4th Joint Action Meeting

July 7-9, 2011

Theatersaal
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Organized by:
Anne Böckler, Georg Theiner, Günther Knoblich and Natalie Sebanz

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Program

	Thursday, July 7th	Friday, July 8th	Saturday, July 9th	
8:45	Welcome			
9:00	Talk session A *Coordination I*	Talk session E *Attention*		
			Talk session I *Shared Mental States III*	10:00
10:30	Poster session 1 / Coffee break	Poster session 2 / Coffee break	Coffee break	11:10
11:30	Talk session B *Planning I*	Talk session F *Coordination II*	Talk session J *Communication*	11:30
13:00	Lunch	Lunch	Lunch	13:00
14:00	Talk session C *Observation*	Talk session G *Planning II*	Talk session K *Coordination III*	14:00
15:30	Poster session 1 / Coffee break	Poster session 2 / Coffee break	DEMO	15:30
			End	15:50
16:30	Talk session D *Shared Mental States I*	Talk session H *Shared Mental States II*		
18:00	End	End		

Talk sessions

Talk session A: *Coordination I* — *Thursday, 9:00-10:30*

Dilip N. Athreya, T.J. Davis and M.A. Riley
Dynamics of interpersonal coordinative structure

Gonzalo C. de Guzman, E. Tognoli and S. Kelso
Agents of change in social coordination tasks with a virtual partner

Michael Richardson
Self-organization in complementary joint actions

Michael T. Tolston
Interpersonal coordination in virtual environments

Talk session B: *Planning I* — *Thursday, 11:30-13:00*

Thomas Dolk, B. Hommel, W. Prinz and R. Liepelt
Salient events induce referential coding in go-nogo Simon tasks

Chiara Gambi, U. Cop and M.J. Pickering
Shared re-planning: What happens when I stop and you resume

Xun He, N. Sebanz, A.G. Lever and G.W. Humphreys
Inter-personal memory guidance of attention in joint action: Effects of in-group coding

Roman Liepelt and W. Prinz
How two share two tasks: Evidence for a social PRP effect

Talk session C: *Observation*	*Thursday, 14:00-15:30*

Cristina Becchio and U. Castiello
Grasping social intentions from movement: from thought experiments to empirical evidence

Tim Welsh and Sanjay Chandrasekharan
The assumed abilities of an observed actor are simulated during the formation of action possibility judgments

Lincoln J. Colling, W.F. Thompson, J. Sutton and M.A. Williams
Functional equivalence between acting alone and acting together

Luisa Sartori, A. Cavallo, G. Bucchioni and U. Castiello
Corticospinal excitability is modulated by the complementary nature of observed actions

Talk session D: *Shared Mental States I*	*Thursday, 16:30-18:00*

Olle Blomberg
Joint action without common knowledge

Steven Butterfill
A puzzle about the possibility of joint action without shared intention

Christopher Woodard
Uncooperative collective reasons

István Zárdai
Knowing how and our introspective knowledge of what we intend

Talk session E: *Attention*	*Friday, 9:00-10:30*

Anne Böckler, G. Knoblich and N. Sebanz
What are you looking at? - Effects of the co-actor's focus of attention on task performance

Sarah Schwarzkopf, B. Timmermanns, K. Vogeley and L. Schilbach
Looking through your eyes: Investigating automatic perceptual perspective taking with a mental rotation task

Anika Fiebich, U. Pfeiffer and L. Schilbach
How to distinguish interaction from joint action: Theoretical assumptions & empirical evidences from research on humanness ascription

Steen N. Larson
Philosophical questions to Michael Tomasello's theory of joint attention

Talk session F: *Coordination II*	*Friday, 11:30-13:00*

Robrecht van der Wel, G. Knoblich and N. Sebanz
Let the force be with us: Haptic information and the sense of agency in joint coordination

Stephan Streuber
The effect of visual information on table tennis performance: what visual information is important about the other person and when?

J. Scott Jordan, A. Kenning, J. Clinton and J. Durtschi
Spatial perception during control with others: The 'other' as potential perturbation

Hanne de Jaegher
A spectrum of explanation for joint action: from individual-dominant to interaction dominant

Talk session G: *Planning II*	*Friday, 14:00-15:30*

Sandro Rubichi, L. Ferraro, C. Iani, M. Mariani, V. Gallese and R. Nicoletti
Look at me: Social transfer of learning with an observer

Jessica Tsai, N. Sebanz and G. Knoblich
The GROOP effect: Groups mimic group actions

Silke Atmaca, N. Sebanz and G. Knoblich
The joint Flanker effect

Dimitris Kourtis, N. Sebanz and G. Knoblich
EEG evidence for representation of an interaction partner's task during action planning

Talk session H: *Shared Mental States II*	*Friday, 16:30-18:00*

Giuliano Torrengo
Collective intentionality, documents, and social reality

Luca Tummolini
From social to shared reality: a cognitive approach to institutional facts

Georg Theiner
Towards a mechanistic psychology of group memory: Some programmatic remarks

Talk session I: *Shared Mental States III*	*Saturday, 10:00-11:10*

Thomas H. Smith
Adverbial and sentential 'jointly'

John Michael
Shared emotions and joint action

Axel Seeman
Joint action: A perception-based approach

Talk session J: *Communication*	*Saturday, 11:30-12:40*

Valeria Manera, M. Del Giudice, B. Schouten, K. Verfaillie, B.G. Bara and C. Becchio
Interpersonal predictive coding: Communicative gestures increase the likelihood of perceiving a second agent

Matthias Scheutz
Coordinated actions and dialogue moves in a collaborative remote search task

Maria Gräfenhain, M. Carpenter and M. Tomasello
Understanding the consequences of joint commitments to act together in 3-year-old children

Richard Veale
Developmental neurorobotics to understand parent-child interaction

Talk session K: *Coordination III*	*Saturday, 14:00-15:30*

Kimberly A. Quinn
Behavioral synchrony paradoxically undermines self-projection

Ivana Konvalinka, D. Xygalatas, J. Bulbulia, U. Schjødt, E.M. Jegindø, S. Wallot, G. Van Orden and A. Roepstorff
Synchronized arousal between performers and related spectators in a fire-walking ritual: Joint action in the wild

Peter E. Keller, N. Pecenka, M.T. Fairhurst and B.H. Repp
Relations between basic temporal error correction processes and the quality of interpersonal coordination

Veronica C. Ramenzoni
Joint coordinative structures: Nested processes of intrapersonal and interpersonal coordination

DEMO	*Saturday, 15:30*

Daniel C. Richardson, R. Dale, J. Rogers and J. Ireland
How do 100 people walk a tightrope together? An experiment in large scale joint action

Poster sessions

Poster session 1	*Thursday, 10:30-11:30 & 15:30 - 16:30*

Lize De Coster, B. Verschuere, L. Goubert and M. Brass
The influence of being imitated on empathy for pain

Terry Eskenazi, F. de Lange, S.A. Rueschemeyer, G. Knoblich and N. Sebanz
Observing shared intentions: An fMRI investigation

Debra Griffiths and S. P. Tipper
When far becomes near: Shared environments activate action simulation

Jeremy Hogeveen and S. Obhi
Engaging in a social interaction primes biologically-selective motor resonance

Paul Hoemke, A. Böckler and N. Sebanz
It doesn't take balls to ostracize: Effects of attentional ostracism on basic needs, sympathy, and gaze behaviour

Michael J. Hove , K. Suzuki, H. Uchitomi, S. Orimo and Y. Miyake
Interactive rhythmic auditory stimulation system reinstates natural 1/f timing in gait of Parkinson's patients

Markus Huber, A. Knoll and S. Glasauer
Efficient assistance - A question of timing

H. IJzerman, M. Gallucci, W.T. J. L. Pouw, Sophia C. Weißgerber, N.J. Van Doesum, M. Vetrova and K.D. Williams
Grounding social relations in physical temperature

Anna Kuhlen, C. Allefeld and J.D. Haynes
Coupling of EEG between speakers and listeners

Janeen Loehr, C. Vesper, D. Kourtis, N. Sebanz, and G. Knoblich
Representing individual and joint action outcomes in duet music performance: An ERP investigation

Poster session 1 (contd.)

Heather Neyedli, M. Ray, D. Weeks, J. Pratt and T. Welsh
"Don't stand so close to me": Joint Simon effects are only observed when participants are in extrapersonal space

Nhung Nguyen and I. Wachsmuth
A computational model of cooperative spatial actions for virtual humans

Sukhvinder Obhi and P. Hall
Sense of agency and intentional binding in joint action

Joanna Rączaszek-Leonardi and M. Denkiewicz
Social Simon effect in a competitive and cooperative setting

Lucia Sacheli, M. Candidi, E. Pavone, E. Tidoni and S.M. Aglioti
Impact of social variables on the kinematics of on-line cooperative-competitive interactions

Lee Tbaily and D.C. Richardson
Social indexing and memory

Poster session 2 *Friday, 10:30-11:30 & 15:30 – 16:30*

Clare Blythe and D. Richardson
Joint perception: gaze, social context and the minimal intergroup situation

Andrea Cavallo, C. Begliomini, C. Becchio, L. Sartori and U. Castiello
Inferring intentions from kinematics

Rita de Oliveira
Joint visual action of passersby

Katalin Egyed and R. Takács
„Lonely" and „cooperative" minds' effect – Imitation-paradigm with one or two models in investigating preschoolers' interpretation of goal-directed actions

Poster session 2 (contd.)

Juliane Honisch and Caroline Gillett
"It's not you, it's me" The role of bottom up and top down processing in modulating interpersonal synchronization

J. Scott Jordan
Multi-scale entrainment as a medium for education and enculturation

Marlene Meyer, S. Hunnius, M. van Elk, F. van Ede and H. Bekkering
Joint action modulates motor system involvement during action observation in 3-year-olds

Sukhvinder Obhi and P. Hall
Sense of agency in joint action: Effects of human and non-human co-actors

Giovanni Pezzulo and H. Dindo
A Bayesian model of joint action that uses shared representations for solving interaction problems

Matthew Ray, D. Kearnan, T. Welsh
The intentional Simon effect is not present in a joint action task

Roberta Sellaro, B. Treccani, S. Rubichi and R. Cubelli
Division of labor in a joint Simon task

Vassilis Sevdalis and P.E. Keller
Captured by motion: Dance, action understanding, and social cognition

Eszter Szabó
Ascribing emotions in foreign language speech

Poster session 2 (contd.)

Bert Timmermans, L. Schilbach and K. Vogeley
Can you feel me: A different sensitivity to interaction dynamics in high functioning autism?

Cordula Vesper, R. van der Wel, G. Knoblich and N. Sebanz
Flying Dutchmen: Temporal predictions for coordinating with others

Abstracts

(in alphabetical order)

Dynamics of interpersonal coordinative structure

A

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

Perceptual-Motor Dynamics Lab, University of Cincinnati, USA

Recent developments in interpersonal coordination research have suggested that coordination between individuals is best understood as a unitary coordinative structure that emerges from dynamical self-organization principles. An immediate ramification of such a framework is the possibility that the coordination between individuals may be mainly driven by task demands. In the current study, we investigated supra-postural coordination in an interpersonal precision task while manipulating the presence or absence of information that each person received about the postural activity of the other. Participants were asked to maintain the relative positions of their index finger with one another, while postural demands were manipulated independently for each person with two different standing stances. Cross recurrence quantification analysis (CRQA) of finger trajectories (effector coordination) and torso (postural coordination) revealed that the postural coordination across individuals decreased in the absence of visual information about the posture of the other agent. However, interpersonal effectors coordination was unaffected. This suggests independence between task demands and the coordination modes by which those demands are met. Further, these results could motivate specific hypotheses regarding the synergetic, self-organizing nature of interpersonal joint coordination.

