

Urban Planning May Affect Cognitive and Motor Development in Children

A new study analyses the impact of 13 urban exposures on the cognitive and motor function of nearly 5,500 children in seven European cities

Barcelona, 4 November 2021. A new study from the Barcelona Institute for Global Health (ISGlobal), a centre supported by the "la Caixa" Foundation, provides further scientific evidence of the health benefits of well-designed urban planning. The study suggests that the **built environment, green space and air pollution** can affect **cognitive and motor function in children**.

According to numerous studies, the **urban environment** can influence **neurodevelopment** from conception onwards, for example through exposure to air pollution. However, previous research has not evaluated the impact of multiple exposure groups simultaneously using an early-life exposome approach.

A team from the European HELIX project, coordinated by ISGlobal, set out to analyse the impact of **13 urban exposures** on the cognitive and motor function of nearly **5,500 children in seven European urban areas**—Bradford, **United Kingdom**; Nancy and Poitiers, **France**; Gipuzkoa, Sabadell and Valencia, **Spain**; and Heraklion, **Greece**—using data from the birth cohorts Born in Bradford, EDEN, the INMA Environment and Childhood Project, and RHEA, respectively.

The new study, published in *Environment International*, analysed urban residential exposures **from pregnancy until age three years**. The analysed factors include the **built environment** (building density, proximity to public transport, facility richness, etc.), **natural spaces**, and **air pollution** from nitrogen dioxide (NO₂) and fine particulate matter (PM_{2.5}). **Cognitive function** (verbal and non-verbal abilities) and **motor function** (fine and gross motor functions) were assessed using validated tests when the children were four to five years old.

The findings showed that exposure to some built environment design factors, natural spaces and air pollution was associated with **children's cognitive and motor function** at five years of age. Specifically, higher exposure to **greenness** within 300 metres of the home during pregnancy was associated with **higher verbal abilities**. In contrast, greater **connectivity** (density of street intersections) and **land use diversity** during pregnancy were associated with **lower verbal abilities**.

"To our knowledge, this is the **first study** to show the negative impact of some factors of the built environment on children's verbal abilities" commented ISGlobal researcher **Anne-Claire Binter**, lead author of the study. "In previous studies, the land use diversity has been associated with positive health effects, so more studies are needed to interpret these results," she adds.

As for **air pollution**, in line with previous research, greater exposure to fine particulate matter during pregnancy was associated with lower scores on tests of **fine motor function**. "During pregnancy, the placenta and the blood-brain barrier, which protects the brain and spinal cord, are still immature defence systems and provide only **partial protection to the foetus** against environmental pollutants," explained Binter.

The study also confirmed the mediating effect of air pollution on the association between green space and verbal skills. In other words, "**natural environments** could have a beneficial effect on cognitive development by **reducing the harmful effects of air pollution**," explained study coordinator **Mònica Guxens**, director of the INMA Project.

“Beyond urban green space—the health benefits of which have already been demonstrated by previous research—our findings suggest that **other urban characteristics should be considered** when studying environmental exposures that may affect children’s cognitive function,” noted Guxens. “The **health of the population**—especially the most vulnerable groups, such as children—should form the **basis of urban planning**,” she concluded.

Reference

Binter AC, Bernard JY, Mon-Williams M, Andiarena A, González-Safont L, Vafeiadi M, Lepeule J, Soler-Blasco R, Alonso L, Kampouri M, Mceachan R, Santa-Marina L, Wright J, Chatzi L, Sunyer J, Philippat C, Nieuwenhuijsen M, Vrijheid M, Guxens M. Urban environment and cognitive and motor function in children from four European birth cohorts. Environ Int. 2021 Oct 15;158:106933. doi: 10.1016/j.envint.2021.106933.

About ISGlobal

The Barcelona Institute for Global Health, ISGlobal, is the fruit of an innovative alliance between the “la Caixa” Foundation and academic and government institutions to contribute to the efforts undertaken by the international community to address the challenges in global health. ISGlobal is a consolidated hub of excellence in research that has grown out of work first started in the world of health care by the Hospital Clínic and the Parc de Salut MAR and in the academic sphere by the University of Barcelona and Pompeu Fabra University. Its working model is based on the generation of scientific knowledge through Research Programmes and Groups, and its translation through the areas of Training and Analysis and Global Development. ISGlobal has been named a Severo Ochoa Centre of Excellence and is a member of the CERCA system of the Generalitat de Catalunya.

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