsolt Palatinus, Damian G. Stephen, Yoshi Kobayashi,  
Jeffrey Kinsella-Shaw, Claudia Carello, & M. T. Turvey*
- 11:40-12:00    Grasp position, object orientation, and perceived heaviness  
*Jeffrey B. Wagman*
- 12:00-1:30     **Lunch**
- 1:40-2:00      Amplitude of environmental rhythm and spontaneous coordination  
*Manuel Varlet, Charles Coey, R. C. Schmidt, & Michael J. Richardson*
- 2:00-2:20      Modulations of respiratory rhythm during precision aiming  
*Nikita A. Kuznetsov & Michael A. Riley*
- 2:20-2:40      Agency and Coordination  
*Charles Coey, Manuel Varlet, R. C. Schmidt, & Michael J. Richardson*
- 2:40-3:10      **Break**
- 3:20-3:40      Perceptual learning in Alzheimer's disease  
*Nam-Gyoon Kim & Keonho Shin*
- 3:40-4:00      Tele-operation through apertures: static vs. dynamic constraints  
*Keith S. Jones, Brian R. Johnson, & Elizabeth A. Schmidlin*
- 4:00-4:20      Breaking down the walls: branching out from the norm to find answers  
*Jim Leonard*
- 4:30-5:30      **Posters (see attached listing of posters)**

**2010 North American Meeting of the  
International Society for Ecological Psychology**  
*Conference Program*

**Saturday July 3, 2010**

8:15-9:15	<b>Coffee</b>
9:20-9:40	Task constraints and postural instability in visually induced motion sickness <i>Ken Yoshida, Sebastien Villard, Benoît G. Bardy, &amp; Thomas A. Stoffregen</i>
9:40-10:00	Motion sickness and body sway among drivers and passengers in a driving video game <i>Jason X. Dong &amp; Thomas A. Stoffregen</i>
10:00-10:20	Postural sway and visual performance in rough seas <i>Yawen Yu &amp; Thomas A. Stoffregen</i>
10:20-10:50	<b>Break</b>
11:00-11:20	Fractal event perception and its effect on anxiety level <i>Julia J. C. Blau, Robert W. Isenhower, &amp; Claudia Carello</i>
11:20-11:40	Ecologizing emotion through event dynamics <i>Robert W. Isenhower &amp; Claudia Carello</i>
11:40-12:00	When are “mental” decisions first realized? <i>Daniela Vaz, Mohammad Abdolvahab, Nigel Stepp, Miguel Moreno, &amp; M. T. Turvey</i>
12:00-1:30	<b>Lunch (in adjacent room)</b>  <i>Symposium: Changes in spatial perception during prospective control: Getting ahead is not an error (Organizer: J. Scott Jordan)</i>
1:40-2:00	Spatial perception as an index of prospective perception <i>J. Scott Jordan</i>
2:00-2:20	On how learning a stimulus context influences spatial perception during prospective control <i>Charles Coey</i>
2:20-2:40	Social impacts on prospective perception <i>Andrew Kenning</i>
2:40-3:10	<b>Break</b>
3:20-3:40	A new methodology to study interpersonal coordination in natural interactions <i>R. C. Schmidt &amp; Paula A. Fitzpatrick</i>
3:40-4:00	Ecological psychology today <i>William M. Mace</i>
6:30-	<b>Banquet</b>

Friday July 2, 2010  
Open Forum Session 1: 9:20 -10:20

## **Affordances 2.0**

Anthony Chemero<sup>1</sup> & Rob Withagen<sup>2</sup>

<sup>1</sup>Franklin and Marshall College

<sup>2</sup>University of Groningen

Ecological psychology is a thoroughly dynamical enterprise. Unfortunately, though, theoretical work on affordances has not taken this into account. In particular, definitions of 'affordance' by Gibson, Turvey, Reed, Heft, Chemero, and Stoffregen have all been insufficiently dynamical. To do justice to the practice of contemporary ecological psychology, our understanding of affordances must be dynamical root and branch; moreover, it should place ecological psychology in contact with non-adaptationist approaches in biology. Combined, these lead to the idea that affordances should be understood in analogy to niche construction, but (1) for individuals and (2) at the shorter time scales appropriate to behavior and development.

## **A demonstration of the transition from ready-to-hand to unready-to-hand**

Dobromir G. Dotov<sup>1</sup>, Lin Nie<sup>2</sup>, & Anthony Chemero<sup>2</sup>

<sup>1</sup>University of Connecticut

<sup>2</sup>Franklin & Marshall College

The ideas of continental philosopher Martin Heidegger have been influential in cognitive science and artificial intelligence, despite the fact that there has been no effort to analyze these ideas empirically. The experiments reported here are designed to lend empirical support to Heidegger's phenomenology and more specifically his description of the transition between ready-to-hand and unready-to-hand modes in interactions with tools. In experiment 1, we found that a smoothly coping cognitive system exhibits  $1/f\beta$  type positively correlated noise and that its correlated character is reduced when the system is perturbed. This indicates that the participant and tool constitute a self-assembled, extended device during smooth coping and this device is disrupted by the perturbation. In experiment 2, we examine the re-organization of awareness that occurs when a smoothly coping, self-assembled, extended cognitive system is perturbed. We found that the disruption is accompanied by a change in attention which interferes with participants' performance on a simultaneous cognitive task. Together these experiments show that a smoothly coping participant-tool system can be temporarily disrupted and that this disruption causes a change in the participant's awareness. Since these two events follow as predictions from Heidegger's work, our study offers evidence for the hypothesized transition from readiness-to-hand to unreadiness-to-hand.

## **Wild Bodies: Self-sustaining Systems as Embodiments of Meaning**

J. Scott Jordan

Illinois State University

If the current embodiment movement is to prove successful, theories of embodiment must explain why some bodies can be mindful (e.g., the human body) while others cannot (e.g., rocks). They must also clarify why such bodies entail the mindfulness (i.e., meaning) referred to via concepts such as phenomenology, aesthetics, and semantics. *Wild Systems Theory* is a recently developed philosophy of embodiment that addresses these questions by asserting that human bodies are 'mindful' because they constitute *multi-scale embodiments* of the phylogenetic, cultural, and ontogenetic contexts in which they emerged and in which they sustain themselves. Such embodiments are 'wild' because their internal dynamics must be as complex and open (i.e., wild) as the external contexts to which they are coupled. Such wild bodies are inherently meaningful (i.e., mindful) because their embodied, internal dynamics are naturally and necessarily 'about' the open, external contexts in which they emerge and sustain themselves.

