
Learning process of an artificial co-ordination in a bimanual load-lifting task in adolescents: acquisition of a new sensori-motor representation.

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Abstract

Anticipation is necessary for the efficiency of action. In postural control, anticipation is expressed by the anticipatory postural adjustments (APAs), which compensate in advance for the destabilizing effects of action. During ontogenesis, the process underlying the acquisition of APAs implies the transformation of feedback postural corrections into a feedforward control associated with voluntary movements. The aim of this experiment was to test the capacity of adolescents to develop anticipation during a new co-ordination in a bimanual load-lifting task. We studied the learning process of an artificial co-ordination by means of a procedure of double unloading in two groups of adolescents (11-13 versus 14-16 years of age) and a group of adults. Elbow-joint rotation measurements and EMG recordings were used to assess the improvement of the forearm stabilization through six learning sessions. Kinematics results reported a difference between adolescents and young adults in learning dynamics, but also in the final level of performance. In adults, the muscular pattern underlying the learning processes was characterized by an inhibition of the muscular flexors, with a latency that gradually appeared before unloading with training experience. In adolescents, preliminary results showed that this timing adjustment required additional learning sessions to become efficient. In conclusion, the mechanisms underlying the acquisition of a new sensorimotor representation, which rely on the transformation of a feedback correction into a feed-forward control, are still maturing during adolescence. Adolescence might therefore constitute a late transient period in the developmental process.

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