

Book of Abstracts

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recent work on speech MP (Spencer & Rogers, 2005; Bohland & Guenther, 2006). Finally, we assessed the contribution of syllable transitions encountered during a speech sequence to the planning delays associated with the INT and SEQ processes. For each experiment 10 to 12 healthy individuals articulated either monosyllabic or multi-syllabic sequences in accordance with an auditory template presented prior to a trial. Study time (time spent viewing a visual precue), reaction time (response to imperative 'Go' signal), and total duration for each syllable were recorded for analysis. We anticipate, first, that syllable duration will increase the latency associated with INT in a manner consistent with limb responses and consistent with Klapp's model of MP. The relevance of these data will be discussed with respect to a common MP process across effectors and INT disruptions being central to particular speech disorders such as apraxia of speech. Second, we assume that increasing sequence difficulty, through changes in syllable complexity, will manifest in greater latency for the INT process. Finally, we propose that an increase in the number of syllable transitions in a sequence should place greatest demand in the serial ordering process that must occur prior to articulation which should be associated with an increased latency for SEQ as opposed to INT. Such a finding is not currently accommodated by Klapp's delineation of motor programming.

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Learning by observation: an EEG study

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Many skills are learned by imitation of a teacher, a model, a sportsman, etc. Mu-activation (15-25 Hz) in the EEG and MEG is thought to reflect motor cortex activation and has repeatedly been shown to be increased in active reaching or grabbing action observation (Järveläinen, Schürmann, & Hari, 2004), or finger movement observation (Cochin, Barthelemy, Roux, & Martineau, 1999) and is especially sensitive for goal directed action observation (Järveläinen, Schürmann, & Hari, 2004). The central question addressed in this study concerns how this mu-activation develops with sequence learning by observation.

Subjects were presented with pictures of a response panel on a screen, with 5 buttons. One central button signaled the start of sequence, the 4 other were configured in a 2x2 configuration. The lower 2 of the buttons (left and right) were the start positions of each movement and the 2 upper buttons were the goal movement buttons (resulting in 4 possible movements). In the 'biological' condition (BC) subjects observed sequences of actions performed by hands. Each movement was made by one hand moving from the starting position to one of the goal buttons and back to the start position. Each sequence was made up of 6 consecutive movements. The observation phase (OP) consisted of 5 repetitions of this sequence after which the subject had to perform the same movement sequence once on a similar response panel as presented on the screen during observation. After that, another sequence was presented. In a 'symbolical' condition (SC), the movements were signaled by the dimming of one of the start buttons and brightening of one of the goal buttons. Contrasting the mu activity in the OP, we are able to correlate the mu activity dynamics to learning by observation and, more importantly, how these dynamics are related to learning through observation of biological rather than symbolical movements. We will discuss how the motor system is activated during learning by observation and how this differs when learning occurs through biological and non-biological movement observation, and its implications for movement learning models.

References

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2. Neural Synchronization

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There is ample evidence that oscillatory coupling is an important mechanism of communication between distant neuronal groups in the nervous system. This coupling is often expressed in a significant and dynamically changing orchestration of neurophysiological signals of different neuronal structures (e.g., Stam, 2005). Indeed, oscillatory coupling is not limited to the central nervous system. Various studies that attempted to unravel neural features of human motor control reported synchronous activity between cortical motor areas and the spinal cord. The speakers in this symposium provided important contributions to prove the functional relevance of this coupling in motor-related settings. Boonstra, Daffertshofer, and Beek (2006) studied acoustically paced, rhythmic motor performance, which was accompanied by a decrease of event-related amplitude during tap onsets as well as by a subsequent increase of phase locking in the beta band. These findings indicated induced