Friday July 2, 2010  
Open Forum Session 2: 11:00 -12:00

## **Apparent Mass Distribution and Multimodal Heaviness Perception**

Laura Bachus, Matthew Streit, Kevin Shockley, & Michael A. Riley

University of Cincinnati

An object's size has been shown to influence heaviness perception in the classic size-weight illusion (SWI)—objects of a given mass feel lighter as they become larger. Non-visual influences of size on heaviness perception have been attributed to corresponding changes in the mass distribution of objects which influences rotational inertia—the resistance of objects to rotational acceleration. However, visual influences of size have not been accounted for by inertia models. Using a virtual reality environment, we manipulated the apparent size and apparent mass distribution of wielded objects in several ways. The results suggest that changes in apparent size do not reliably influence heaviness perception, but changes in apparent mass distribution do reliably influence heaviness perception. Results will be discussed in the context of inertia models of heaviness perception.

## **Perceiving length by dynamic touch without use of limbs and without active exploration**

Zsolt Palatinus, Damian G. Stephen, Yoshi Kobayashi,  
Jeffrey Kinsella-Shaw, Claudia Carello & M. T. Turvey

University of Connecticut

Selective perception capabilities of the torso are comparable to the hand in perceiving whole and partial object length by dynamic touch (Palatinus et al., under review). Given that perceptual capabilities of the hand are preserved under extremely restricted exploration conditions (holding still), we asked whether people can similarly make selective judgments of either the whole or partial length of a torso-mounted object even if they are required to stand still. Selective perception was successful once again. Moreover, dynamical analysis of force-plate data shows that fluctuations of the center of pressure correspond to the intention to perceive whole or partial object length. Our results indicate that the significant mechanical variables for perceiving object extent are available in the small scale of normal body sway and that these “passive” movements are biased by the goal of the perceiver.



## **Grasp position, object orientation, and perceived heaviness**

Jeffrey B. Wagman & Samantha J. Aspel

Illinois State University

Perception of heaviness is a function of how a given object resists being moved by the perceiver-actor—i.e., its translational and rotational inertia. Whereas an object's translational inertia is independent of grasp position, an object's rotational inertia is not. Therefore, perception of heaviness should vary with grasp position. We conducted three experiments that investigated this hypothesis. In all three experiments, blindfolded participants wielded internally weighted cylindrical objects at different grasp positions (along the length of the object) and rated how heavy each object felt at a particular grasp position relative to a standard. Overall, the three experiments suggest that both object mass and grasp position influence perceived heaviness and that perceived heaviness is likely due to the juxtaposition of translational and rotational inertia with the perceiver-actor's movement capabilities at the wrist joint.

Friday July 2, 2010  
Open Forum Session 3: 1:40 -2:40

### **Amplitude of Environmental Rhythm and Spontaneous Coordination**

Manuel Varlet <sup>1,2</sup>, Charles Coey <sup>1</sup>, R. C. Schmidt <sup>3</sup> & Michael J. Richardson <sup>1</sup>

<sup>1</sup>University of Cincinnati

<sup>2</sup>Université Montpellier

<sup>3</sup>College of the Holy Cross

Rhythmic limb movements become spontaneously coordinated with the rhythms of environmental stimuli. Previous research has shown that the stability of such visual entrainment depends on the difference between actor's oscillation frequency and that of the stimulus as well as the degree to which an actor visually tracks the movements of the stimulus. Specifically, a higher degree of coordination occurs when the stimulus frequency is close to the actor's preferred movement frequency and when the actor actively tracks the stimulus with his/her eyes. The aim of the current study was to investigate the influence of stimulus amplitude on spontaneous entrainment. Participants performed rhythmic forearm movements while tracking an oscillating stimulus or while keeping their eyes fixed on a stationary location directly above an oscillating stimulus. Stimulus amplitude and frequency were manipulated. As expected, the results revealed that the stability of visual entrainment is influenced not only by visual tracking and stimulus frequency, but also by stimulus amplitude, with smaller amplitudes resulting in weaker entrainment.

## **Modulations of Respiratory Rhythm during Precision Aiming**

Nikita A. Kuznetsov & Michael A. Riley

University of Cincinnati

Oscillatory movements of the upper body due to breathing provide a global background for human movement. Previous studies showed that breathing influences the precision of finger movements during visually guided tracking (Rassler, 1996, 1999). We conducted an experiment to examine spontaneous modulations of the thoracic respiratory rhythm during a precision manual aiming task. Participants ( $N = 19$ ) aimed at a series of targets of three different sizes (0.3, 0.5, & 0.8 deg of visual angle). The respiratory pattern during aiming at the smallest target was relatively slow, more variable, and shallow, with a low expiratory rate as compared to the other conditions. Recurrence quantification analysis revealed a decrease in recurrence rate and an increased likelihood of local stable states while aiming at the smallest target. These modulations may reflect reorganization of the relation between the thoracic and abdominal respiratory degrees of freedom that contribute to shoulder and trunk movements.

## Stability of Interpersonal Coordination

Charles Coey <sup>1</sup>, Manuel Varlet <sup>1,2</sup>, R. C. Schmidt <sup>3</sup> & Michael J. Richardson <sup>1</sup>

<sup>1</sup> University of Cincinnati

<sup>2</sup> Université Montpellier

<sup>3</sup> College of the Holy Cross

Past research on human motor coordination has revealed that the stability of interpersonal entrainment is governed by the same coupled oscillator dynamic as intrapersonal coordination. For instance, interpersonal coordination is constrained to the two stable phase modes, inphase and antiphase, with inphase being more stable than anti-phase. The current research examined if the relative stability of intrapersonal coordination (i.e., inphase vs. antiphase) affects the degree and stability of interpersonal coordination. Participants produced either inphase or antiphase intrapersonal coordination while engaged in an interpersonal problem-solving task with another participant who was producing either the same or opposite intrapersonal phase pattern. The results demonstrated that the stability of interpersonal coordination *is* influenced by the stability of intrapersonal coordination, but that the stability of intrapersonal coordination *is not* influenced by either the stability of observed movements or by the degree of interpersonal coordination.