The joint Flanker effect

G

Silke Atmaca[1], Natalie Sebanz[2] and Günther Knoblich[2]

[1] Department of Psychology, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, DE

[2] Donders Institute for Brain, Cognition, and Behaviour, NL

The Eriksen Flanker task (Eriksen and Eriksen 1974) was distributed among pairs of participants to investigate whether individuals take into account a co-actor's S-R mapping even when coordination is not required. Participants responded to target letters (Experiment 1) or colors (Experiment 2) surrounded by distractors. When performing their part of the task next to another person performing the complementary part of the task participants responded more slowly to stimuli containing flankers that were potential targets for their co-actor (incompatible trials), compared to stimuli containing identical, compatible, or neutral flankers. This joint Flanker effect also occurred when participants merely believed to be performing the task with a co-actor (Experiment 3). Furthermore, Experiment 4 demonstrated that people form shared task representations only when they perceive their co-actor as intentionally controlling her actions. These findings substantiate and generalize earlier results on shared task representations and advance our understanding of the basic mechanisms sub-serving joint action.

Grasping social intentions from movement: from thought experiments to empirical evidence

C

Cristina Becchio[1] and Umberto Castiello[2]

[1] Center for Cognitive Science, Department of Psychology, University of Turin, IT

[2] Department of General Psychology, University of Padua, IT

Scepticism has been expressed concerning the possibility to understand others' social intentions by simply observing their movements: Since there are always an infinite number of different intentions that may have produced any particular action, motor information might be sufficient to understand what an agent is doing, but it is not sufficient to understand her remote goal in performing that particular action. This talk will question this view *on the basis of recent evidence* regarding the extraction of intentions from movement observation. Based on these recent findings, we shall contend that i) different social intentions translate into differential kinematic patterns; ii) observers rely on differences in visual kinematics to anticipate the intention of an agent in performing a given movement; iii) incapability to exploit information from kinematic sources can lead to difficulties in understanding others' intentions when no other cues (e.g. context information) are available.

Joint action without common knowledge

D

Olle Blomberg

Department of Philosophy, School of Philosophy, Psychology and Language Sciences, University of Edinburgh, UK

In the philosophical literature on joint action, it is typically argued that certain attitudes of participants must be "common knowledge" (CK). Such a CK condition is introduced for a variety of reasons: (i) to rule out some otherwise problematic cases, (ii) to allow the joint intention to play a role in joint deliberation and planning, (iii) to account for a characteristic phenomenology of participation (referred to by suggestive metaphors of 'openness' and 'transparency'), and (iv) to justify participation in joint action as rational. The notion of CK is typically left analysed, but joint action theorists often appeal to a classical analysis developed by Lewis (1969) and Schiffer (1972). In this talk, I examine whether this classical analysis can play all the roles that joint action theorists have assigned to it. I argue that the classical analysis cannot in deliver on (iii) and (iv), and suggest that a condition of reciprocal trust is better suited to meet the joint action theorists' "job spec". This condition also has the advantage of being able to accommodate joint activities where participants lack a robust “theory of mind”.

Lewis, D. K. (1969). Convention: a philosophical study. Harvard University Press.

Schiffer, S.R. (1972). Meaning. Clarendon Press.

Joint perception: Gaze, social context and the minimal intergroup situation

2

Clare Blythe and Daniel Richardson

University College London, UK

The aim of this study was to explore whether recent research on joint perception could be explained by the minimal intergroup situation. Richardson and colleagues (submitted, 2010) found that participants under joint-perception conditions looked less at negative imagery [versus positive] when expecting to be compared to each other, but more at negative imagery when expecting to collaborate together. Past research has demonstrated that accessible in-group identity causes group members to assume similarities between themselves and other members (Allen & Wilder, 1979), and that people prioritise stimuli they believe relevant to the group (Shytenberg, 2010). Based on the hypothesis that collaboration instructions may have induced a feeling of shared in-group membership amongst joint-perception partners who expected to have to cooperate as a team, this study replicated the original joint-perception paradigm, manipulating assumed similarity between joint-perception partners using an avatar colour choice task. It was predicted that the combination of both collaboration instructions and assumed similarity to the joint-perception partner would magnify the findings of Richardson and colleagues (submitted, 2010), thus revealing an interaction between the social context and participants expectations and beliefs which can be explained by the minimal intergroup situation. The results spoke to both the original research and the current predictions.

Allen, V.L., & Wilder, D.A. (1979). Group categorization and belief similarity. Small Group Behavior, 10, 73-80.

Shytenberg, G. (2010). A silent emergence of culture: the social tuning effect. Accepted at the Journal of Personality and Social Psychology, Online.

Richardson, D.C., Street, C.N.H., Tan, J.Y.M., Kirkham, N.Z., Hoover, M.A., Cavanaugh, A. (2010). Joint perception: gaze and social context, submitted for publication.

What are you looking at? - Effects of the co-actor's focus of attention on task performance

E

Anne Böckler, Natalie Sebanz and Günther Knoblich

Donders Institute for Brain, Cognition, and Behavior, NL

People take a co-actor's perspective on a jointly attended scene into account and give up their egocentric view when the other's spatial perspective is noticeably different. Present experiments investigated whether people's performance is also affected by a co-actor's focus of attention – even when spatial perspectives do not differ. Two participants were sitting next to each other while each performed a two-choice Navon task, responding to the identity of letters consisting of similar (congruent) or different (incongruent) smaller letters. Stimuli and responses of the two participants were kept independent. The critical manipulation concerned the focus of attention: participants either attended to the same aspect of the letters (e.g. both to the local aspect/small letters) or they attended to different aspects. Results revealed a significant slow-down of responses when participants focused on different aspects. This slow-down did not depend on participants attending to the same stimulus location, but the effect broke down when the other's stimuli could not be perceived. An EEG-study revealed effects of the co-actor's focus of attention on components related to attentional processing. Taken together, this may indicate that the co-actor's different focus can't be ignored and induces the need to re-focus on one's own stimulus aspect.

A puzzle about the possibility of joint action without shared intention

D

Stephen Butterfill

University of Warwick, UK

Many researchers at previous JAMs have claimed or implied that some joint actions do not involve shared intentions. This claim generates a puzzle. For two or more agents' activities to constitute a joint action there must be a goal to which these activities are collectively directed. And, trivial cases aside, their activities being directed to this goal cannot consist only in each agent's activities being individually directed to the goal. How could two or more agents' activities be collectively directed to a goal? When shared intention is present, the question has a standard answer: shared intentions link agents' activities to a goal by both causing the activities and representing the goal. The puzzle is to understand how two or more agents' activities could be collectively directed to a goal when the agents do not share an intention. We need to solve this puzzle in order to properly understand what joint action is. This talk offers a solution by introducing the notion of a collective goal. Collective goals are a necessary but neglected building block for research on joint action.

Inferring intentions from kinematics

2

Andrea Cavallo[1], C. Begliomini[2], C. Becchio[1], L. Sartori [2], and U. Castiello[2]

[1] Centre for Cognitive Science, Department of Psychology, University of Torino, IT

[2] Department of General Psychology, University of Padova, IT

The aim of the present study was to explore the neural circuits underlying the ability to infer covert intentions from kinematics cues in socially motivated vs. individually intended actions. Seventeen adults (7 males) aged 19-36 (mean 23.3 years) participated in an fMRI investigation. They were asked to observe video clips representing either socially motivated (i.e. cooperative and competitive) or individually intended actions. Stimuli consisted of video clips showing only the early stage of an object-directed reach-to-grasp movement: in social-type of video clips the final part of the movement, showing interaction with another agent, was masked as to equate these with the individual-type of video clips. In order to maintain a constant level of attention, following the presentation for each video, participants were asked to discriminate the congruency between a static image and a video clip. Results show that the observation of socially motivated actions produces a significant activation within the left inferior parietal lobule, the left middle frontal gyrus and the inferior frontal gyrus bilaterally. These findings confirm and extend previous literature demonstrating that the neural circuits involved during the observation of explicit social interactions are also alerted when the social nature of the observed action is only intended.

Functional equivalence between acting alone and acting together

C

Lincoln J. Colling[1], William F. Thompson[1,2], John Sutton[1], Mark A. Williams[1]

[1] Macquarie Centre for Cognitive Science, Macquarie University, Sydney, AU

[2] Department of Psychology, Macquarie University, Sydney, AU

Many forms of joint action occur in situations where time constraints make it difficult to coordinate actions by using language. In these situations, individuals need to be able to anticipate the actions of their co-actors. We provide an account of joint action coordination built on a foundation of individual action control. This framework regards the predictive mechanisms that underlie individual action control and joint action coordination as functionally equivalent. To support this claim, we present findings from action prediction tasks in which participants are asked to generate predictions about the movements of an animated mannequin. The results show that participants are more accurate when generating predictions about recordings of self-produced actions. This is consistent with individuals employing the same action models for action production and action prediction. In a follow-up electroencephalographic study, participants viewed visually identical displays under two conditions. In the prediction condition they were asked to synchronize a button press with the movement of a mannequin while in the control condition they were asked to synchronize a button press with a marker on the mannequin that intermittently changed color. The results show enhanced motor system activity, as indexed by mu-rhythm suppression, during the prediction of the mannequin's actions.

The influence of being imitated on empathy for pain

1

Lize De Coster[1], Bruno Verschuere[2], Liesbet Goubert[3] and Marcel Brass[1]

[1] Department of Experimental Psychology, Ghent University, BE

[2] Department of Clinical Psychology, University of Amsterdam, NL

[3] Department of Clinical-experimental and Health Psychology, Ghent University, BE

Social psychological research suggests that being imitated leads to prosocial behaviour, while pain perception studies indicate that pain-related brain representations become activated in the observer when viewing another person in pain. The aim of this study is to investigate whether being imitated can modulate such empathy for pain. To this end, we developed an experimental approach combining a simple imitation task with a pain perception task: Participants have to carry out an index or a middle finger movement that is either imitated by a previously videotaped hand presented on a monitor (imitation block) or not (non-imitation block), while the hand on the video receives painful stimulation at the end of each block. We predict that being imitated leads to stronger empathy for pain than not being imitated, due to a self-other confusion mechanism. Preliminary results, using behavioural questionnaires and autonomic responses as indices for the strength of activation of the pain matrix, suggest that being imitated has an influence both on explicit and implicit measures of empathy for pain. These results provide important insights into the basic mechanisms of being imitated and empathy for pain (self-other confusion), and thus contribute to a better understanding of processes underlying joint action.

