

Study shows early environment has a lasting impact on stress response systems

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Credit: George Hodan/public domain

New University of Washington research finds that children's early environments have a lasting impact on their responses to stress later in life, and that the negative effects of deprived early environments can be mitigated—but only if that happens before age 2.

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Sciences, the research is believed to be the first to identify a sensitive period during early life when children's [stress response](#) systems are particularly likely to be influenced by their caregiving environments.

"The early environment has a very strong impact on how the stress response system in the body develops," said lead author Katie McLaughlin, a UW assistant professor of psychology. "But even kids exposed to a very extreme negative environment who are placed into a supportive family can overcome those effects in the long term."

The study focuses on children who spent the first years of their lives in Romanian orphanages and others who were removed from orphanages and placed in foster care. It finds that the institutionalized children had blunted stress system responses—for example, less [heart rate](#) acceleration and blood pressure increases during stressful tasks and lower production of cortisol, the primary hormone responsible for stress response.

By comparison, children who were removed from the Romanian institutions and placed with foster parents before the age of 24 months had stress system responses similar to those of children being raised by families in the community.

The results suggest that children's early experiences can impact the development of the stress response system, and that removing them from adverse environments can mitigate such damaging effects.

"Institutionalization is an extreme form of early neglect," McLaughlin said. "Placing kids into a supportive environment where they have sensitive, responsive parents, even if they were neglected for a period of time early in life, has a lasting, meaningful effect."

In 2005, the Romanian government passed a law prohibiting the

institutionalization of children younger than 2.

The study is part of the Bucharest Early Intervention Project, launched in 2000 to study the effects of institutionalization on brain and behavior development among some of the thousands of Romanian children placed in orphanages during dictator Nicolae Ceausescu's reign.

Researchers tested 138 children close to age 12 from three groups: those who had spent several years in institutions, others who were removed from institutions and placed into high-quality foster care, and children raised in families living in areas near the institutions.

The children placed into foster care were moved at between six months and 3 years of age. Those left in institutions remained there for varying amounts of time before eventually being adopted, reunited with their biological parents or placed in government [foster care](#) after policies around institutionalization changed in Romania.

During the tests, children were asked to perform potentially stressful tasks including delivering a speech before teachers, receiving social feedback from other children and playing a game that broke partway through. Researchers measured the children's heart rate, [blood pressure](#) and several other markers including cortisol.

The children raised in institutions showed blunted responses in the sympathetic nervous system, associated with the flight or fight response, and in the HPA axis, which regulates cortisol. A dulled stress response system is linked to health problems including chronic fatigue, pain syndrome and autoimmune conditions, as well as aggression and behavioral problems.

"Together, the patterns of blunted stress reactivity among children who remained in institutional care might lead to heightened risk for multiple

physical and mental health problems," the researchers write.

McLaughlin said it's difficult to say for certain why the children's stress response systems were blunted. It's possible that since they endured such extreme stress early in life, the tasks the researchers put them through were relatively benign in comparison and thus did not evoke a strong response.

More significantly, McLaughlin said, their stress response systems might have been initially hyperactive at earlier points in development, then adapted to high levels of stress hormones by reducing the number of receptors in the brain that stress hormones bind to.

"If we'd been able to measure their stress systems early in life, we would expect to find very high levels of [stress hormones](#) and stress reactivity," she said.

Related research from the study found that children raised in the orphanages had thinner brain tissue in areas linked to impulse control and attention, and less grey matter overall.

The [children](#) involved in the study are now about 16 years old, and researchers next plan to investigate whether puberty has an impact on their stress responses. It could have a positive effect, McLaughlin said, since puberty might represent another sensitive period when [stress](#) response systems are particularly tuned to environmental inputs.

"It's possible that the environment during that period could reverse the impacts of early adversity on the system," she said.

More information: Causal effects of the early caregiving environment on development of stress response systems in children , *PNAS*, www.pnas.org/cgi/doi/10.1073/pnas.1423363112

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