Friday July 2, 2010  
Open Forum Session 4: 3:20 – 4:20

## **Perceptual Learning in Alzheimer's Disease**

Nam-Gyoon Kim<sup>1</sup> & Keonho Shin<sup>2</sup>

<sup>1</sup>Keimyung University

<sup>2</sup>Kangnam University

Recent research has demonstrated that Alzheimer's disease (AD) affects the visual sensory pathways, producing a variety of visual deficits, including the capacity to perceive structure-from-motion (SFM). Because the sensory areas of the adult brain retain a large degree of plasticity, the present study was conducted to explore whether a visual dysfunction impaired by AD can be slowed through perceptual learning. Patients with mild or moderately severe AD were presented with computer displays depicting SFM. Participants completed three sessions a day on three consecutive days with each session comprised of 48 trials. Displays showed eight different geometric solids rendered in three densities of a random dot texture. Results showed impaired capacity for SFM perception in both AD groups. However, performance of mild AD patients improved over the nine sessions, whereas that of moderate AD patients remained unchanged. These results suggest that the cortical circuits for SFM are still plastic in the mild AD stage.

## **Tele-Operation through Apertures: Static vs. Dynamic Constraints**

Keith Jones<sup>1</sup>, Brian Johnson<sup>2</sup>, & Elizabeth Schmidlin<sup>1</sup>

<sup>1</sup>Texas Tech University,

<sup>2</sup>Naval Air Warfare Center Aircraft Division

Search and rescue robots get stuck. To investigate why, Experiment 1 examined tele-operators' abilities to judge whether a robot could fit through apertures (pass-ability judgments), and drive the robot through apertures (driving performance). Results indicated that tele-operators made accurate pass-ability judgments, but routinely impacted apertures that were wider than the robot. Thus, tele-operating through an aperture may be constrained by the robots' dimensions plus a safety margin associated with how well the operators drove the robot. This suggests that tele-operators should base decisions to enter an aperture on their ability to drive the robot. It was unclear, however, whether tele-operators could do so. Thus, Experiment 2 replicated Experiment 1, and examined tele-operators' abilities to judge whether they could drive a robot through apertures (drive-ability judgments). Results replicated Experiment 1, and demonstrated that tele-operators did not make accurate drive-ability judgments. Implications for tele-operation training and interfaces will be discussed.

## **Breaking down the walls: Branching out from the norm to find answers**

Jim Leonard

Wright State University

Many individuals have (or will experience) a disease or disability that renders them locked in their own body. Aware, yet walled away from the world. This research centers on a case study of an adolescent child in public school with a condition that renders him locked in. Where a switch scanning (indirect) interface with a button type switch are being used, we have compared a hands-free computer interface (Neural Impulse Actuator from OCZ technologies) in both indirect and direct selection methods. In one condition, switch scanning with the hands-free device in lieu of a button, in the other, the NIA was used to control the mouse cursor (vertical axis) and click. The mouse cursor condition was augmented with an auditory display for cursor position. This adaptation itself highlights the problem and the child's condition. The current solution has not proven a reliable communication strategy, even to confirm or deny blindness.

Saturday July 3, 2010  
Open Forum Session 5: 9:20 – 10:20

### **Task constraints and postural instability in visually induced motion sickness**

Ken Yoshida<sup>1</sup>, Sebastien Villard<sup>2</sup>, Benoît G. Bardy<sup>2</sup>, & Thomas A. Stoffregen<sup>1</sup>

<sup>1</sup>University of Minnesota

<sup>2</sup>Université Montpellier

Previous research has shown that the subjective symptoms of motion sickness are preceded by changes in both the magnitude and dynamics of postural activity among persons exposed to visual motion in laboratory devices, in flight simulators, in virtual environments, and in console video games. Both theoretical and empirical interest surrounds questions relating to the role of deliberate control of body movement in susceptibility to motion sickness. We addressed this issue in the context of standing body sway. Using an electric motor under computer control, a moving room was oscillated forward and backward along the line of sight, using a sum-of-sines motion function that resembled (in frequency) ordinary standing body sway. Individuals in the Looking group were instructed to stand comfortably in the room and look at the walls. Individuals in the Tracking group were instructed to move their heads back and forth so as to maintain a constant distance between their head and the front wall of the room (cf. Bardy et al., 1999). The 40 cm range of room motion ensured that the room's movement was visible to all participants. The incidence of motion sickness did not differ between the Looking and Tracking groups (53% and 63%, respectively). The overall magnitude of body movement was greater in the Tracking group than in the Looking group (cf. Oullier et al., 2002). Motion sickness was preceded by changes in body movement, but the nature of these changes differed between the Looking and Tracking groups. The results suggest that the nature (i.e., definition) of unstable movement, as it relates to motion sickness etiology, is defined in part relative to constraints imposed by different supra-postural tasks, as predicted by Riccio and Stoffregen (1991).



## **Motion sickness and body sway among drivers and passengers in a driving video game**

Jason X. Dong & Thomas A. Stoffregen

University of Minnesota

We investigated the influence of vehicle control (driver vs. passenger) on postural activity and motion sickness in the context of a driving simulator (an Xbox video game). Using a yoked control design, each pair of participants included one driver and one passenger. To avoid the possibility of contagion, individuals participated alone. The first member in each pair was the Driver, whose game performance was recorded and (later) played back to the corresponding passenger. During game play, we recorded movement of the head and torso. Passengers were more likely than Drivers to report motion sickness. Overall, Drivers moved more than passengers. During game exposure, participants who later became motion sick moved significantly more than those who did not. However, among both Drivers and Passengers movement was greater among participants who (later) reported motion sickness than among those who did not. The results confirm that active control of a simulated vehicle can reduce susceptibility to motion sickness, and that postural instability precedes and predicts motion sickness.