Agents of change in social coordination tasks with a virtual partner

A

Gonzalo C. de Guzman, E. Tognoli and J.A.S. Kelso

Human Brain and Behavior Laboratory, Center for Complex Systems and Brain Sciences, Florida Atlantic University, USA

We study agents of change in a manual coordination task between a human and a virtual partner. An agent is the partner who induced coordination change on the other. The virtual partner–human interaction (VPI) simulates real time coordination between two people based on the framework of coordination dynamics. We asks: (1) can VPI induce behavioral transitions in human subjects similar to those found in live interactions, and (2) can the agent(s) of change be unambiguously identified and the extent of their role contribution quantified. Subjects synchronize finger movement in-phase with a virtual partner programmed to coordinate nominally only in anti-phase. We used the similarity index to assess directional coupling (in the sense of "who copies whom, more"). Relative phase plots show regions of phase locking and phase wrapping such as found in visually coupled live interactions. Similarity index reveals interchanging leader-follower roles, with maxima of the measure occurring at peak flexions and peak extensions. These findings match observed coordination patterns and directional coupling behaviors in experiments between two people reasonably well. The study also paves the way to study agency in a parametric way.

A spectrum of explanation for joint action: From individual-dominant to interaction dominant.

F

Hanne De Jaegher

Centre for Life, Mind and Society Studies, University of the Basque Country, ES

We have proposed that social interaction processes can take on a life of their own (become autonomous) (De Jaegher & Di Paolo 2007) and be constitutive of performance on a social task (De Jaegher, Di Paolo & Gallagher 2010). Based on this theory (called *participatory sense-making*), I present a tool for evaluating experiments on social cognition and joint action: a spectrum ranging from interaction-dominant to individual-dominant explanations. Using examples from contemporary research (specific experiments), I illustrate this range of accounts. I discuss advantages and disadvantages of explanations on either end of the spectrum. The conclusion is that neither is sufficient on their own, and that they need to be combined in specific ways if the richness and complexity of human social cognition is to be captured.

Joint visual action of passersby

2

Rita F. de Oliveira

Department of Psychology, University of London, UK

Institute of Psychology, German Sport University Cologne, DE

In everyday streetwalking, people are rather skilful at avoiding bumping into passersby walking in their direction, but when the sidewalk is crowded passersby do sometimes start heading in our direction.

Goal: We examined the hypothesis that the direction where people look is the relevant information source that allows disambiguation of walking direction.

Methods: Fifty participants walked passed one of eleven confederates 5 times on a 10×3m corridor under four conditions: No-Instruction; Eye-Ear consisted of looking at the eyes of the confederate who looked back at their eyes; Eye-Eye consisted of looking at the eyes of the confederate who looked at the ear on the side he or she intended to pass; Ear-Ear consisted of both participant and confederate looking at the ear on the side they intended to pass. Video recordings were rated to determine the degree to which the two persons bumped into each other.

Results: There was a significant effect of condition with contrast analysis showing significant differences between the Eye-Ear condition and both Ear-Ear and Eye-Eye conditions but not between the Eye-Ear and No-Instruction conditions.

Conclusion: This supports the hypothesis that visual direction is a relevant information source to guide the behaviour of passersby.

Salient events induce referential coding in go-nogo Simon tasks

B

Thomas Dolk[1], B. Hommel[2], W. Prinz[1] and R. Liepelt[1,3]

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[2]Cognitive Psychology Unit, and Leiden Institute for Brain and Cognition, Leiden University, NL

[3]Department of Psychology, Westfälische Wilhelms-University, Münster, DE

The Social Simon effect (SSE) has been considered as an index of action/task co-representation. Recent findings challenge this view, however, by suggesting that the SSE may result from salient social or non-social events that provide a reference for spatially coding one's action. To further clarify what the notion of action/task co-representation means, what it refers to and how it can account for the SSE, we conducted two experiments. By implementing a non-social "action" event in an auditory go-nogo Simon task we were able to replicate our previous finding of a SSE under solo conditions (Experiment 1). The same result was also obtained when the salient event was visual (Experiment 2), suggesting that the SSE-inducing event does not need to share the modality with the target stimulus. That is, the task relevance of the reference-inducing event does not matter if it only is sufficiently salient. We conclude that the SSE occurs whenever agents code their own action as left or right in reference to another salient event, suggesting that the effect does not necessarily require the co-representation of another person's task.

„Lonely" and „cooperative" minds' effect – Imitation-paradigm with one or two models in investigating preschoolers' interpretation of goal-directed actions

2

Katalin Egyed and Rita Takács

Eötvös Loránd University, Institute of Psychology - Institutional Center of Developmental Psychology, Budapest, HU

Imitation is our most sophisticated ability to reproduce others' actions allowing us to acquire new skills rapidly. Although imitation is considered a social learning skill we pay little attention how different social context affect children's interpretation. In our view it is a good opportunity to manipulate the social context with applying joint actions in an imitation-paradigm. Therefore we employed two different conditions: a classical 1-model and a new 2-model condition with two cooperating and role-reversing models. Each model in both conditions did relevant and irrelevant steps too.

Our present data show that preschoolers reproduce more relevant steps than irrelevant ones independently from the condition. However, they imitate role-reversing even if it is irrelevant to the goal. In our ongoing experiment we are running another 2-model condition in which one of the two models does only relevant steps and the other person only irrelevant ones. We suppose that in this social context children can attach the irrelevant steps to one person increasing the 'social-relevance' of the causally irrelevant steps, so more irrelevant steps will appear than earlier. In our opinion this new imitation-paradigm with two models can prove to be useful in the future to investigate children's interpretation of joint actions.

Observing shared intentions: An fMRI investigation

1

Terry Eskenazi, Floris de Lange, Shirley-Ann Rueschemeyer, Guenther Knoblich and Natalie Sebanz

Donders Institute for Brain, Cognition, and Behavior, NL

Action perception studies have so far investigated the perception of individual actions. It is unknown however how we perceive joint actions. Joint actions involve two or more individuals coordinating their actions around a shared intention. According to philosophical accounts of joint action, this is fundamentally different from multiple individuals acting in parallel without a shared intention. Do observers process situations where two individuals act towards a shared intention (joint action) differently than situations where they act on their independent intentions (parallel action)? To answer this question, this fMRI study compared perceptually identical yet intentionally ambiguous actions observed in varying contexts.

In an observation paradigm, a dialogue between two individuals set the context for the following video depicting these individuals engaging in various actions. In the joint action condition, the dialogue conveyed two actors agreeing to do something together (making a pizza). In the parallel action condition actors expressed their own independent intentions (pizza vs. salad). Importantly, the videos following the dialogue were exactly the same. Data analysis focused on the BOLD response during the observation of action performance.

We observed activation in anterior parts of the medial prefrontal cortex (MPFC) in the joint action condition, whereas in the parallel action condition posterior parts of the MPFC were found active. MPFC is an area associated with representing mental states. Accordingly, the results suggest that the mentalizing processes subserving the perception of intentions shared by multiple individuals are different from the processes involved in the perception of multiple independent intentions.

How to distinguish interaction from joint action: Theoretical assumptions and empirical evidences from research on humanness ascription

E

Anika Fiebich[1*], Ulrich Pfeiffer[2*], & Leonhard Schilbach[3] (*equal contribution)

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In our talk, we highlight the theoretical distinction between *mutual shared attention* (i.e. interactional gaze-following) and *joint attention* (i.e. mutual shared attention with a mutually acknowledged purpose) (Fiebich & Gallagher, under review). Support for this distinction comes from research on humanness perception: Using interactive eye-tracking, we investigated the influence of a virtual character's gaze-following behavior on the ascription of humanness to the character. The character was said to be controlled by a computer or by another person introduced as naïve to the participant's task, cooperative or competitive (Pfeiffer et al, under review). The probability of gaze-following as compared to gaze aversion was systematically varied. Results indicate that the ascription of humanness increases with higher degrees of gaze-following when participants interact with a putatively naïve partner (i.e. during an interaction *without* shared intentions). In contrast, humanness was also ascribed in cases of high degrees of gaze aversion when the confederate had been introduced as cooperative (i.e. during an interaction *including* shared intentions). In competitive interaction, neither valence nor contingency of reactions played a role in humanness ascription. While humans may have a default expectation of reciprocity in interaction, this can be influenced dramatically by an interactor's presumed disposition to cooperate, thus turning mutual shared attention into joint attention.

Fiebich, A., & Gallagher, S. (under review). Joint Attention: From Interaction to Joint Action.

Pfeiffer, U.J., Timmermans, B., Bente, G., Vogeley, K., & Schilbach, L. (under review). A Social Turing Test: Ascription of humanness to virtual characters depends both on interaction contingencies and presumed disposition to cooperate.

Shared re-planning: What happens when I stop and you resume

B

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The motor system is activated while watching other people's actions. It may serve as an emulator, generating expectations that can facilitate perception of those actions (Wilson & Knoblich, 2005). Pickering and Garrod (2007) argued that comprehending language similarly involves recruiting the production system to generate predictions about upcoming words. We tested this hypothesis by investigating the process of stopping and resuming speech in a joint task setting. Participants took turns in naming pictures. On a small percentage of trials an initial picture changed into a different (target) picture; participants were asked to stop naming the initial picture as fast as possible. Their task was either to name the target picture themselves (SELF), simply ignore the target (NO) or ignore the target while their partner named it (OTHER). Hartsuiker et al. (2008) showed, with an individual version of the task, that stopping is harder when you then have to resume by naming the target. This is because planning the target picture name takes up resources needed to inhibit speech. We found indication that the pattern of results in OTHER lays in-between SELF and NO. We take this as evidence that participants are, to some extent, predicting their partners' responses before they are uttered.

Hartsuiker, R.J., Catchpole, C.M., de Jong, N.H. & Pickering, M.J. (2008). Concurrent processing of words and their replacements during speech. *Cognition, 108*, 601-607.

Pickering, M.J., & Garrod, S. (2007). Do people use language production to make predictions during comprehension? *Trends in Cognitive Sciences, 11*, 105-110.

Wilson, M., & Knoblich, G. (2005). The case for motor involvement in perceiving conspecifics. *Psychological Bulletin, 131,* 460-473.

Understanding the consequences of joint commitments to act together in 3-year-old children

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When acting together in a cooperative activity, adults make a joint commitment to act together entailing certain obligations to the partners. This ensures that partners fulfill their roles properly. Little is known, however, whether young children similarly form such joint commitments with the resulting obligations. In two studies, we engaged 3-year-old children in a game, in which we confronted children with unexpected events. Half the children agreed to play the game together with a puppet partner (and cooperated with the partner), the other half played the game individually (in parallel to another player). We found that children reacted differently to the unexpected events as a function of the play context: Children who were engaged in a joint commitment to play the game together were more likely to wait for the partner when she stopped acting than children who had played individually. They also helped their partner spontaneously more often and even took over the partner's part when necessary.

These results present evidence that by 3 years of age, children have developed a quite sophisticated understanding of joint commitments to act together and the obligations they entail. They are thus well on the way to an adult understanding of cooperative activities.

When far becomes near: Shared environments activate action simulation

1

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It has been proposed that one means of understanding a person's current behaviour and predicting future actions, is by simulating their actions. That is, when another person's actions are observed, similar motor processes are activated in the observer. For example, after observing a reach over an obstacle a person's subsequent reach trajectory is more curved, reflecting motor priming. Importantly, such motor states are only activated if the observed action is in near (peripersonal) space (Griffiths & Tipper, 2009). However, we demonstrate that when individuals share action environments and act upon the same objects, simulation of another person's obstacle avoiding reach path takes place even when the action is in far (extrapersonal) space. Motion tracking recorded the arm movements of 32 participants, half where neither the workspace nor objects were shared and half where they shared objects and a movable work space. In both the conditions the observed movement was identical. This experiment demonstrates that action embodiment is sensitive to higher-level concepts such as shared environments.

