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CHILDCONTROL - CHILDren in CONTROL: Novel insights from electrophysiology and modeling on the development of information control

Vast research efforts have been made to understand how executive control (i.e., the domain-general processes needed to flexibly plan and monitor goal-oriented behavior) evolves in children to help them focus on a task (e.g., studying) while resisting interferences (e.g., phone notifications), ensuring an optimal cognitive development and future success in life. Still, no study has examined age-related changes in (domain-specific) semantic control, namely the processes needed to focus on non-dominant aspects of knowledge based on the current goal and context demands, rather than automatically retrieving the dominant ones (e.g., during symbolic play, the non-dominant shape of a banana is used to make it a phone, ignoring its dominant edibility). Semantic control is intrinsically related to the development of memory for concepts meaning, however, this aspect is still unexplored. Moreover, its development is naturally paralleled by cortical maturation, but their interplay remains a hot topic of debate. This project aims to address these issues by studying for the first time the development of executive and semantic control processes and their relation at three levels: behavior, models, and brain. I will build a battery of control tasks using a gamification method for online assessment of Italian children at different ages. High-density electroencephalography will also be recorded to assess their task-related brain activity and organization. I will use stateof-the-art analytical approaches (multi-level models, structural equation modelling and representational similarity analysis) to assess the development of control processes (O1), their relation (O2), and (O3) their functional brain bases. Results will provide a new brain-behavior theoretical model of cognitive control acquisition embedding semantic control, opening new research agendas in cognitive neurosciences and education and paving the way to build trainings in control functions for children with typical and atypical development.