## Postural sway and visual performance in rough seas

Yawen Yu & Thomas A. Stoffregen

University of Minnesota

Motion of a ship at sea often challenges crew performance. In previous studies, the influence of rough weather on stance at sea has been evaluated in terms of the likelihood of staggers or falls. Few studies have evaluated the influence of sea state on visual performance. Effects of rough seas on visual vigilance performance, subjective mental workload, and the kinematics of postural control have not been demonstrated. Crewmembers of the R/V Thomas G. Thompson stood on a force plate, from which we obtained data on the center of pressure (COP). We varied stance width (the distance between the feet in side-by-side stance; 5 cm, 17 cm, and 30 cm) and the difficulty of visual vigilance tasks (Easy vs. Hard). Separately, we evaluated participants' self-selected foot positioning. Visual performance was better on the Easy task (mean  $d' = 4.20$ ) than on the Hard task (mean  $d' = 3.57$ ), and subjective mental workload was greater for the Hard task than for the Easy task. Overall vigilance performance (mean  $d' = 3.88$ ) was worse than when the same participants were tested under mild sea states (mean  $d' = 4.11$  [25]). Relative to mild sea states the variability of postural activity was greater and its predictability was reduced. In addition, postural dynamics were influenced by controlled variations in stance width. We conclude that rough seas affect visual vigilance performance and postural activity but do not eliminate effects of vigilance task difficulty or stance width.

Saturday July 3, 2010  
Open Forum Session 6: 11:00 – 12:00

## **Fractal Event Perception and its Effect on Anxiety Level**

Julia J.C. Blau, Robert Isenhower, Claudia Carello

University of Connecticut

Recent investigations have shown that the perception of nested events is structured fractally (Blau et al., 2010). Fractality also characterizes depictions of events, in particular, the editing of professional films. It has been suggested that film genre is linked to the fractal structure of the editing (Cutting et al, 2010). For example, the editing of action movies tends to have a higher Hurst exponent than the editing of drama or romantic films. Perhaps not coincidentally, action movies also tend to induce a feeling of anxiety in the viewer. Is that anxiety related to the structure of the events, the content of the events, or some interaction between the two? Our initial attempt to disentangle these alternatives involved varying the temporal structure of the presentation of still pictures normed for arousal. Implications for understanding the fit between the structure of events and the structure of event perception are discussed.

## **Ecologizing Emotion through Event Dynamics**

Robert W. Isenhower and Claudia Carello

University of Connecticut

Ecological psychology is, at its heart, a theory of inherent meaningfulness at the level of the organism–environment system. Although largely considered a subjective phenomenon, emotion may be the most easily and directly accessible means of assessing this value and meaning. Specifically, we consider the contributions of J. J. Gibson’s theory of affordances and Arthur Iberall’s homeokinetic physics to developing an ecological understanding of emotion. The perception and actualization of affordances and homeokinetic behavior modes are two classes of events that may contribute to the patterning of the affective states an individual experiences. We consider how the dynamics of these two classes of events, as well as their nesting, may pattern affective states at both shorter and longer time scales and between individuals. Additionally, we briefly examine the work of Bud Craig, Nico Fridja, and Timo Järvillehto, in order to consider their theoretical approaches in relation to Gibson and Iberall.

## When are “mental” decisions first realized in movement responses?

Daniela Vaz<sup>1</sup>, Mohammad Abdolvahab<sup>1</sup>, Nigel Stepp<sup>1</sup>,  
Miguel Moreno<sup>2</sup>, & Michael Turvey<sup>1</sup>

<sup>1</sup>University of Connecticut

<sup>2</sup>Texas A&M University – Corpus Christi

We examined visual lexical decision (*word* or *nonword*?) when the participant is standing and when the response has consequences for postural stability—rapidly raising the right or left arm to the horizontal position. We recorded electromyographic (EMG) activity in right and left thigh (biceps femoris) and right and left calf (soleus) and trunk muscles (erector spinae) and movement initiation of the responding arm. We asked whether the latency difference in the onsets of arm movements for *words* and *nonwords* was present beforehand in the postural-maintaining activity of erector spinae, biceps femoris and soleus. Previous work has found lexical decision at the biceps femoris  $\frac{1}{4}$  second prior to the intentional arm movement. Our interest was whether the anticipation would be even greater in the soleus. Minimally, the results show that postural adjustments (nonintentional) and focal arm movement (intentional) comprise a single time-evolving behavior sensitive to the lexical decision.

Saturday July 3, 2010  
Symposium: 1:40 – 2:40

**Changes in Spatial Perception during Prospective Control:  
Getting Ahead is not an Error**

J. Scott Jordan

Illinois State University

When participants indicate the vanishing point of a moving stimulus, the perceived vanishing point is displaced beyond the actual vanishing point, in the direction the stimulus was traveling prior to its offset. Research has revealed the magnitude of this forward displacement (FD) varies significantly as a function of dynamic physical laws such as velocity, implied friction, and implied gravity. Traditional accounts attribute FD to the brain's ability to represent dynamic stimulus properties (i.e., velocity, friction, and gravity). According to this account, when the stimulus vanishes, its dynamic representation 'continues,' thereby displacing the perceived vanishing point forward. The purpose of this symposium is present a program of research that takes issue with this traditional 'representational momentum' account and asserts, instead, that FD emerges out of the participants' prospective control of their action relationship to the stimulus' movements. Speakers will present experiments that examine how changes in prospective control alter FD.