Griffiths, D., & Tipper, S. P. (2009). Priming of reach trajectory when observing actions: hand-centred effects. Quarterly Journal of Experimental Psychology, 62(12), 2450-2470.

Inter-personal memory guidance of attention in joint action: Effects of in-group coding

B

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It is suggested that people represent aspects of a partner's task, when individuals perform together. We examined whether the representation of another's task extends to working memory (WM) representations held during a task and whether these WM representations influence attention. Participants performed visual search and memory tests in turn, sitting side by side in front of a single screen. Individuals were: a) Caucasian strangers, b) Caucasian friends, c) South Asians strangers born and raised in Britain, and d) native Chinese people living in UK. We replicated the results that attention can be guided towards the image that an individual had to hold in WM. More interestingly, visual attention was also be directed by images that only the partner had to code in WM. However, this effect only occurred between Caucasian strangers and between British South Asians; no effect of the partner's memory items was found between Chinese participants or between Caucasian friends. We suggest that interpersonal memory-based guidance of attention is modulated by the nature of the relationship between individuals, and reduces when individuals have higher ingroup relations.

It doesn't take balls to ostracize: Effects of attentional ostracism on basic needs, sympathy, and gaze behaviour

1

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When playing a computer ball-tossing game with virtual partners, people react very sensitively to being ostracized (this is, excluded from the game by their interaction partners). Particularly, it has been shown that being ostracized in these games lowers people's self-esteem, feeling of belongingness, feeling of meaningful existence, and experience of control. Present experiments aimed at investigating whether ostracism could also be induced in a context where the participant and the virtual agents merely look at each other without jointly acting on objects. As compared to people who were included during the joint-attention game (looked at), people who were ostracized (not looked at) reported lower levels of self-esteem, belongingness, meaningful existence, and control. A second experiment examined the effects of being ostracized on participants' evaluation and liking of their virtual interaction partners. In a third experiment, the effect of ostracism on subsequent gaze following behaviour was investigated. Taken together, results suggest that people are susceptible to being ostracized in a joint attention-game, thus, to 'epistemic ostracism'.

Engaging in a social interaction primes biologically-selective motor resonance

1

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The mirroring of actions in an observer's motor system (motor resonance; MR) may be the neural mechanism underlying the tendency for humans to mimic one another during social interactions (nonconscious mimicry; NCM). If MR is *involved* in NCM, action processing during a social interaction should prime MR during subsequent action observation. If MR is *sufficient* for NCM, action observation should prime NCM during a subsequent social interaction. Crucially, these priming effects should require a human action stimulus. Participants in the present study observed videos of either a human hand squeezing a rubber ball, or a similar movement by a robotic effector, while transcranial magnetic stimulation (TMS) induced motor-evoked potentials (MEPs) indexed MR. Half of the participants engaged in an interaction designed to elicit NCM before the TMS session, whereas the other half performed the interaction after TMS. MEP facilitation varied as a function of prior mimicry for the participants who observed the human, but not the robotic, action stimulus. Mimicry was unaffected by prior action observation. Thus, engaging in a social interaction primes biologically-selective motor resonance, but action observation does not prime mimicry. We suggest that motor resonance is necessary, but not sufficient, to account for human mimicry.

"It's not you, it's me" - The role of bottom up and top down processing in modulating interpersonal synchronization

2

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Most studies of timing have focused on isolated individual timing, explaining aspects such as synchronization to a metronome or a flashing light. Interpersonal coordination is potentially more challenging as multiple people may influence each other's performance which may not only be modulated by basic action-perception links, but also by cognitive processes. One example for a top down modulation of interpersonal coordination is ballroom dancing. When dancers perform with a partner who is familiar to them and to whom they may have high affinity for, their joint performance may significantly improve compared to performing with a unknown or disliked partner. We are interested if knowledge of the identity of the agent we synchronize to influences our accuracy in performance. Specifically, does temporal performance improve when this agent is allegedly known to us? To provide a more controlled environment we used a 3D point light display of real motion tracking data to which a participant had to synchronize to simple arm movements. The belief of the agent's identity in the 3D display (self, other) was manipulated. The 'known agents' were recordings of the participant them self (self) and 'unknown agents' were recordings of other physically matched participants (other). Participants' movements were recorded using a motion tracking system. Preliminary results suggest when agency was unknown synchronization accuracy was significantly better when synchronizing to oneself over others. However, when given identity information (whether true or false) synchronization performance was improved when participants believed they were performing with themselves. We will present the final results (N12) which are currently being analyzed, providing support for top down modulation of interpersonal coordination.

Interactive rhythmic auditory stimulation system reinstates natural 1/f timing in gait of Parkinson's patients

1

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Parkinson's Disease (PD) impairs movement and gait timing. An important diagnostic tool is the fractal scaling of stride times: Stride-time fluctuations are more random in PD patients compared to the 1/f fractal scaling observed in healthy controls. Rhythmic Auditory Stimulation (RAS) can improve gait timing. In this experiment, PD patients and healthy participants walked with three conditions: a silent control; fixed-tempo RAS; and an interactive rhythmic auditory stimulation system using nonlinear oscillators that tracked and adapted to the human's timing. Patients effortlessly synchronized with the interactive system, and their fractal scaling returned to the level of the healthy controls. When patients and healthy participants did synchronize with the fixed-tempo RAS, their fractal scaling declined away from healthy 1/f levels. Carry-over effects of higher fractal scaling after the interactive rhythms indicate stabilized internal rhythm-generating systems. Interactive rhythmic auditory stimulation represents a promising rehabilitation tool to improve PD patients' mobility and well-being.

Keywords: Timing; Parkinson's Disease; Cognitive Technology; Nonlinear oscillators; 1/f; Scaling Laws.

Efficient assistance – A question of timing

1

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For centuries the seamless cooperation of foreman and assistant has been a crucial factor for efficiency, because the mutual understanding of each other's intentions and actions facilitates a smooth workflow. In a typical handover task, a skilled human assistant knows exactly when to pass an item to a foreman. We hypothesize that this predictive ability results from a combination of adapting to the partner's skill level and knowledge about the work plan, which together determine the timing of the next required action.

To implement an efficient robotic assistant, we first measured the duration of different assembly steps in a self-paced assembly experiment. Based on our experimental results, we then developed an optimal estimation model to predict both the complexity of an assembly step and its duration, which depends on the skill level of the worker.

By applying our model in a human-machine interaction scenario with the robot as assistant, we were able to improve the efficiency of the worker and to release resources of the robot for other concurrent tasks. In addition, the safety of the interaction increases, because the ability of the robotic assistant to accurately predict the upcoming action of the humans minimizes the risk of a collision.

Spatial perception during control with another: The 'other' as potential perturbation

F

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The perceived vanishing point of a moving stimulus is displaced beyond the actual vanishing point. This forward displacement (FD) decreases with implied friction (i.e., the stimulus appears to move across a surface). The effect reverses when participants control stimulus movements (via right- and left-key presses) versus observe them. This reversal is consistent with economy-of-action (EOA) effects in which variables such as perceived pitch are influenced by the energy-demands implied by a stimulus (e.g., a steeper hill). The present talk presents experiments that reveal EOA effects when two participants control stimulus movements together, each having access to one of two control buttons. Specifically, FD increases across implied friction, regardless who controls the stimulus when it vanishes. Since participants are basically observers as the other participant controls the stimulus, the increase of FD during such observation indicates participants perceive the other-controlled stimulus movements in terms implied effort (i.e., EOA). In addition, FD is larger when it vanishes while the 'other' participant is in control of it. This self-other difference reveals the 'other' is present in the 'self's' action plans in terms of the potential disturbances the 'other' might produce during joint control. That is, the data reveal EOA effects for the 'other.'

Multi-scale entrainment as a medium for education and enculturation

2

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Data indicate that *mirroring* and *anticipation* constitute design principles of the brain. *Mirroring* resides in the sensory properties of neural systems previously believed to be purely motor (i.e., mirror systems), while *anticipation* resides in the fact these mirroring centers are involved in cerebellar-cortical circuits that are able to embody command-feedback regularities and, as a result, simulate action-effects faster than the speed of sensory feedback. Data further indicate such anticipatory mirroring circuits are at work at the scale of action, perception, and cognition. As a result, interacting humans are anticipatorily coupled at multiple scales simultaneously as the movements, goals, and thoughts of another "hijack" ones own mirroring/planning systems. The present paper describes how these systems provide a developmental medium for entraining ones actions, perception, and cognitions to those of another. In addition, we describe recent research on the impact entrainment has on stereotypes, projection (i.e., perceiving another as being like oneself), and education.

Relations between basic temporal error correction processes and the quality of interpersonal coordination

K

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Interpersonal coordination in joint activities such as ensemble music making can be temporally precise yet highly flexible and variable between individuals. The current study investigated the relationship between individual differences in an automatic temporal error correction process (phase correction) and interpersonal sensorimotor synchronization. Phase correction was assessed in 40 participants with wide ranging musical experience by estimating the average proportion of asynchronies that each individual corrected for when synchronizing finger taps with adaptively timed auditory pacing signals. Participants were subsequently paired to form 10 'high correcting' dyads and 10 'low correcting' dyads. Each dyad performed a synchronization-continuation task that required both individuals first to tap together in time with a 2 Hz auditory metronome and then to continue tapping together when the metronome ceased. Each individual's taps produced a distinctive sound. The variability of interpersonal asynchronies was greater for low than high correcting dyads only when the interaction was paced by the metronome. Low correcting dyads were apparently able to stabilize their performance during self-paced continuation tapping by increasing the gain of phase correction or by engaging in period correction (i.e., adjusting the tempo of their tapping). These findings imply compensatory mutual adaptive timing strategies that are most likely effortful.

