When do children anticipate like adults?

A developmental study of motor anticipation in sequential pointing

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Context and research aim

Human languages are expressed through orofacial and/or manual movements. All languages rely on the ability to move body segments in space and time coordinated ways. When children learn to produce language, they develop specific motor abilities to translate language units into complex, but fluent, sequences of sensory motor units. In this process, each gesture has to be precise enough to reach the language unit's goal but also has to anticipate the following gestures in order to achieve fluency. Motor anticipation is consequently a central issue in understanding the production of language. According to previous work, motor anticipation relies on neuromuscular maturation as well as sensory-motor experience. Motor anticipation is not only involved in language production but also in other serial-order tasks such as manual skills or locomotion. Our aim in this project will be to characterize the acquisition of motor anticipation by children of different ages and to compare the performances with the anticipatory behavior observed in young adults when performing a non-communicative sequential pointing task. The properties of movements in the different groups will be interpreted in relation to previous work on co-articulation in speech production.

Relevance

Understanding the relationship between motor anticipation in non-communicative actions and co-articulation in communicative actions is an important topic for rehabilitation procedures, and more generally to understand how language production is anchored in neuro-motor maturation.

Objectives of the internship

- Review related work in both motor control and speech sciences (a first list of references will be provided as a starting point),
- Design a sequential pointing experiment adapted to children and adults. The set-up will use an horizontal screen on which the targets will be displayed coupled with a motion capture system (Optitrak)
- Recruit 3 groups of subjects with ~8 subjects in each group (aged 5-6, 7-8 and 18-30). The number of groups and participants could be increased depending on the progression of the internship;
- Conduct the experiment and analyze the results (motion timing, movement profiles (trajectory, velocity,…) and learning effect), using statistical methods such a ANOVA or Linear General Model.

The supervisors and collaborators will provide support and material for each step.

Applicants

The applicants should have programming skills to process and analyze data (any scripting skills, Matlab and R are a plus). Skills in experimental methods and statistics are a plus.

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