Presentations:

**Spatial Perception as an Index of Prospective Perception**

J. Scott Jordan

Illinois State University

**On How Learning a Stimulus Context Influences  
Spatial Perception during Prospective Control**

Charles Coey

University of Cincinnati

**Social Impacts on Prospective Perception**

Andrew Kenning

Illinois State University

Saturday July 3, 2010  
Open Forum Session 7: 3:20 – 4:00

## **A New Methodology to Study Interpersonal Coordination in Natural Interactions**

R. C. Schmidt <sup>1</sup> & Paula A. Fitzpatrick <sup>2</sup>

<sup>1</sup> College of the Holy Cross

<sup>2</sup> Assumption College

Past research investigating interpersonal coordination using laboratory tasks has revealed important facts about the dynamical and perceptual processes constraining it. An overarching concern with these investigations is whether, given the artificial nature of the tasks, the results will generalize to natural social interactions especially those that include special populations such as young children or people with psychological pathologies. A methodology that obviates some of these concerns uses video recording to acquire time series of people's activity during natural social interactions. By estimating the amount of pixel change between adjacent video frames the amount of movement of a whole person or a specific body part can be measured. The validity and utility of this method will be demonstrated by showing how it can be used to analyze simple rhythmic movements of the whole body or limbs as well as interpersonal coordination of whole body activity in conversation.

## **Ecological Psychology Today**

William M. Mace

Trinity College

The intent of this talk is to describe the current state of Ecological Psychology. The method will be to survey current research programs, beginning with what is reflected in this meeting, and then imagine the creation of reference material. For example, suppose that one of our members were to write a chapter on Ecological Psychology for the *Annual Review of Psychology*. What would the sections be? What if there were a series of volumes like the *Annual Review*. What would the volumes be? Suppose that a textbook on Ecological Psychology were produced. What would the chapters be? In this talk, I propose to discuss considerations to take into account to develop answers to each of these. That is, the talk would be based on some lists, but (mercifully) would not BE the lists. To support this enterprise a website of resources, organized along lines described in the talk, will be developed and placed online soon after this presentation.



**2010 North American Meeting of the  
International Society for Ecological Psychology**  
*Poster Presentations*

**Friday July 2, 2010 4:30pm– 5:30pm**

1. Evaluation of a dynamical model for positive and negative hysteresis in affordance experiment  
*Stacy Lopresti-Goodman & Till D. Frank*
2. Hand-ball coupling in skilled bilboquet players  
*Mariko Ito, Hiroyuki Mishima, Masato Sasaki*
3. Stability of interpersonal coordination  
*Charles Coey, Manuel Varlet, R. C. Schmidt, & Michael J. Richardson*
4. The optical flow structure induce body sway by binocular and monocular vision  
*Wen-Chen Liu & Chih-Mei Yang*
5. Postural control of perceiving affordance for reaching in sighted and blind people  
*Chia-Chun Huang & Chi-Mei Yang*
6. The judgment of gap crossing with visual control for the late childhood in stationary locomotion conditions  
*Chia-Pin Huang & Chih-Mei Yang*
7. The investigation of body sway in the direct perception mechanism of the individual-environment system: Manipulating optic flow by the moving room  
*Chih-Mei Yang, Chia-Chun Huang, & Ting-Liang Kuo*
8. Affordances for stair climbing induced by standing heights and perceptual systems  
*Chia-Sheng Huang, Chih-Mei Yang, Chih-Hui Chang, & Hank Jwo*
9. Postural sway variability as a function of supra-postural task difficulty  
*Scott Bonnette & Michael A. Riley*
10. Unintentional entrainment and visual tracking mediate rhythmic movement interference  
*Michael J. Richardson, Charles Coey, Veronica Romero, Michelle Chu, & R. C. Schmidt*
11. Measuring group synchrony: A test statistic based on the Kuramoto order parameter of synchronization  
*Michael J. Richardson, Till D. Frank, Madison Gregor, Randi Garcia, & Kerry L. Marsh*
12. How important is direction change information for spontaneous environmental entrainment  
*R.C. Schmidt, Joanna Mergeche, & Michael J. Richardson*
13. Heart variability and postural motion as correlates of anxiety level in a golf putting competition  
*Sam Haag & Michael Wade*
14. Angle-less orientation for robot alignment to the environment  
*Timothy Gifford*
15. Interpersonal coupling of affective valence  
*Robert W. Isenhower, James A. Dixon, & Claudia Carello*
16. Differential learning in aiming at a target  
*Zsolt Palatinus, Till D. Frank, Ryan Arzamarski, Yoshi Kobayashi, & M. T. Turvey*
17. Perceptual independence of afforded actions  
*Tehran J. Davis, Dilip N. Athreya, & Michael A. Riley*
18. Speed in an imperfection parameter for the human odometer  
*Vivek Kant, Robert W. Isenhower, Claudia Carello, & M. T. Turvey*
19. Postural responses to concurrent suprapostural memory task for children in the risk of developmental coordination disorder  
*Fu-Chen Chen, Michael G. Wade, Chia-Liang Tsai, & Chih-Hui Chang*

Friday July 2, 2010  
Poster Session, 4:30-5:30

Poster 1.

**Evaluation of a Dynamical Model for Positive and  
Negative Hysteresis in Affordance Experiments**

Stacy M. Lopresti-Goodman<sup>1</sup> & T. D. Frank<sup>2</sup>

<sup>1</sup>Marymount University,

<sup>2</sup>University of Connecticut

Experimenters have demonstrated that grasping behavior exhibits the typical features of a self-organized dynamic system (Lopresti-Goodman et al., 2009; Richardson et al., 2007; van der Kamp et al., 1998). For example, the boundary between graspable-with-one-hand and graspable-with-two-hands differs experimentally when the pi-number (object-to-hand-ratio) is scaled in both an ascending and a descending manner: There is hysteresis. When the ascending pi-number is larger than the descending pi-number, positive hysteresis has occurred. When the descending pi-number is larger than the ascending pi-number, negative hysteresis has occurred. Frank et al. (2009) developed a dynamical model, the Grasping Transition (GT) Model, that accounts for hysteresis in grasping experiments. The current study evaluated the GT model's ability to account for both types of hysteresis in affordance experiments. Possible causes for positive and negative hysteresis, as well as potential weaknesses of the model, are discussed.

Poster 2.