Synchronized arousal between performers and related spectators in a fire-walking ritual: Joint action in the wild

K

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Collective rituals are present in all societies, but their function is a matter of long-standing debates. Field observations suggest that they may enhance group cohesion, and that their effects are not limited to those actively performing but also affect the audience. Previous research has shown that synchronized behaviours enhance cooperation, and lead to increased rapport between group members. We hypothesized that synchronized arousal even in the absence of synchronized movements could be one mechanism responsible for the social effects of collective rituals. To test this, we measured heart-rates of both active participants and spectators, during a Spanish fire-walking ritual. We compared synchronized arousal in fire-walkers and closely related spectators, as well as unrelated observers. For this comparison, we used recurrence quantification analysis on individual data, and cross-recurrence quantification analysis on pairs of participants' data. This method identified fine-grained commonalities of arousal during the 30-minute ritual between fire-walkers and related spectators, but not unrelated spectators. This indicates that the mediating mechanism may be informational, as participants and related observers had very different bodily performance. Moreover, it links field observations to a physiological basis, and offers a novel approach for the quantification of social effects on human physiology during real-world joint actions

EEG evidence for representation of an interaction partner' task during joint action planning

G

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Previous studies have shown that when people engage in joint actions, they take into account their co-actors' parts of the task even if they do not need to do so, which suggests that representation of the others' parts of the task is the "default" way of operating in joint action situations. Our aim was to trace such representation processes that take place when planning the performance of a joint action, by means of high-density EEG. Two experiments were conducted, which involved two participants planning and performing either an individual action (lifting an object) or a joint action (passing/receiving an object). We employed a choice-reaction paradigm, where a fully informative visual cue indicated the type of action to be planned and an imperative visual stimulus prompted the participants to execute the planned action. We recorded significant amplitude modulations of the frontocentral P3a and the parietal P3b (sub)components in response to the cue stimulus, which suggest that the participants activated joint task representations and specified their interaction partner's task well before action execution. These effects were stronger when the tasks were performed under conditions that facilitated interpersonal coordination and presumably created a strong "group feeling" between the interaction partners. In the latter situation, we also found evidence for predictive simulation of the partner's action in the amplitude of the pre-movement motor Contingent Negative Variation (CNV) when one was planning to receive the object. In addition the motor CNV was positively correlated with the gradual improvement in coordination between the two partners, which suggest that the predictive simulation of the partner's action may have led to the continually improving joint-task performance. Our results provide electrophysiological evidence that individuals represent in advance the task of their interaction partners when planning the performance of a joint action, at the cognitive as well as at the motor level.

Coupling of EEG between speakers and listeners

1

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This project explores a possible coupling of neural activity between a person speaking and a person listening, as assessed via recordings of their ongoing EEG (electroencephalogram). The EEG of 12 speakers was recorded while narrating short stories, or giving directions on how to follow a route marked on a map. The EEG of another set of participants was recorded while watching video recordings of these narrations. To exclude the trivial explanation that a neural coupling between speakers and listeners is due to processing similar sensory input, audiovisual recordings were superimposed on each other so that two speakers were narrating simultaneously. Listeners were instructed to attend either to one or the other speaker. Thus, while keeping the sensory input identical across all listeners, the assumption is that listeners' EEG will be coupled only with the speaker who is being attended to. Listeners' comprehension was assessed through a memory test. After separating the EEG stream into frequency bands, bivariate and multivariate analyses provide global measures of the degree of speaker-listener coupling. The strength of the coupling is expected to vary with the degree of listeners' comprehension. Measures developed in this exploratory study can serve as a basis for further investigations of joint action.

Philosophical questions to Michael Tomasello's theory of joint attention

E

Steen Nepper Larson

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According to Michael Tomasello humans cannot help to be informative. Apes do not point for one another, only humans do so in order to increase the mutual attention, i.e. to (get) help, play and share experiences. In shared cooperative activities the individual rationality is transformed into a social rationality. A feeling of "we-ness" is being born, a "we" intentionality. It is Tomasello's claim that in shared cooperative activities the collaborators must first all be mutually responsive to one another's intentional states. In *The Cultural Origins of Human Cognition* (Harvard University Press 1999) he states that human infants are very social creatures from the moment they are born, if not before, and that intention reading and human beings inborn capability to identify with conspecifics are the clues to the unique human interaction and joint attention.

The thesis of this lecture is that the power of the event – *in casu*: the social synchronization - creates the possibility for joint attention and not the intention reading. New forms of social interaction do *not* spring from cognitive intention reading processes *inside* the brain. Humans have certain biological predispositions but they cannot explain joint attentional patterns.

How two share two tasks: Evidence for a social PRP effect

B

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A strong assumption shared by major theoretical approaches to cognition and performance posits that the human cognitive system has a limited capacity for information-processing and task performance. Evidence in support of this claim comes from the dual-task paradigm in which a single cognitive system is required to process two tasks simultaneously. In this study we examined if bottleneck-like processing can also be obtained when a dual task is distributed among two persons. Under dual-task instructions giving priority to Task 1, we found evidence for a PRP effect in Dual-task and Joint-task conditions. Under equal priority instructions, we replicated the finding of a PRP effect in the Dual-task, but not in the Joint-task condition. These findings are in line with the assumption that a social PRP effect can be induced across two persons. We discuss our findings with respect to both, dual-task and joint action theories.

Representing individual and joint action outcomes in duet music performance: An ERP investigation

1

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When two people perform a joint action, they may each represent the desired outcome of their combined actions (joint outcome) as well as the specific actions the other must produce in order to achieve this outcome (partner's actions). The current study examined whether pianists represent the specific pitches their partner has to produce (partner's actions), and/or the musical harmony that results from the two performers' combined actions (joint outcome), when they perform duets together. Pairs of pianists memorized both parts of a simple piano duet. Each then performed one part of the duet while their partner performed the other, while EEG was recorded from both. On some trials, the auditory feedback associated with a pitch produced by one of the pianists was altered so that it either a) changed the pitch without changing the harmony of the chord to which it belonged (partner's action) or b) changed both the pitch and the harmony of the chord (joint outcome). Examining ERP components that reflect violations of expectancy (feedback-related negativity/N200) will reveal whether pianists represent their partner's actions, the joint outcome of their combined actions, or both, when performing duets together. These findings will elucidate the types of representations that underlie successful joint action.

Interpersonal predictive coding: Communicative gestures increase the likelihood of perceiving a second agent

J

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In the context of interacting activities requiring close-body contact such as fighting or dancing, the actions of one agent can be used to predict the actions of the second agent (Neri, Luu & Levy, 2006). In the present two studies we investigated whether interpersonal predictive coding extends to interactive activities – such as communicative interactions - in which no physical contingency is implied between the movements of the interacting individuals.

Participants observed point-light displays of two agents (A and B) performing separate actions. In the communicative condition, the action performed by agent B responded to a communicative gesture performed by agent A. In the individual condition, agent A's communicative action was substituted with a non-communicative action. Using simultaneous masking detection tasks, we demonstrated that observing the communicative gesture performed by agent A: a) enhanced visual discrimination of agent B (Experiment 1), and b) increased the likelihood of perceiving agent B, also when agent B was in fact not present (Experiment 2). These finding complements and extends previous evidence for interpersonal predictive coding, suggesting that the communicative gestures of one agent can serve as a predictor for the expected actions of the respondent, even if no physical contact between agents is implied.

Joint action modulates motor system involvement during action observation in 3-year-olds

2

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Neurocognitive research on joint action has focused mainly on adults, leaving the development of joint actions unexplored. In adults, findings show enhanced motor activation during action observation of a partner in contrast to an individual actor. We investigated whether similar motor involvement is present at early stages of joint action and whether it is related to joint action performance. In an EEG experiment, we assessed brain activity and performance of 3-year-olds during a joint button-pressing game. During this game, two players had to act in turns. In one condition, the children played together with an experimenter while they watched the experimenter play with someone else in another condition. Power in the mu- and beta-frequency bands was compared between these conditions when children observed the experimenter's turn – without moving themselves. Sensorimotor mu- and beta-power was attenuated during action observation when the 3-year-olds were engaged in the joint action. Moreover, this enhanced motor activation was associated with better joint action performance. The findings suggest that already in early childhood others' actions are integrated differentially in the motor system depending on whether children are involved in a joint action with the observed person. This differentiation might be important for children's joint action performance.

Shared emotions and joint action

John Michael

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In recent years, several minimalist accounts of joint action have been offered (e.g. Tollefsen 2005; Sebanz, Bekkering and Knoblich 2006; Vesper et al. 2010), which seek to address some of the shortcomings of classical accounts. Minimal accounts seek to reduce the cognitive complexity demanded by classical accounts either by leaving out shared intentions or by characterizing them in a way that does not demand common knowledge of complex, interconnected structures of intentions. Moreover, they propose models of the actual factors facilitating online coordination of movements. The present proposal aims to enrich a minimalist framework by showing how shared emotions can facilitate coordination without presupposing common knowledge of complex, interconnected structures of intentions. Shared emotions are defined for the purposes of this paper as affective states that fulfill two minimal criteria: (i) they are expressed (verbally or otherwise) by one person; and (ii) the (conscious or unconscious) perception of their expression by another person leads to effects that play a coordinating role in an interaction. Various kinds of shared emotion are distinguished and their coordinating roles in joint action discussed.

"Don't stand so close to me": Joint Simon effects are only observed when participants are in extrapersonal space

1

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Guagnano et al. (2010) reported that participants no longer demonstrated a joint Simon effect when the co-actors were seated outside of each other's peripersonal space. The purpose of the present study was to determine whether the co-representation underlying the joint Simon effect is influenced by interpersonal space (e.g., Guagnano et al., 2010) or the relationship between the stimuli display and the joint workspace. To this end, pairs of participants performed a joint go/no go task in three conditions that differed on the size of the display and the spatial arrangement of the participants. In the Peripersonal- and Extrapersonal-Small Screen conditions, participants sat 0.2m or 1.5m apart and responded to stimuli on a 17-inch computer monitor. In the key Extrapersonal-Large Screen condition, participants responded to stimuli on a 1.5m x 2.5m projection screen while seated 1.5m apart. Unexpectedly, we found the joint Simon effect in both Extra-personal conditions, but not in the conventional Peripersonal-Small Screen joint Simon condition. We suggest that the results of Guagnano et al. study (and co-representation more broadly) are less dependent on the spatial relationship between participants, but are the consequence of a complex interplay between the task conditions and workspace arrangement.

A computational model of cooperative spatial actions for virtual humans

1

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In human spatial cooperation the interactants share and sustain a space that is equally and exclusively reachable to them (Kendon, 1990). In such interaction the partners' reach-spaces, the so called peripersonal spaces, may overlap and establish a shared reach-space which we define as their *interaction space*. In interaction space, cooperation takes place and actions to claim or release spatial areas have to be adapted dynamically, to avoid obstructions of the other's movements. We report on our approach to model such smooth spatial adaptation and action planning abilities for humanoids in near space interactions with humans. Inspired by studies in cognitive neuroscience, we realized peripersonal space for the virtual human Max in terms of a multi-sensory representation (Nguyen and Wachsmuth, 2009) with boundaries taken from the body structure, known as body schema (Holmes and Spence, 2004). In order to model interaction space and the partner's spatial perspective, Max projects his own peripersonal space to the partner (Gallese, 2005). By means of interaction space we show how Max can relocate object positions toward or away from locations reachable for the partner and how the amount of cooperation in an interaction task can be influenced.

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Sense of agency and intentional binding in joint action

1

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Understanding the sense of agency is a key challenge for the psychological and brain sciences. When an individual makes an action that is followed by an effect such as an auditory tone, there is a perceived compression in time of the interval between the action and the effect. Since this only occurs for intentional actions, this compression is termed 'intentional binding' and has been suggested as an implicit measure of agency. Very little is known about how the sense of agency and indeed intentional binding may be altered in joint action contexts in which two individuals act and an effect occurs. Here we assessed the subjective sense of agency via self-report and implicit agency via intentional binding in a joint action task in which one person initiated a movement which another person joined in with. We further manipulated whether both individuals knew who the initiator would be ahead of time (by assigning one person as the initiator at the start of a block of trials) or whether this became apparent in a dynamic fashion based on who acted first. In both settings, only the initiator reported reliable subjective feelings of agency, whereas both the initiator and the responder demonstrated significant and indistinguishable intentional binding. We suggest that, when two individuals are involved in a joint action context, there is an automatic formation of a new agentic identity (a "we" identity). In such contexts, both partners register agency at the pre-reflective level, despite the fact that their subjective experience of agency differs, and indeed their role in producing the outcome differs. Hence, the subjective sense of agency and intentional binding are dissociable, and it remains for future work to understand how pre-reflective agency 'registration' and the reflective 'experience' of agency are if at all, related.

