

To maximize a child's development, genetics provide important insight

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A South African child is evaluated as part of a Stellenbosch University study.
Credit: Stellenbosch University

A child's genetic make-up can play a large, hidden role in the success of efforts to maximize his or her development, South African research

suggests.

The study, published February 28 in *PLoS Medicine* and supported by the Government of Canada through Grand Challenges Canada's Saving Brains program, sheds new light on why some [children](#) benefit more than others from interventions and raises complex questions about psychosocial intervention programs in future.

In a study led by Professor Mark Tomlinson of Stellenbosch University, the study followed-up an intervention implemented between 1999 and 2003, in which expectant mothers underwent mentoring to improve attachment with their children—attachment being a measure of a child's psychological security, and predictive of future wellbeing. In the original study, a control group of roughly equal size was composed of expectant mothers who did not receive mentoring.

The original study concluded that the intervention had a small-to-moderate effect on mother-child attachment, evaluated once the children reached 18 months of age.

The follow-up study, conducted thirteen years after the intervention, re-examined the original attachment results and revealed something surprising: the intervention had in fact worked well for toddlers who had a particular genetic characteristic.

Conducted in collaboration with colleagues from the University of Reading, University College London, and Western University, the study re-enrolled and conducted genetic tests on 279 of the original 449 children.

220 children had both genetic and attachment data, enabling the investigators to test whether the original attachment outcomes were influenced by their [genes](#).



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The researchers factored in whether the child had the short or long form of gene SLC6A4—the [serotonin transporter gene](#), which is involved in nerve signalling, and which other studies have linked to anxiety, depression and other conditions. Serotonin is popularly thought to contribute to feelings of well-being and happiness.

The attachment of children with the short form of the gene, and whose pregnant mothers were mentored, were almost four times more likely to be securely attached to their mothers at 18 months old (84 percent were secure) than children carrying the short form whose mothers did not

receive mentoring (58 percent were secure).

Meanwhile, children with the long gene were apparently unaffected by their mother's training or lack thereof: in both cases, the rate of secure attachment was almost identical (70 and 71 percent).

Subject to further validation, says Professor Tomlinson, the insight has "important implications for scientists designing and evaluating interventions to benefit as many people as possible in South Africa and worldwide."

"Without taking genetics into account, it is possible that other studies have under-estimated the impact of their interventions, as we originally did."

Says lead author Dr. Barak Morgan of the University of Cape Town: "The immediate significance of this research is the revelation that in principle, and probably in many cases in practice too, the effectiveness of interventions has been mis-measured—under-estimated for genetically susceptible individuals and over-estimated for those who are genetically less susceptible. But even more worrying is the implication that the negative consequences of not receiving an intervention also differ by genotype."

"This is an enormously important insight because, in this case, the subgroup with the short form of the SLC6A4 gene is also the one with the most to lose if not helped."



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Credit: Stellenbosch University

"Individuals with the long form of the gene, on the other hand, appear less sensitive and derived little benefit from the same intervention, and little detriment from not getting it."

Adds Professor Tomlinson: "In the original study, we did not see such a big impact from this intervention because only those with the short gene improved, and this improvement was 'diluted' by the large number of children with the long gene who did not improve."

The researchers caution that, among other limitations, this study involved a relatively small sample and only measured one gene and one

outcome (attachment).

Dr. Morgan stressed: "We are certainly not saying that only some people should receive the intervention—those who are 'susceptible' to improving from it. There is little scientific justification for this. For example, many children with the non-susceptible long genotype of the SLC6A4 gene may carry the susceptible form of another gene which renders them much more likely to benefit from the same intervention but for a different but equally important outcome.

"Going forward, the implications are therefore two-fold. Firstly, measuring genetic differences allows for proper assessment of the effectiveness or lack of effectiveness of an intervention for a particular outcome in different individuals. Secondly, this information can then be used to find out how to intervene effectively for all—to guide what might be done to improve outcomes for a non-responsive gene-[intervention](#) interaction while continuing to optimise outcomes for the responsive one."

Says Dr. Karlee Silver, Vice President Programs of Grand Challenges Canada: "This work is fundamentally about better understanding the impact of interventions which is an important step forward to creating a world where every child can survive and thrive."

Says Dr. Peter A. Singer, Chief Executive Officer of Grand Challenges Canada: "This is a startling finding that changes the way I think about child development. Why is it important? Because child development is the ladder of social mobility used to climb out of the hole of inequity by millions of children around the world."

More information: "Serotonin Transporter Gene (SLC6A4) Polymorphism and Susceptibility to a Home-Visiting Maternal-Infant Attachment Intervention Delivered by Community Health Workers in

South Africa: Re-analysis of a Randomized Controlled Trial" [DOI: 10.1371/journal.pmed.1002237](https://doi.org/10.1371/journal.pmed.1002237)

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