## **Head-Ball Coupling in Skilled Bilboquet Players**

Mariko Ito, Hiroyuki<sup>1</sup> Mishima<sup>2</sup>, Masato Sasaki<sup>1</sup>

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In this study, we addressed the visual control of posture in skilled Bilboquet players. Four expert and four novice players participated in this experiment. They performed 200 trials of “Swing-in,” a Bilboquet trick. Results indicated the following. (1) In each trial, the head and the knee movements of experts were greater than that of novices. However, the coupling of the head and the ball, and the knee and the ball was tighter in the experts than in the novices. (2) At the end of each trial, the expert’s head and ball movements were more coupled than the movements of novices, whereas there was no difference in the coupling of knee and ball movements in both groups. Based on these findings the importance of visual exploratory activity in Bilboquet is discussed.

Poster 3.

### **Stability of Interpersonal Coordination**

Charles Coey <sup>1</sup>, Manuel Varlet <sup>1,2</sup>, R. C. Schmidt <sup>3</sup> & Michael J. Richardson <sup>1</sup>

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Past research on human motor coordination has revealed that the stability of interpersonal entrainment is governed by the same coupled oscillator dynamic as intrapersonal coordination. For instance, interpersonal coordination is constrained to the two stable phase modes, inphase and antiphase, with inphase being more stable than anti-phase. The current research examined if the relative stability of intrapersonal coordination (i.e., inphase vs. antiphase) affects the degree and stability of interpersonal coordination. Participants produced either inphase or antiphase intrapersonal coordination while engaged in an interpersonal problem-solving task with another participant who was producing either the same or opposite intrapersonal phase pattern. The results demonstrated that the stability of interpersonal coordination *is* influenced by the stability of intrapersonal coordination, but that the stability of intrapersonal coordination *is not* influenced by either the stability of observed movements or by the degree of interpersonal coordination.

Poster 4.

## **The optical flow structure induce body sway by binocular and monocular vision**

Wen-Chen Liu and Chih-Mei Yang

National Taiwan Normal University

Perception-action coupling and affordances are two important concepts that can be used to explain how individuals pick up the information in the environment to keep the posture stability. Individuals perceive the optical array structure through the optical flow caused by the body sway. How individuals' body sway were induced in the different optical array structure? The purpose of this study was to examine that the body sway induced by the different optical flow structure in the binocular and monocular vision. There were twelve adults served as participants (age =  $22.8 \pm 2.1$  years old). Standing on the three different places (include middle, right, and left side) and in the three visual conditions (include using right eye, left eye and both) were the experimental manipulations. For enlarging the experimental effect the participants must stand on the three different setting up wooden bars (included standing on the ground, upright, and lateral). Each trail lasted 40s, and there were 27 trails in this study. The data were collected by the hardware of Polhemus LIBERTY and the software of MotionMonitor. A repeated measures design one-way ANOVA was employed to analyze the data. The results indicated that participants in the same visual conditions showed more body sway in standing middle place than left and right places and the body sway were much more in the binocular vision than the monocular vision. It was because that the optical array structure was complicated in the standing middle place so that the participants can not pick up the information easily. Furthermore participants could pick up more information in binocular vision to keep the posture stability. In the different optical array structure, the binocular vision could help participants to pick up the simple and explicit information for maintaining the postural control.

Poster 5.

## **Postural control of perceiving affordance for reaching in sighted and blind people**

Chia-Chun Huang & Chih-Mei Yang

National Taiwan Normal University

Individuals can judge the reachability of an object by hearing in the non-visual condition. People would modulate body sway to pick up the available information when facing different task demands or environments. The major perceptual modal and the experience of blind people were different from sighteds. The purpose of the present study was to investigate blind and sighted people's perception of reachability, and to understand the postural control when perceiving affordances by observe the body sway. There were 20 sighteds and 8 blinds served as participants. In the experiment, sighteds visually and audibly judged whether the front object was reachable, and estimated the confidence of judgment. The blinds judged by hearing only. The body sway data were collected during the observation of participants. The max-reachable distance, judgment accuracy, body-scaled ratio, body sway, judgment confidence, and perceiving time were analyzed after the experiment. The results showed that: 1) There were same accuracy and body-scaled ratio in sighteds' and blinds' auditory reachability perception; 2) Sighteds would reduce body sway but blinds would increase body sway when perceiving the reachability; 3) For the sighteds, the accuracy of visual and auditory perception of reachability was the same, but there were larger body-scaled ratio and smaller body sway for visual perception.

Poster 6.

**The judgment of gap crossing with visual control  
for late childhood in stationary and locomotion conditions**

Chia-Pin Huang & Chih-Mei Yang

National Taiwan Normal University

Optical array played an important role in perception-action coupling, and the visual perception system of later child has already grown maturely at nine years old. The visually controlled information of stationary and locomotion at late childhood perception-action coupling is the main concern in the study. Twenty-four children were recruited and divided into two groups by stature, and they have to judge the crossable of gaps in monocular standing, binocular standing, and binocular moving conditions. The gaps arrangements were randomized in sixteen trials at each condition, and the actual crossings were measured in the final section for each participant. The judgment in each condition was overestimated than actual crossing, and the differences between taller and shorter groups were relevant also. But the judgment in monocular standing has less erroneous than binocular situations, no matter standing on the floor or moving. We concluded that limited information might be enough for later childhood who were considered as less movement experienced group. Too much information from surroundings might be “noise” for actors, and they would have more erroneous judgment for action.

Poster 7.

**The investigation of body sway in the direct perception mechanism of the individual-environment system: Manipulating optic flow by the moving room**

Chih-Mei Yang, Chia-Chun Huang, & Ting-Liang Kuo

National Taiwan Normal University

Relative movements in an individual-environment system caused by displacement of individuals or environment objects can invoke the continuous change of optic array to form a flow structure. This optic flow can promote the perception of the relationship between individuals and environment. The perception mechanism mediated by optic flow emphasizes the continuity. But whether the duration of continuity or the separation of the optic flow can influence the perception mechanism is waiting for proofs. The purpose of this study is to investigate the above uncertain issues, the research questions for this study are: 1) Is individuals' body sway affected by different continuity of optic flow when standing naturally? 2) Do the relative position between the individual and moving room change when exposing in different continuity of optic flow and being required to follow the room movement? 16 adult participants stood in the moving-room and randomly faced 12 manipulation conditions twice separately. The conditions composed mutual combinations based on factors: 1) Illumination in normal, quick twinkle, and slow twinkle; 2) Room movements when stationary and in motion; 3) Participants' action requirements in following and non-following the room. The movement data of participants and the room were recorded and computed to conduct the statistic analysis of the cross-correlation and repeated measure ANOVA for verifying the roles of the optic flow in perception mechanisms. The results showed that: In quick twinkled illumination, the participants have more body sway but less cross correlation with the room when they were required to follow the room in the moving-room stationary condition; And the participants move less when the room was moving and following was required also. It means that the twinkled illumination do cause that optic flow was transformed into optic array, and block the animal's perception to induce inappropriate body sway.



