

## Acting early to prevent neurodevelopmental disability in young children

Press release from the French National Academy of Medicine (\*)

June 29, 2022

In France, each year, more than 10% of newborns are affected by a neurodevelopmental disorder (NDD). This entity includes multiple impairments (sensory, neuro-visual, motor, language or cognitive disorders; autism; attention-concentration, learning or behavior disorders). Screening for high-risk factors for NDD (prematurity, history of NDD in siblings, exposure to some toxins or drugs during pregnancy, etc.) and early identification of these NDD are major prerequisites for the implementation of recommended interventions during the period of maximum brain plasticity, known as the "first 1,000 days" (1, 2, 3, 4, 5).

In this short time window, from conception to the first two years of life, the essential but not definitive stages of brain development take place: formation of neurons, migration and programmed death of a significant proportion of them; formation of axons and dendrites, and elimination of their excess; formation of synapses, contact areas between two nerve cells, the whole, exponential from the third trimester of pregnancy and during the first two postnatal years, key to the constitution of neuronal networks; angiogenesis and myelination. These stages of functional organization and maturation of the brain and cerebellum are controlled by genetically determined factors, but also by environmental factors, including stimulation, experience and learning. Modulation by environmental factors involves epigenetic mechanisms (6, 7, 8)

Dysfunction of brain circuits and synaptic connections is evoked in TNDs (9). For example, in autism, nearly 50% of the genes involved encode proteins expressed at the synapse.

It is therefore essential to detect early a gap in the developmental trajectory in order to implement preventive or therapeutic interventions and parental guidance as soon as possible (10). According to international recommendations, as soon as "risk of NDD" indices are identified, practitioners must implement a personalized global intervention plan without waiting for a formal diagnosis. This project, co-developed with the family, integrates therapeutic, educational and socialization approaches that complement and potentiate each other (3, 11, 12, 16, 17). Early interventions, through psycho-educational programs using play as a support and relying on sensory integration processes, allow the recovery of an optimal developmental trajectory and prevent over-disabilities.

Valuing and placing parents "at the heart of their child's care" is a major challenge (15). A balance between individual family care and inclusion of the child in a peer group fostered by a childminder, in a crèche or a drop-in center and then, at a nursery school, with duly trained early childhood professionals) is a source of progress (2).

National programs have been implemented to structure a graduated transversal pathway of diagnosis, care and education: national strategy "autism within the TND"; "handicap act early"

campaign (5, 13). Throughout the country, TND coordination and referral platforms have been set up: these innovative systems enable early detection and promote links between all those involved in the child's health, which is a major progress. Such systems need to be adequately sized and managed by medical and paramedical staff trained in these new practices (14,15)

**In order to consolidate and expand early diagnosis, intervention and rehabilitation practices, as well as healthy prevention of neurodevelopment in young children, the French National Academy of Medicine recommends:**

-to train early childhood health and education professionals in new neurodevelopmental knowledge, identification and recommended practices;

-to inform, guide and support parent care partners and caregivers (15), and to prevent breaks in the care pathway by promoting links between the family and other child health actors;

-to sustain monitoring networks for vulnerable newborns, including premature newborns at very high risk of TND;

-to increase the number of places in collective care structures;

-to guarantee rapid access to care by strengthening, in particular, the new TND coordination and referral platforms, the early medical and social action centers (Centres d'action médico-sociale précoces, CAMSP) and other early intervention health and medical-social structures;

– to accelerate biological and cognitive neuroscience research, by prioritizing studies on the developmental window of maximum brain plasticity of the first 1000 days.

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(\*) Press release from the Academy's Rapid Communication Platform validated by the members of the Board of Governors on June 28, 2022.