



## Jessica Tallet

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### Title:

Mirror movements as marker of cognitive and cerebral (dys)function

### Abstract:

Most activities of daily living require unimanual or bimanual coordinated movements. Symmetrical bimanual movements represent the default coordinative mode of the central nervous system and can interfere with the ability to perform complex hand skills (Swinnen, 2002). One manifestation of symmetry refers to mirror movements (MM) that are involuntary contractions occurring in homologous muscles contralateral to voluntary movements, particularly in the distal upper limb muscles (Carson, 2005). The production of unimanual or complex asymmetric bimanual activities require inhibiting MM (Tallet et al., 2009; 2010). Hence, inhibition of MM is crucial to perform or learn unimanual and complex asymmetric bimanual activities. Inhibition processes improve progressively during child development, as the central nervous system matures, hence leading to decrease of MM. However, MM can persist or reappear in aging or troubles, hence leading to alteration of unimanual and asymmetric bimanual activities (Tallet et al., 2013; Sallard et al., 2016; Blais et al., 2017; Martin et al., 2017; Tisseyre et al., 2018). Given that MM is the behavioral manifestation of the cerebral functioning, we will see that the excessive production of MM reflects a lack of inhibition and attention and alerts of possible cerebral disconnection. On this basis, cognitive-motor training or rehabilitation focused on executive control could help inhibiting MM. Other interventions such biofeedback or neurofeedback could also be appropriate to evaluate and inhibit MM via real-time visualization of EMG or EEG signals.

### Related publications:

- Blais M, Amarantini D, Albaret JM, Chaix Y, Tallet J (2017). Atypical inter-hemispheric communication correlates with altered motor inhibition during learning of a new bimanual coordination pattern in Developmental Coordination Disorder. *Developmental Science*; 21:e12563.
- Carson, R. G. (2005). Neural pathways mediating bilateral interactions between the upper limbs. *Brain Research Reviews*; 49(3), 641-662.
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Alzheimer's disease: A sign of inter-hemispheric disconnection? *Human Movement Science*; 55:43-53.

- Sallard E, Tallet J, Thut G, Deiber MP, Barral J (2016). Age-related changes in post-movement beta synchronization during a selective inhibition task. *Experimental Brain Research*; 234:3543-53.
- Swinnen SP (2002). Intermanual coordination: from behavioural principles to neural-network interactions. *Nature Reviews*; 5:350-361.
- Tallet J, Albaret JM, Barral J (2013). Developmental changes in lateralized inhibition of symmetric movements in children with and without Developmental Coordination Disorder. *Research in Developmental Disabilities*; 34(9):2523-32.
- Tallet J, Barral J, James C, Hauert CA (2010). Stability-dependent behavioural and electro-cortical reorganizations during intentional switching between bimanual tapping modes. *Neuroscience Letters*; 483(2):118-22.
- Tallet J, Barral J, Hauert CA (2009). Electro-cortical correlates of motor inhibition: a comparison between selective and non-selective stop tasks. *Brain Research*; 1284:68-76.
- Tisseyre J, Amarantini D, Chalard A, Marque P, Gasq D, Tallet J (2018). Mirror movements are linked to executive control in healthy and brain-injured adults. *Neuroscience*; 379:246-256.

### **Biography:**

After initial training in psychomotor therapy, Jessica Tallet has obtained a PhD in Human Movement Science in 2007. She has then conducted a post-doctorate in the Faculty of developmental psychology and neuroscience in Geneva (Switzerland) and became a lecturer at the University of Toulouse 3. Now, she is doing her research activity at the Toulouse NeuroImaging Center (ToNIC, UMR1214) of the French National Institute of Health and Medical Research (Inserm) in the iDREAM team (Innovation in Drug, Regenerative mEdicine, and modulation of Motor plasticity and recovery). She is also co-responsible of the Licence (Bachelor) in "Adapted Physical Activities and Health" at the Faculty of Sport and Human Movement Sciences where she gives teaching courses on neurosciences, neurodevelopment and learning in healthy human and neurological troubles. Her work focuses on the behavioral, cognitive and brain characteristics associated with motor control and motor learning in healthy developing individuals with or without neurodevelopmental, neurological or neurodegenerative pathologies. She is also an expert member of the Collective Expertise Inserm on child dyspraxia and Developmental Coordination Disorder.