Sense of agency in joint action: Effects of human and non-human co-actors

2

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Intentional binding is the perceived shortening of the time between a voluntary action and its consequent effect and has been suggested as an implicit measure of agency. This shortening has been linked to processes underlying action preparation, and is also affected by post-movement feedback. Intentional binding has been demonstrated in joint action tasks involving two humans but it is unknown whether it occurs for tasks involving a human working alongside a non-human partner. This experiment investigated the influence of high-level feedback on the experience of agency and whether binding occurs in human-computer joint action settings. Participants were involved in two versions an action task involving another "agent". In one version, two participants (a genuine participant, and a confederate) sat side by side, separated by a curtain that prevented vision of the other person. In baseline conditions, both participants were instructed to make a self paced action and judge the time of the action by reporting the position of a rotating clock-hand on a computer screen. In other baseline conditions participants judged the time of an auditory tone. In operant conditions, participants made actions and the genuine participant's action was followed 200 ms later by a tone on every trial. To examine the effect of post movement information on binding and explicit agency judgments, a colour cue was presented on each trial informing participants about which person's action caused the tone. In another version of the task participants were paired with a computer instead of a human co-actor. Post-movement information affected the genuine participant's explicit agency judgments but had no effect on intentional binding, which always occurred. In the human-computer version, participants never showed binding, even when they explicitly judged that their action had caused the tone. We suggest that human-human partnerships result in the formation of a new "we" agentic identity, but that human-computer partnerships lead to inhibition of the processes that mediate the pre-reflective sense of agency.

A Bayesian model of joint action that uses shared representations for solving interaction problems

2

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Humans engaged in joint actions have to solve problems at two levels. At the higher level, they have to recognize actions executed by others and their associated goals, and select goals and actions that are complementary or at least do not conflict with them. At the lower level, they have to coordinate their actions in real time, and this requires a precise estimation of their timing and trajectories. Numerous brain areas participate to the solution of these problems, forming a so-called "social brain". By assuming a computational perspective, we propose a Bayesian model of joint action having two main characteristics. First, it solves high and low level problems in a unified framework: goals and actions selected (and recognized) at the higher level guide motor execution (and perceptual processing) at the lower level, and in turn lower level processes of motor simulation are used to finesse goal recognition. Second, it uses shared representations as a coordination tool for simplifying action planning and recognition. Model performance is compared with human data in a joint action task consisting of building together a tower of bricks.

Behavioral synchrony paradoxically undermines self-projection

K

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Using oneself to anchor judgments of others ("self-projection") is generally assumed to be effortless and to be more likely for similar others. We examined the impact of behavioral synchrony, which is believed to promote social connectedness, on self-projection. Pairs of participants (in reality, a participant and a confederate) nodded in time to music presented over headphones that fed into the same mp3 player. Unbeknownst to participants, sometimes they listened to music with different tempos; as a result, synchronizing with the music led some participants to be in synch with one another, but others to be out of synch. Using this manipulation, we corroborated previous evidence that being in synch with another person led to greater liking and greater perceived self–other similarity. Interestingly, however, we found significant self–other correlations for participants in the asynchrony condition but not for participants in the synchrony condition. Thus, despite perceiving greater self-other similarity during synchronized versus asynchronized movement, synchronized participants did not project their own attributes onto their "similar" task partner. We argue that synchrony creates a sense of "knowing" another person, and that this feeling of knowing undermines the perceived utility of the self as a proxy for the other.

Social Simon effect in a competitive and cooperative setting

1

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Recent research on joint action is rapidly transforming social cognition area of psychology: the main tenet of it becoming the deeply social nature of cognition (in the vein of Bruner, Vygotsky) rather than general cognitive processes applied to social stimuli. Neuropsychology is uncovering brain processes responsible for intersubjectivity, imitation and coordination, but the behavioral findings on the automaticity of taking others into account when acting with them is no less striking. One of the most powerful illustrations of these behavioral effects is the Social Simon Effect (SSE) (Sebanz et al., 2003), where it was shown that the spatial compatibility effect is present when two people independently perform a subtask of the Simon task. The present paper aimed at elucidating how the nature of the task (collaborative versus competitive) affects the magnitude of the effect. The magnitude of Social Simon Effect was compared in three groups of participants: one in which they were competing with each other, one in which there were competing, as a pair, with other pairs, and a control group. We found marginally significant differences in the magnitude of SSE, pointing to a stronger SSE in the collaborative setup and weaker in the competitive one, relative to the control group. In addition two interesting methodological points emerge from our study: We noticed that even though the majority of the studies report no spatial compatibility in the go-nogo task performed alone, in most of them the reported reaction times for congruent reactions are faster than for incongruent. We take this as an argument to measure SSE relative to the go-nogo-performed-alone baseline. Secondly, our results show a transfer effect: SSE effects were smaller when performed after go-no go task alone. This transfer effect may thus be responsible for not finding the SSE in some studies.

Joint coordinative structures: Nested processes of intrapersonal and interpersonal coordination

K

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In recent years, research in the field of social interactions has focused on the exploration of the coordinative structures that substantiate joint task performance. The current project explores whether interpersonal coordination during joint task performance gives rise to a joint coordinative structure across individuals, and whether such coordinative structures are affected by task demands. Principal component analysis (PCA) is used to identify relevant interpersonal and intrapersonal coordinative modes for the single and joint performance of a supra-postural task, which varied along its precision and role demands. In addition, cross-recurrence quantification analysis (CRQA) was combined with PCA in order to quantify the degree and stability of interpersonal coordination across intrapersonal coordinative modes. Results indicate that the composition and number of coordinative modes varied for joint compared to single performance, and that interpersonal coordination across the first coordinative mode increased in degree and stability for joint compared to single performance. Overall, these findings indicate that joint coordinative structures are affected by the nature of the task performed and the constraints it places on joint and single performance.

The intentional Simon effect is not present in a joint action task

2

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Ideomotor accounts of joint action suggest that joint actions are facilitated by a common coding process in which co-actors use the predicted effects of the other's actions to activate representations of the other's response. The purpose of the present study was to provide an initial testing of this hypothesis using a Simon task in which participants were instructed to focus on creating a response after-effect. Hommel (1993) has previously demonstrated that the spatial compatibility effect can emerge based on the location of the response after-effect, as opposed to the location of the response, when participants were instructed to "generate an effect" following a stimulus. Hommel suggested that a common coding mechanism was responsible for this after-effect based compatibility effect. If joint actions are facilitated by a common coding mechanism, then a similar pattern of after-effect based compatibility should be observed in a joint Simon task in which co-actors are instructed to "generate an effect". In contrast to predictions, however, participants only demonstrated an after-effect based compatibility effect in the individual Simon task. A Simon effect was not observed in the joint action context. These results suggest that common coding systems may not facilitate joint action in some contexts.

How do 100 people walk a tightrope together? An experiment in large scale joint action

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Following the discussion that concluded Jam3, we set out to investigate joint action on a large scale. In our experiment, 120 people played a computer game together. Our first goal was to see if the ability of crowds to make good judgements (Surowiecki, 2004) also meant that they could successfully act together in a dynamic task. Our second goal was to take predictions about pairs of participants acting together (Knoblich & Jordan, 2003) and see if they scale up to much larger groups. The game was to keep a tightrope walker balanced. Each player had a handset that delivered a small left or right nudge. The tightrope walker was also pelted by tomatoes which knocked him off balance. The difficulty was changed by the frequency and visibility of tomatoes. After each game, the participants rated their performance and the group's. We modeled the button presses of individuals, and quantified how they related to the moment by moment action of the group. On successful games, participants were able to anticipate the behaviour of the group and kept the tightrope walker in equilibrium. If accepted at Jam 4, we will invite attendees to participate in this and other large scale joint action games.

Self-organization in complementary joint actions

A

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We often perform actions in a social setting. Consequently, many of our actions are best understood as interpersonal or joint actions. Although there is now a growing body of research investigating the neural and cognitive mechanisms that play a role in joint action, identifying the dynamical processes by which individuals are mutually responsive to one another in time and space is also crucial to understanding joint action. Much past research has demonstrated that the processes of dynamical synchronization found generically in nature seem to provide a deep structure of support for the temporal coordination of joint actions. The dynamical coupling of individual's movements appears to offer a means for the prediction or anticipation of each other's actions that may obviate or facilitate the neural and mental simulation processes that have been proposed for this function. Although past research has investigated the dynamics of the joint coordination for both intended and spontaneous between-person interactions, it has only investigated the presence of these processes in simple rhythmic coordination tasks, which included movements that are coordinated incidentally in 1-to-1 manner. Accordingly, in this talk I will address the question of whether dynamical self-organization can account for more complex joint actions that required individuals to perform complementary goal directed actions. By adopting a 'behavioral dynamics' approach (Warren, 2006) to joint action, I will present data (and dynamical models) from a number of recent research studies that demonstrates that the coordination that occurs during many complementary goal-directed joint actions could indeed be understood as dynamical self-organized.

Look at me: Social transfer of learning with an observer

G

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The aim of the study was to investigate whether the transfer of learning found in task-sharing situations occurs even when one of the two participants observes the other.

Two experiments were conducted in which participants practiced a spatial compatibility task with an incompatible S-R mapping. For each couple, one participant performed his/her part of the practice task while the other observed. Then, both participants transferred to a joint Simon task, either keeping the same sitting positions (Experiment 1), or exchanging them (Experiment 2).

In Experiment 1 practice eliminated the social Simon effect for both the agent and the observer, while in Experiment 2 a regular social Simon effect occurred. Thus, provided that participants kept their sitting positions across sessions, social transfer of learning occurred for both the agent and the observer. These results clearly indicate that in task-sharing situations observing another person performing his/her part of the task activates the complementary actions. They also suggest that shared representations are based formed on motor parameters: perceiving events produced by the actions of the others activates the same representational structures that govern one's own planning and control of these actions.

Impact of social variables on the kinematics of on-line cooperative-competitive interactions

1

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Interactions may bring about peculiar emergent processes based on social affordances: a co-agent's behaviour has features directly perceived by the partner, which generate a response without the need for high-level and explicit categorization.

Furthermore, joint-actions are inherently anticipatory processes. Indeed, performing mutually complementary actions requires that each partner predicts and adapts to the movements of the other. Importantly, such predictions are based on both sensorimotor and higher-order social cues such as bias, stereotypes and pre-conceptions; hence, the construction of shared meanings and shared affective experiences may have an impact on co-agents' motor behaviour.

We propose to experimentally investigate this issue by manipulating a number of social variables that bind or divide two individuals involved in a naturalistic joint-grasping interaction. We posit that the influence of these variables can modify the pattern of the interacting agents' movement kinematics. Movement instructions will never change across conditions, yet reciprocal social and affective contexts will be manipulated. We expect to find differences in the partners' abilities to mutually predict each other's movements and smoothly coordinate their motor plans. We will thus measure the impact of reciprocal social perception on the kinematics of joint actions.

