News Release

February 28, 2017

To Maximize a Child's Development, Genetics Provide Important Insight

In study, children with a particular genetic variation were four times more likely to develop strong attachment to mother after intervention

Toronto, Canada / Cape Town, South Africa – 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.

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."

"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 the hole of inequity by millions of children around the world.”

For more information, visit grandchallenges.ca and look for us on Facebook, Twitter, YouTube and LinkedIn.

– 30 –

About Grand Challenges Canada

Grand Challenges Canada is dedicated to supporting Bold Ideas with Big Impact® in global health. We are funded by the Government of Canada and we support innovators in low- and middle-income countries and Canada. The bold ideas we support integrate science and technology, social and business innovation – we call this Integrated Innovation®. Grand Challenges Canada focuses on innovator-defined challenges through its Stars in Global Health program and on targeted challenges in its Saving Lives at Birth, Saving Brains and Global Mental Health programs. Grand Challenges Canada works closely with Canada’s International Development Research Centre (IDRC), the Canadian Institutes of Health Research (CIHR) and Global Affairs Canada to catalyze scale, sustainability and impact. We have a determined focus on results, and on saving and improving lives.
www.grandchallenges.ca

About Saving Brains

Saving Brains is a partnership of Grand Challenges Canada, Aga Khan Foundation Canada, the Bernard van Leer Foundation, the Bill & Melinda Gates Foundation, The ELMA Foundation, Grand Challenges Ethiopia, the Maria Cecilia Souto Vidigal Foundation, the Palix Foundation, UBS Optimus Foundation and World Vision Canada. It seeks and supports bold ideas for products, services and implementation models that protect and nurture early brain development relevant to poor, marginalized populations in low- or middle-income countries.
www.savingbrainsinnovation.net

FOR MEDIA ENQUIRIES

LIAM BROWN
Press Officer
Grand Challenges Canada
T. +1-416.583-5821 Ext. 5564 / M. +1-647.328.2021
liam.brown@grandchallenges.ca

TERRY COLLINS
T. +1-416.538.8712 / +1-416.878.8712
tc@tca.tc

XANTHE HUNT
Media Manager
Stellenbosch University
T. + 27 83 840939
xanthehuntwrites@gmail.com