Sasha Ondobaka - selected references

1 Ondobaka, S., de Lange, F. P., Wittmann, M., Frith, C. D., & Bekkering, H. (2014). Interplay Between Conceptual Expectations and Movement Predictions Underlies Action Understanding. *Cerebral Cortex*.
Notes: Recent accounts of understanding goal-directed action underline the importance of a hierarchical predictive architecture. However, the neural implementation of such an architecture remains elusive. In the present study, we used functional neuroimaging to quantify brain activity associated with predicting physical movements, as they were modulated by conceptual-expectations regarding the purpose of the object involved in the action. Participants observed object-related actions preceded by a cue that generated both conceptual goal expectations and movement goal predictions. In 2 tasks, observers judged whether conceptual or movement goals matched or mismatched the cue. At the conceptual level, expected goals specifically recruited the posterior cingulate cortex, irrespectively of the task and the perceived movement goal. At the movement level, neural activation of the parieto-frontal circuit, including inferior frontal gyrus and the inferior parietal lobe, reflected unpredicted movement goals. Crucially, this movement prediction error was only present when the purpose of the involved object was expected. These findings provide neural evidence that prior conceptual expectations influence processing of physical movement goals and thereby support the hierarchical predictive account of action processing

2 Ondobaka, S., Newman-Norlund, R. D., de Lange, F. P., & Bekkering, H. (2013). Action recognition depends on observer's level of action control and social personality traits. *PLoS.ONE., 8,* e81392.
Notes: Humans recognize both the movement (physical) goals and action (conceptual) goals of individuals with whom they are interacting. Here, we assessed whether spontaneous recognition of others' goals depends on whether the observers control their own behavior at the movement or action level. We also examined the relationship between individual differences in empathy and ASD-like traits, and the processing of other individual's movement and action goals that are known to be encoded in the "mirroring" and "mentalizing" brain networks. In order to address these questions, we used a computer-based card paradigm that made it possible to independently manipulate movement and action congruency of observed and executed actions. In separate blocks, participants were instructed to select either the right or left card (movement-control condition) or the higher or lower card (action-control condition), while we manipulated action- and movement-congruency of both actors' goals. An action-congruency effect was present in all conditions and the size of this effect was significantly correlated with self-reported empathy and ASD-like traits. In contrast, movement-congruency effects were only present in the movement-control block and were strongly dependent on action-congruency. These results illustrate that spontaneous recognition of others' behavior depends on the control scheme

that is currently adopted by the observer. The findings suggest that deficits in action recognition are related to abnormal synthesis of perceived movements and prior conceptual knowledge that are associated with activations in the "mirroring" and "mentalizing" cortical networks

3 Ondobaka, S., de Lange, F. P., Newman-Norlund, R. D., Wiemers, M., & Bekkering, H. (2012). Interplay between action and movement intentions during social interaction. *Psychological Science, 23,* 30-35.
Notes: Observing the movements of another person influences the observer's intention to execute similar movements. However, little is known about how action intentions formed prior to movement planning influence this effect. In the experiment reported here, we manipulated the congruency of movement intentions and action intentions in a pair of jointly acting individuals (i.e., a participant paired with a confederate coactor) and investigated how congruency influenced performance. Overall, participants initiated actions faster when they had the same action intention as the coactor (i.e., when participants and the coactor were pursuing the same conceptual goal). Participants' responses were also faster when their and the coactor's movement intentions were directed to the same spatial location, but only when participants had the same action intention as the coactor. These findings suggest that observers use the same representation to implement their own action intentions that they use to infer other people's action intentions and also that a dynamic, multitiered intentional mechanism is involved in the processing of other people's actions

4 Ondobaka, S. & Bekkering, H. (2012). Hierarchy of idea-guided action and perception-guided movement. *Front Psychol., 3,* 579.
Notes: The ideomotor theory of voluntary behavior assumes that the selection and control of a concrete goal-directed movement depends on imagining its direct perceptual consequences. However, this perception-guided assumption neglects the fact that behavioral control entails a hierarchical mechanism wherein conceptual expectations - action goals - can modulate lower level perceptuo-motor representations. In this paper, we focus on the hierarchical nature of voluntary behavior by distinguishing between perceptual representations of images that relate to attainment of concrete movement goals and conceptual representations of ideas that pertain to attainment of action goals. We review the dominant ideomotor principle of the direct perceptuo-motor relation and examine its limitation in the light of the proposed hierarchical view of voluntary behavior. Finally, we offer a revision of the ideomotor principle that allows extension of its explanatory domain from perception-guided movement to conceptual, idea-guided action