Kinematic characteristics and laterality quotient predict interlimb transfer of sensorimotor adaptation

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Introduction

Humans can adapt their reaching behavior to various perturbations such as prismatic deviations, visuomotor rotations or velocity force fields. However, it is unclear whether why adaptation generalizes to the non-exposed limb.

1- Paradigmatic Investigation: Here we hypothesize that generalization may depend on the visual context. Indeed, interlimb transfer has been observed without vision of the limb or even with an indirect visual feedback of the limb (e.g., a cursor) [1, 2] while no transfer has been found with vision [3, 4]. The underlying processes may rely on credit assignment issues, i.e. the source of errors [5] and/or cognitive factors [6].

Hypothesized relationship between credit assignment and generalization [5]

Methods

Two groups of young, right handed adults and a group of 2 deafferented subjects had to reach toward flashed targets on a rotating platform:

1- Vision Proprioception (VP group) N=10, 5 males 5 females; mean age : 24.6 years
2- Vision Non Proprioception (NP group) N=10, 5 males 5 females; mean age : 23.3 years

Comparison of the mean of transfer (difference between pre and post) according to awareness and assignment of errors (both in the Per) to internal factors.

Results

1- Adaptation (Dominant Arm)

Reaching direction at 150 ms of the DA in each experimental phase

A) Evolution of the initial direction of reaching movements in both groups in Pre- and Post-baseline phase.
B) Top view trajectories of one subject of the VP group.
C) Mean initial direction (at 150 ms) differed in Pre, Per-and Initial- Post (p<0.000).

2- Interlimb Transfer (Non Dominant Arm)

Reaching direction of the NDA in Pre- and Post-rotation phases

A) Top view trajectories of the NDA for one subject of the VP group
B) Mean initial direction (at 150 ms) of the NDA differed between pre- and post-rotation phase (p<0.05). There was no significant effect of group and no significant interaction.

References