Poster 8.

**Affordances for stair climbing induced by  
standing heights and perceptual systems**

Chia-Sheng Huang, Chih-Mei Yang, Chih-Hui Chang, & Hank Jwo

National Taiwan Normal University

Affordances in ecological psychology viewpoint mean a kind of interlaced relation between the animals and their environment. The definition for the properties of environment should refer to the characteristics of animals and be interpreted through the concept of body scale. This study was based on the ecological approach to investigate haptically and visually guided stair climbing possibility. Perceived affordances of maximum riser heights were examined by changing individual's standing heights in this experiment. Twenty-four adults were recruited and randomly assigned to two groups, the haptic judgement group and the visual judgement group. The participants were asked to judge whether each stair height is climbable if they were limited to raise a single leg. The judgments were made according to visual observation and exploration with a white cane separately. Three experimental conditions were arranged when participants made their judgments: Standing on the real floor, standing on 10cm height raising floor, and wearing 10cm height blocks. The adjustable stair was used to measure perceived maximum raiser heights of participants, and the critical ratio was calculated by comparing it to the leg length of participants. The results revealed that the perceived affordances of maximum riser heights would not be influenced by standing heights. Between the lengths of the individual's legs and the stair heights would maintain invariant ratio. The perceived maximum raisers height by the haptic exploration could also be described by the concept of body scale with the visual observation. The critical ratio was approximately 0.97, no matter what the standing heights were. Despite individuals perceived maximum raiser heights through different perceptual systems, the accuracy and confidence of haptic and visual judgment did not differ. It supported the viewpoint of perceptual equivalence.

Poster 9.

**Postural sway variability as a function of supra-postural task difficulty**

Scott Bonnette & Michael A. Riley

University of Cincinnati

Postural sway can be functionally modulated in response to task demands. We examined the effect of supra-postural manual aiming task on the dynamics of postural sway in medio-lateral (ML) and antero-posterior (AP) directions to further explore this functional relationship. In the first study, participants were oriented parallel to the target and in the second study perpendicular. Participants were instructed to aim while keeping their hand coupled to the torso, therefore relaying control of the task to the postural system. Task difficulty was manipulated by varying target sizes (2 cm<sup>2</sup>, 3 cm<sup>2</sup>, and 6 cm<sup>2</sup>) at a fixed distance (110cm). Fine-grained postural sway variability decreased as task difficulty increased, but did not depend on the participant's orientation or the axis of postural sway, in contrast to previous results that manipulated difficulty by changing target distance (Balasubramaniam et al., 2000). These results suggest the dynamics of postural sway are functionally related to environmental demands.

Poster 10.

**Unintentional Entrainment and Visual Tracking Mediate  
Rhythmic Movement Interference**

Michael J. Richardson <sup>1,2</sup>, Charles Coey <sup>1</sup> Veronica Romero <sup>2</sup>,  
Michelle Chu <sup>2</sup>, & R. C. Schmidt <sup>3</sup>

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The patterning of an individual's limb movements is constantly influenced by observing the movements of other individuals and environmental stimuli. When observing incompatible movements such as action observation effects are understood to reveal motor contagion within the human mirror-neuron system, whereby motor input interferes with motor output. Recent research investigating rhythmic movement interference (RMI), however, has found evidence to suggest that motor interference effects do not reflect motor interference or error at all, but rather emergent and constructive properties of movement goals. In support of this latter proposal we present experimental results that demonstrate how RMI is mediated by an observer's coordination intention, the stability of the entrainment to observed movements, and the degree to which observed movements are visually tracked.

Poster 11.

**Measuring Group Synchrony:  
A Test Statistic based on the Kuramoto Order Parameter of Synchronization**

Michael J. Richardson <sup>1</sup>, Till D. Frank <sup>2</sup>, Madison Gregor <sup>3</sup>,  
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We present a quantitative approach to detecting and measuring phase synchronization in a group movement setting. The test statistic proposed is based on the Kuramoto order parameter and provides a continuous measure of group synchrony. As a demonstration of the proposed method, we apply the test statistic to a recently conducted study that investigated six-person intentional and unintentional rocking chair coordination. In this context, we effectively demonstrate how the proposed method can be used to quantify the emergence of phase synchronization within small groups of participants.

Poster 12.

**How important is direction change information  
for spontaneous environmental entrainment?**

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Past research has found that limb movements become more strongly spontaneously entrained to a rhythmic environmental stimulus when the eyes track the stimulus than when the eyes are stationary. The current experiment investigated whether the pick-up of direction change information at the ends of the cycle is the reason why greater spontaneous entrainment occurs in eye tracking conditions. Participants swung a pendulum at a comfort tempo while reading letters that appeared on an oscillating square (tracking condition) or on a stationary square that appeared either under the end or the middle of the trajectory of the oscillating square (i.e., non-tracking condition with direction change information or not). Results verified that movements become strongly entrained when the eyes track the stimulus but indicated little difference in entrainment between the middle and end non-tracking conditions suggesting that direction change information is not causing the differential strength of tracking and non-tracking entrainment

Poster 13.