Corticospinal excitability is modulated by the complementary nature of observed actions

C

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A large body of research reports that perceiving body movements of other people activates motor representations in the observer's brain. This automatic resonance mechanism appears to be imitative in nature. However, action observation does not inevitably lead to symmetrical motor facilitation: mirroring the observed movement might be disadvantageous for successfully performing joint actions. What remains unknown is how do we solve the possible conflict between the automatic tendency to 'mirror' and the need to perform different context-related complementary actions. By using single-pulse transcranial magnetic stimulation, we found that observation of a double step action characterized by an implicit complementary request engendered a shift from simulation to reciprocity in the participants' corticospinal activity. Accordingly, differential motor facilitation was revealed for the snapshots evoking imitative and complementary gestures despite the fact that the observed type of grasp was identical. Control conditions in which participants observed the same action sequence but in a context not implying a complementary request were included. The results provide compelling evidence that when an observed action calls for a non-identical complementary action, an interplay between the automatic tendency to resonate with what is observed and to implicitly prepare for the complementary action do emerge. Implicit complementary requests might have the ability to prime non-identical responses.

Coordinated actions and dialogue moves in a collaborative remote search task

Matthias Scheutz

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Joint actions are often accompanied by and coordinated through natural language interactions. We present data from our new multi-modal "CReST" corpus (Eberhard et al. 2010) collected from experiments in a "Collaborative Remote Search Task" where two spatially separated humans coordinate their actions to achieve common goals through natural language. Different from the Edinburgh Map Task (Anderson et al. 1991) where one instruction giver and one instruction follower are seated at a table across from each other, our experimental setup requires one subject (the "searcher") to traverse a physical environment to search for objects guided by the other remotely located subject (the "director") that has a (mostly correct) map of the environment. Moreover, the searcher has to inform the director of locations of objects not indicated on the map, thus making the flow of information bidirectional. Finally, the task includes multiple goal objectives as well as dynamic goals communicated to the director during task execution. We will discuss the implications of findings about dialogue moves such as "hedged explains" that require a particular action together with a particular form of acknowledgment and findings about the placement of disfluencies together with the concurrently executed actions by the speaker.

Looking through your eyes: Investigating automatic perceptual perspective taking with a mental rotation task

E

Sarah Schwarzkopf, Bert Timmermans, Kai Vogeley, and Leonhard Schilbach

University of Cologne, DE

The ability to take the perspectives of others is an essential precondition for joint action. Visuospatial perspective is taken automatically – even if a task does not require it (Samson et al. 2010). But do people only simulate automatically *what* other people see or also *how* they perceive the world?

In the present experiment a classical mental rotation task is used in which an abstract object is embedded in a virtual scene. In the human condition a virtual human agent is also presented, looking at the object from a different vantage point than the participant. In the control condition he is replaced by a plant. After a short delay a second abstract object is presented from a different angle. Participant's reaction times and performance is measured during their decision whether the presented objects are the same or not.

If participants automatically simulate the visual perceptions of others, we expect them to be faster in identifying objects as being the same if the second object is presented from the agent's perspective. If it is presented from the opposite side, participants are expected to show slower reaction times, although the same amount of mental rotation is required.

Joint action: A perception-based approach

Axel Seemann

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What makes an action 'joint'? The traditional answer is that collective undertakings rely on intentions which are in some sense shared. In this paper, I am going to suggest that the notion of collective intentionality faces serious problems. These problems include, first, the consideration that actions can be joint in a significant sense even though the participants don't share an intention at all; secondly, the reliance on a causal theory of action which may not be sustainable in the case of joint undertakings; and thirdly, the notorious problems with spelling out what makes an intention collective.

In light of these problems, I am going to advocate an alternative approach. This approach takes it that the 'jointness' of collective undertakings resides in their phenomenology. Collective action experience, I suggest, arises from activities that are joint in a very basic sense. Hence it is important, when thinking about joint action, to take seriously phenomena such as joint attention and joint motor engagements. In such activities, I suggest, the engaged creatures enjoy a particular kind of perceptual 'acquaintance' with one another. Drawing on data from developmental psychology, I explain what it means to be perceptually acquainted with another person. I end by explaining how the notion of 'acquaintance' can help avoid some of the problems that beset attempts to account for joint action in terms of collective intentionality

Division of labor in a joint Simon task

2

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The interactive Simon effect refers to the finding that, when two participants, sitting close to each other, respond each to one of the two possible values of a lateralized stimulus (i.e., they perform two complementary Go/NoGo tasks), responses are faster when the position of the stimulus corresponds to the position of the response, that is, to the position of the responding participant. The present study aimed at investigating the social (i.e., task sharing) and spatial (i.e., response position coding) factors underlying this effect.

Participants performed a Go/NoGo task first individually, then either imaging themselves responding to the NoGo trials or co-operating with another person acting in another room. The Simon effect occurred only when participants spatially coded both alternative responses within their own task representation. Conversely, the belief of co-acting with another individual, whose position was unknown, induced the implementation of a division-of-labor mechanism, which led participants to ignore the alternative response (i.e., the co-actor's response), thus eliminating the Simon effect.

Captured by motion: Dance, action understanding, and social cognition

2

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In a series of psychophysical studies, dance was used as a research tool for exploring aspects of action understanding and social cognition. Specifically, agent and expression intensity recognition in point-light displays depicting dancing performances were investigated. In a first session, participants danced with two different expression intensities to music, solo or in dyads. In subsequent sessions, participants watched point-light displays of 1–5-s duration, depicting their own, their partner's or another individual's recorded actions, and were asked to identify the agent (self vs. partner vs. stranger) and/or the intended expression intensity (expressive vs. inexpressive) of the performer. The results of the studies indicate that performer identity and expression intensity could be discerned reliably from displays as short as 1 s. They also reveal a range of factors on which observers base their responses. The accuracy in judgment in agent and expression intensity recognition tasks increased with exposure duration and higher expression intensity. Judgment accuracy correlated also with self-report empathy indices. Accuracy correlated also with confidence in judgment, but only in the intensity recognition task. The results and their implications are discussed in relation to perceptual and neural mechanisms underlying action understanding and social cognition.

Adverbial and sentential ‘jointly’

Thomas H. Smith

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The consensus in the philosophical literature is that, sometimes at least, when agents intentionally jointly φ, this is explicable by their intending that they φ, for a period of time prior to their φ-ing. If this be granted, it poses a dilemma. For agents who so intend either severally or jointly intend that they φ. The first option is ruled out by two further stipulations that we may consistently make: (i) that at least one of the agents non-akratically believes that, all things considered, they ought not to φ, and (ii) that an agent is akratic, if she intends a thing that she believes, all things considered, ought not to be done. I resolve the dilemma by noting that ‘They jointly intend’ is indeterminate between ‘They intend, jointly’, which does indeed entail that some mental state is an intention with multiple subjects, and ‘Jointly, they intend’, which entails a weaker claim, viz. that some mental state or states is an intention with multiple subjects. I then sketch an account of how a plurality of mental states, distributed among multiple subjects, might, collectively, do service as their intention that they φ.

The effect of visual information on table tennis performance: What visual information is important about the other person and when?

F

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Successful social interaction hinges on seeing the interaction partners actions. We used a table tennis task to examine which sources of visual information are important in an interaction task. Participants' task was to hit a virtual ball served by a virtual table tennis player in an immersive virtual environment. We manipulated the visibility of visual information (ball, racket, body) about the virtual player and the timing when this information was presented (before, during, and after the virtual player's stroke). The shortest distance between the ball and the participants' racket was used as a performance measure. Results: (1) The visibility of each source of information was associated with performance increases; (2) performance did not change when visual information was presented after the virtual player hit the ball; (3) the presentation of the virtual player's racket induced the largest performance improvement shortly before the virtual player hit the ball; (4) performance changes associated with seeing the virtual player's body were independent of presentation time. In sum participants seem to use multiple sources of visual information about the interaction partner. Moreover visual information about the interaction partner is most useful when seen before the interaction partner's stroke.

Ascribing emotions in foreign language speech

2

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The present study investigated the role of pause length and pause ratio in emotion ascribing while subjects were listening to monologues in a foreign language. The stimuli were five Hungarian emotionally neutral monologues which pauses were systematically modified in four different ways. All the pauses were elongated 18 or 50 % or abbreviated by 21 or 50 %. 37 Austrian subjects with a German mother tongue were to listen to these Hungarian speech samples and to rate the emotionality of these with the help of a questionnaire. Theirs task was to rate on a 1-to-6 point scale how angry, sad, disgusted, happy, surprised, frightened, positive, and heated the speaker could have been. We correlated the pause ratio and the ratings on the 1-to-6 point scales, and got significant results. With the decrease of the pause ratio subjects rated the same monologues happier, more positive, less sad, and less frightened. Our findings argue that pauses play a relevant role in emotion ascribing and that the ability to recognize emotions in the speech is based on universal cues.

Keywords: emotion recognition, emotion ascribing, speech, cross-linguistic study, pauses, foreign language

Social indexing and memory

1

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We investigated the social indexing hypothesis in the context of a memory task. Our prediction was that participants would relate the content of remembered words to their current social context - the people around them. Participants performed a standard memory task for a list of words. During a test phase, they heard another list of words and recalled whether or not they had heard each word previously. Participants were told that their performance would be scored collectively with their 'coworkers' who were visible on a screen. Prior to the task, the coworkers introduced themselves, giving a social identity associated with a subset of the words. (e.g. 'zebra' was associated with an animal loving coworker). Eye movements were tracked during word presentation and recall. There was some evidence that participants suppressed looks to co-workers who were associated with the items during presentation. However, there were significantly longer looks to associated co-workers during the test phase - but only when they test item was a foil that had not actually been presented earlier. One interpretation of these results is that participants actively suppress connections between items and co-workers in situations where it might interfere with their memory task.

Towards a mechanistic psychology of group memory: Some programmatic remarks

Georg Theiner

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Cognitive neuroscience has made great strides towards mechanistic accounts of mental activities (such as memory) carried out by the brain. But according to the 'extended mind' thesis (Clark, 2008), and the related theory of 'distributed cognition' (Hutchins, 1995), the activity of remembering does not always occur entirely inside the brain, but can also be distributed across heterogeneous systems involving the interplay of neural, bodily, social, and technological resources (Sutton et al., 2010). Does 'going extended' imply that we have to give up on the program of mechanistic explanation in psychology (Bechtel, 2009)? I argue that it does not, and that we can profitably understand collective memory activities in groups, teams, and organizations as the operation of 'supersized' cognitive mechanisms. My argument focuses on the role of experimentation in the discovery of such mechanisms. I examine the underlying assumptions about the relationship between the individual and the group by which collective memory researchers identify the relevant points of *intervention*, and of *recording* the effects of those interventions, in their experimental designs.

Can you feel me: A different sensitivity to interaction dynamics in high functioning autism?

