

The brain consumes half of a child's energy—and that could matter for weight gain

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Weight gain occurs when an individual's energy intake exceeds their energy expenditure—in other words, when calories in exceed calories

out. What is less well understood is the fact that, on average, nearly half of the body's energy is used by the brain during early childhood.

In a new paper published in the journal *Proceedings of the National Academy of Sciences (PNAS)*, "A hypothesis linking the [energy](#) demand of the [brain](#) to obesity risk," co-authors Christopher Kuzawa of Northwestern University and Clancy Blair of New York University School of Medicine, propose that variation in the energy needs of [brain development](#) across kids—in terms of the timing, intensity and duration of energy use—could influence patterns of [energy expenditure](#) and [weight gain](#).

"We all know that how much energy our bodies burn is an important influence on weight gain," said Kuzawa, professor of anthropology in the Weinberg College of Arts and Sciences and a faculty fellow with the Institute for Policy Research at Northwestern. "When kids are 5, their brains use almost half of their bodies' energy. And yet, we have no idea how much the brain's energy expenditure varies between kids. This is a huge hole in our understanding of energy expenditure."

"A major aim of our paper is to bring attention to this gap in understanding and to encourage researchers to measure the brain's energy use in future studies of child development, especially those focused on understanding weight gain and obesity risk."

According to the authors, another important unknown is whether programs designed to stimulate brain development through enrichment, such as preschool programs like Head Start, might influence the brain's pattern of energy use.

"We believe it plausible that increased energy expenditure by the brain could be an unanticipated benefit to early child development programs, which, of course, have many other demonstrated benefits," Kuzawa said.

"That would be a great win-win."

This new hypothesis was inspired by Kuzawa and his colleagues' 2014 study showing that the brain consumes a lifetime peak of two-thirds of the body's resting energy expenditure, and almost half of total expenditure, when kids are five years old. This study also showed that ages when the brain's energy needs increase during [early childhood](#) are also ages of declining weight gain. As the energy needed for brain development declines in older children and adolescents, the rate of weight gain increases in parallel.

"This finding helped confirm a long-standing hypothesis in anthropology that human children evolved a much slower rate of childhood growth compared to other mammals and primates in part because their brains required more energy to develop," Kuzawa said.

"A hypothesis linking the energy demand of the brain to [obesity risk](#)" will publish the week of June 17 in *PNAS*.

More information: Christopher W. Kuzawa et al., "A hypothesis linking the energy demand of the brain to obesity risk," *PNAS* (2019). www.pnas.org/cgi/doi/10.1073/pnas.1816908116

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