**Heart rate variability and postural motion as correlates  
of anxiety level in a golf putting competition**

Sam Haag & Michael G. Wade

University of Minnesota

Competitive golf can produce high levels of competitive anxiety, especially when putting for a win. This study examined the relationship between heart rate variability (HRV) and postural motion on putting performance in a competitive setting. Participants were low handicap collegiate and club golfers assigned to two groups, with the three best scores from each group advancing to a final round of competition. Baseline measures of HRV and postural motion (center of pressure) were recorded to act as a within subject control for each participant. Participants wore a Polar HR monitor and stood on a force plate while putting. All putts were recorded with respect to HRV and center of pressure (CoP). An embodied cognition perspective would predict changes in HRV and CoP would reflect a relationship that argues for a perception action link between HRV and CoP in a competitive, anxiety-producing environment.

Poster 14.

**Angle-less orientation for robot alignment to the environment**

Timothy Gifford

University of Connecticut

Robot navigation is often a matter of providing the robot with a model of its world and the eventualities it might encounter. We are trying to whittle away those loans on intelligence to move towards an ecological robotics. For example, using simple color recognition software attached to web cams, it is possible for a robot to use information about itself and the environment to determine the relative direction of objects in the environment that have been previously observed and are now occluded. A previously observed object—now designated as a goal-object by the experimenter—can be found and aligned to without the use of angular information or trigonometric calculations. In essence, the robot becomes attuned to the invariant structure of the environment. The environment, rather than an internal representation, holds the information. This system is robust and can deal with occlusion arising from other objects moving through the environment.

## **Interpersonal Coupling of Affective Valence**

Robert W. Isenhower, James A. Dixon, and Claudia Carello

University of Connecticut

Interpersonal coordination is the spatio-temporal locking of behavior by two or more co-actors. It emerges spontaneously in a variety of perceptual-motor tasks, such as rhythmic limb (Richardson, Marsh, & Schmidt, 2005) and torso movements (Richardson, Marsh, Isenhower, Goodman, & Schmidt, 2007), and postural sway during conversation (Shockley, Santana, & Fowler, 2003). We examine interpersonal coordination in a new domain: the coordination of emotional states. Dimensional accounts of emotion have found strong evidence that emotional experience can be captured and classified along at least two dimensions: valence and arousal (Barrett & Russell, 1998). We focus on valence, in particular, *affective valence*, which refers to how good or bad particular emotional experiences feel (Charland, 2005). Employing a portable switch methodology (cf. Isenhower, Frank, Kay, & Carello, under review) and a variety of time series analyses, we demonstrate that the dynamics of ultradian fluctuations in affective valence are coupled between cohabitating persons.



Poster 16.

**Differential learning in aiming at a target**

Zsolt Palatinus, Till D. Frank, Ryan Arzamarski,  
Yoshi Kobayashi and M. T. Turvey

University of Connecticut

In differential learning, training is characterized by a large variety of between-trial differences. Several previous studies of learning complex motor skills have shown this technique to be superior to target-movement training that emphasizes eliminating variation across trials. Moreover, improvement due to differential learning occurs even after training has ceased. The present study compared differential training and target-movement training in an aiming task in which the training was relatively brief. Our results indicate that differential learning is again superior (on measures of effectiveness, retention, and transferability). These results are examined in the context of a formal description that highlights self-organizing dynamics. Particular attention is paid to the relationship between noise structure in the post-training period and degree of retention.

Poster 17.

### **Perceptual Independence of Afforded Actions**

Tehran J. Davis, Dilip N. Athreya, & Michael. A Riley

University of Cincinnati

Many actions involve combining several, putatively more fundamental acts. For example, jumping to reach (JTR) an overhead object integrates a vertical jump with an overhead reach behavior. One's maximum JTR may be obtained by summing the limits of the two "lower-order" actions (maximum vertical reach while standing + maximum vertical jump). Whether this same additive strategy is involved when *perceiving* affordances for JTR remains an open question. Inference accounts suggest that perceiving a "higher-order" affordance such as JTR depends upon the individual percepts of "lower-order" variables (i.e., percept-percept coupling, ; Epstein, 1982). In the current study, we investigated the dependence of perceived JTR on reports of maximum vertical reachability and vertical jumping ability. Participants were asked to make estimates relative to the maximum height an object could be just touched while standing and reaching, jumping and reaching, and jumping and touching with the their head. The results suggest that individuals did not engage in an additive strategy when perceiving JTR.

Poster 18.

Speed is an Imperfection Parameter for the Human Odometer

**Vivek Kant, Robert W. Isenhower, Claudia Carello, and M. T. Turvey**

University of Connecticut

Operation of the *human odometer*, with distance measured and reported by locomotion, is accurate if the outbound or measure (M) gait and the return or report (R) gait are of like symmetry (Turvey et al., 2009). Additionally, however, differences between the speed of M and R can result in systematic overestimation or underestimation of distance (Mittelstaedt & Mittelstaedt, 2001). Here we examine the effect of a speed difference ( $\delta_{\text{speed}}$ ) between M and R of same ( $\delta_{\text{gait}} = 0$ ; walk, jog; Experiment 1) and different symmetry ( $\delta_{\text{gait}} \neq 0$ ; walk, gallop-walk; Experiment 2). Results demonstrate an effect of  $\delta_{\text{speed}}$  that is reduced when  $\delta_{\text{gait}} \neq 0$ . Implications for the claim that the human odometer functions at the level of the M-R system will be discussed.

Poster 19.

**Postural responses to concurrent suprapostural memory task for children in the risk of developmental coordination disorder**

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University of Minnesota  
National Taiwan Normal University

Developmental coordination disorder (DCD) is a diagnosis for children who have movement difficulties but are of normal intelligence and have no specific neurological deficits. Elevated levels of postural motion have been reported for these children. Since children with DCD manifest difficulties in postural control, further investigation of concurrent postural and suprapostural tasking for children at risk for DCD is warranted. We investigated the effects of varying recall demands of a suprapostural task on postural motion in DCD and typically developing children (TDC). Six DCD and TDC performed a suprapostural memory task, recalling digit span lists, in two conditions of task difficulty. To date no research has manipulated task difficulty while recording, in real time, postural motion. The findings are discussed regarding the perception-action link between postural motion and cognitive performance for TDC children and those at risk for DCD.