2

Bert Timmermans, Leonhard Schilbach and Kai Vogeley

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In the perceptual crossing paradigm by Auvray et al. (2009), two blindfolded participants interact by moving their mouse cursor in a one-dimensional space on a PC. In this space they encounter a fixed and a moving object, and an object representing the other's cursor. At each encounter participants receive a tactile stimulation, and the have to click the mouse whenever they think a stimulation is due to an encounter with the other. Thus, only when they meet, both simultaneously are stimulated. Auvray et al. showed that healthy volunteers show a dissociation between task performance and awareness, in that their interaction dynamics distinguish between the moving object and the other's cursor, which however is not reflected in the proportion of clicks (they are unable to tell the difference explicitly between moving object and the other). We test dyads consisting of either one healthy control with one person with High Functioning Autism, as well as dyads consisting of two HFA persons. HFA persons can exhibit three types of behaviors: (a) less exploration; (b) less marked (implicit) distinction in interaction dynamics between the moving object and the other; (c) increase in click-based (explicit) distinction between moving object and the other.

Interpersonal coordination in virtual environments

A

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Interpersonal postural coordination has been observed during conversation. Visual constraints have been shown to influence this coordination and coordinated eye movement has been shown to facilitate communication. Virtual reality (VR) environments offer the opportunity to further explore visual constraints on interpersonal coordination by allowing actual movements to be de-coupled from visual information about movement. Our goal was to evaluate the utility of using a VR environment to study the interpersonal coordination that occurs during cooperative conversation by attempting to partially replicate the enhanced movement coordination that Shockley et al. (2003) observed between participants talking with their task partner (as opposed to when conversing with an experimental confederate) while jointly completing a find-the-differences task. We also evaluated the influence of VR versus real environments. Participants exhibited more shared postural activity when conversing with their task partner than when conversing with the experimenter in real and VR environments, suggesting that the VR environment sustains the coordination observed in the real environment. The virtual environment also yielded more shared postural activity and more stable coordination than the real environment. The influence of de-coupling VR movement from actual movement on cognitive performance and movement coordination will also be discussed.

Collective intentionality, documents, and social reality

Giuliano Torrengo

University of Torino, IT

The social world is populated by a great many entities, such as promises, contracts, presidents,

money, debts, and financial crises. Many philosophers regard collective behaviour and attitudes as the ground of social reality. According to this view, social ontology is at bottom composed of collective intentions and cooperative behaviours, and that holds both for simple cases concerning small groups and complex institutional structures. In this paper, In particular, this view is challenged. I want to suggest that the mistake upon which contemporary social ontology rests is the assumption that social reality is constituted, at bottom, by collective intentions with a *shared* content. An alternative approach is proposed in which the role of collective intentions and cooperative behaviour is very different in (a) small group cases, where it can be seen as the ground of social roles and obligations, and (b) cases concerning complex institutions, in which documents and records of social acts in general are the ground that determines rights, duties, and all other complex status functions.

The GROOP effect: Groups mimic group actions

G

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Research on perception–action links has focused on an interpersonal level, demonstrating effects of observing individual actions on performance. Does perception–action matching also occur at an inter-group level? Pairs of participants responded to hand movements that were performed by two individuals who used one hand each or they responded to hand movements performed by an individual who used both hands. Apart from the difference in the number of observed agents, the observed hand movements were identical. If co-actors form action plans that specify the actions to be performed jointly, then participants should have a stronger tendency to mimic group actions than individual actions. Confirming this prediction, the results showed larger mimicry effects when groups responded to group actions than when groups responded to otherwise identical individual actions. This suggests that representations of joint tasks modulate automatic perception–action links and facilitate mimicry at an inter-group level.

From social to shared reality: A cognitive approach to institutional facts

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Apart from natural kinds, it has been argued that reality is also composed of social kinds like 'money', 'property', 'marriage' and social or institutional facts like “Ann is married to Bob” (Barnes 1983; Elder 1989; Thomasson 2003; Guala 2010). However, understanding better what these social kinds and facts amount to has proved to be difficult. Recently, it has been contended that facts about these kinds are intentionalityrelative in the sense that they depend for their existence on the mental and, in particular, on the peculiar kind of intentionality that only a community of humans can exhibit: the so called 'collective' or 'we' intentionality (Searle 1995; 2010). From this perspective, social kinds and the facts that they constitute are the *subjective* facts of a population. In this contribution, I will first offer some arguments to reject the idea that, from an ontological point of view, social facts are the subjective facts of a human group, and I will contend that they are most fruitfully understood as the complex cognitive and behavioral coordination of a group of agents. That is, facts involving social kinds reduce to facts about psychological kinds (i.e. natural kinds). Next, I will explore the peculiar way in which the human cognitive system represents social reality. I will argue that the recent turn in cognitive science which emphasizes the re-enactment of the sensory and motor systems in simulation to understand intentionality (Grush 2004; Jeannerod 2006; Wolpert et al., 2003; Pezzulo 2011) provides the adequate conceptual resources to understand this phenomenon. In continuity with the way humans represent external physical reality, I will contend that they perceive social reality in terms of opportunities for joint actions (i.e. social affordances; Richardson, Marsh & Baron 2007), and that research on the cognitive underpinnings of joint action (Sebanz, Bekkering & Knoblich 2006) and dialogue (Pickering & Garrod 2009) suggest that social reality should be understood as a form of *shared reality* (see also Echterhoff et al 2009).

Let the force be with us: Haptic information and the sense of agency in joint coordination

F

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People often perform actions that involve a direct physical coupling with another person, such as when moving furniture together. Here, we examined various aspects of such joint actions. First, we compared how people learn successful coordination when they learn a new coordination task by themselves or together with someone else. Second, we compared whether these modes of coordination differ in terms of their reliance on haptic information. Third, we compared whether learning to coordinate jointly transfers to individual performance and vice versa by including transfer conditions. Finally, we compared the development of the sense of agency in these two coordination modes.

Our findings indicate that although performance success and the rate of learning was similar in the individual and joint conditions, the reliance on haptic information was not. Dyads amplified their forces compared to individuals to generate a haptic information channel to support coordination. The reliance on haptic information (or lack thereof) transferred from the joint to the individual condition and vice versa. The results also suggest that learning a skill individually versus jointly profoundly affects the sense of agency.

Developmental neurorobotics to understand parent-child interaction

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Infants are capable of habituating to audio-visual stimuli from a very young age, but rely on caregivers to scaffold their environments because of undeveloped brains. A caregiver-infant interaction in which the caregiver teaches names for objects is joint-action. The caregiver accommodates the infant's learning constraints (synchrony of object motion and word), while the infant attends to stimuli at correct times. The infant's eye movements and reaction provide feedback to the caregiver, which changes her behavior. The importance of the joint-action component becomes clear when one breaks either side of the interaction. It is known that asynchronous presentation of multimodal stimuli to very young infants will not lead to learning on the infant's part (caregiver side breakdown). Meanwhile, the infant must instantiate the appropriate model, and must be in a receptive state to take advantage of the parent's behavior. Before infants reliably orient to moving stimuli, even simultaneous object and word presentation will not cause learning because they are not reacting to the stimuli as expected (breakdown on infant side). A realistic neurorobotic model was implemented and the effect of different levels of breakdown investigated. I discuss the benefits of this approach to understanding joint-action by analysing the constraints on one side of the interaction.

Flying Dutchmen: Temporal predictions for coordinating with others

2

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When acting together, people often have to precisely coordinate the timing of their individual action parts. We investigated how temporal predictions support coordination when no online perceptual information about another's action is available. Pairs of participants performed simple forward jumps of variable length with the task to synchronize landing times. They could not see or hear their partner, but were informed about their own and the other's jump distance beforehand. Auditory feedback when people landed provided information about the accuracy of coordination. We expected participants to take their partners' jumping distance into account for their own movement planning. The results confirmed this prediction. Specifically, the movement onset (i.e. how long someone waits before jump take-off) was significantly longer when the distance to their partner was larger. This suggests that also in the absence of online perceptual information, people integrate predictions about their own and their partner's actions to achieve coordination.

Grounding social relations in physical temperature

1

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Across many languages and cultures metaphors linking physical temperature to affection ("holding warm feelings for someone" or "giving somebody a cold shoulder") depict the way people make sense of their complex social relationships. However, these linguistic expressions do not simply coordinate people's abstract thoughts – they should be taken as literal. People recruit temperature experiences to understand social relationships. We propose that social relations are actually structured through the perceptual system, and abstract metaphors are scaffolded onto changes in bodily skin temperature. We hypothesized and found that social exclusion from a virtual ball tossing game (Cyberball) leads to lower finger-temperature (Study 1). Moreover, negative affect typically experienced after such social exclusion is alleviated when briefly holding a cup of warm tea, fooling the perceptual system by creating an artificial state *as-if* a "warm" relationship is present (Study 2). Our findings imply that actual physical simulations of temperature ground people's shared understanding of relationships and their imagery use in language. We further discuss to what extent these simulations are part of evolutionarily-prepared assemblies for construal, thinking, talking, and guiding situated actions within relationships.

The assumed abilities of an observed actor are simulated during the formation of action possibility judgments

C

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To successfully execute some joint actions, people must be able to judge what is and what is not possible for their co-actor to perform. It has been suggested that these judgments are formed by the individual simulating the performance of the co-actor. We have previously reported that such possibility judgments are influenced by changes in the motor system, including experience with the task and weights on the relevant effector. The present experiments explored cognitive influences on possibility judgments by investigating whether such judgments were influenced by the characteristics of the observed person. Participants saw alternating pictures of a person's hand moving at different speeds between two targets and judged whether or not it was possible for the person to maintain movement accuracy at the presented speed. Across the studies, the person in the pictures (child, adult) and the background about the person (athletic, sick) was manipulated. Results showed that participants adjusted their possibility judgments based on the assumed capabilities of the individual they observed. These findings suggest that the formation of action possibility judgments can be adapted to the specific context because people are able to alter action simulation based on the characteristics of their co-actors.

Uncooperative collective reasons

D

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Almost all appeals to the idea of collective reasons presuppose that they can exist only in cooperative contexts. That is, they take for granted that I can have a reason to do *X* because it is part of some favoured possible collective action *C* only if the other agents involved in *C* are sufficiently willing to perform their parts of it, such that there is a good chance that *C* will be realized. This paper argues against this assumption, which I call the *Willingness Requirement*. An implication is that collective reasons can exist in uncooperative contexts.

The paper distinguished some different reasons for believing in the *Willingness Requirement* and argues against them in turn. In particular, we do not need to make this assumption in order to achieve circumspection, or to avoid reckless unilateral action. We can do that simply by permitting collective reasons to exist alongside ordinary act-based reasons. And there are advantages in dropping the *Willingness Requirement*, since doing so allows us to explain some common claims about moral reasons in a more elegant way than is normally thought possible.

knowing how and our introspective knowledge of what we intend

D

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Knowledge how is a tricky term: it suggests that agents performing actions have some kind of knowledge they can give a propositional account of. But the case seems to be that most of our actions are planned and executed on the sub-personal level. Plus, we rarely use our instrumental rationality to find the best possible means to reach our goals. Instead we usually perform actions based on routines, internalized by copying the successful actions of others.

Knowledge without observation of our own actions is an even more interesting topic: I wish to present a recent argument in favour of the possibility of knowledge of our own actions. If this kind of knowledge is possible and we can make correct statements about what we do, in every case, then this must be true of joint action as well.

If my statement above holds then there seems to be some connection between our knowledge how and our knowledge of our own actions that explains how two or more individuals can share both the same description of their action and the knowledge how, by means of which they carry out the action. I wish to explain this connection by suggesting a close link between the two kinds of knowledge.

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