Toddlers' aggression is strongly associated with genetic factors, study reports

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The development of physical aggression in toddlers is strongly associated genetic factors and to a lesser degree with the environment, according to a new study led by Eric Lacourse of the University of Montreal and its affiliated CHU Sainte-Justine Hospital. Lacourse's worked with the parents of identical and non-identical twins to evaluate and compare their behaviour, environment and genetics.

"The gene-environment analyses revealed that early genetic factors were pervasive in accounting for developmental trends, explaining most of the stability and change in physical aggression, " Lacourse said. "However, it should be emphasized that these genetic associations do not imply that the early trajectories of physical aggression are set and unchangeable. Genetic factors can always interact with other factors from the environment in the causal chain explaining any behaviour."

Over the past 25 years, research on early development of physical aggression has been highly influenced by social learning theories that suggest the onset and development of physical aggression is mainly determined by accumulated exposure to aggressive role models in the social environment and the media. However, the results of studies on early childhood physical aggression indicate that physical aggression starts during infancy and peaks between the ages of 2 and 4. Although for most children the use of physical aggression initiated by the University of Montreal team peaks during early childhood, these studies also show that there are substantial differences in both frequency at onset and rate of change of physical aggression due to the interplay of

genetic and environmental factors over time. Genetically informed studies of disruptive behavior and different forms of aggression across the lifespan generally conclude that genetic factors account for approximately 50% of the variance in the population.

Lacourse and his colleagues posited and tested three general patterns regarding the developmental roles of genetic and environmental factors in physical aggression. First, the most consensual and general point of view is that both sources of influence are ubiquitous and involved in the stability of physical aggression. Second, a "genetic set point" model suggests a single set of genetic factors could account for the level of physical aggression across time. A third pattern labeled 'genetic maturation' postulates new sources of genetic and environmental influences with age. "According to the genetic maturation hypothesis, new environmental contributions to physical aggression could be of short duration in contrast to genetic factors," Lacourse explained.

About the twins cohort

This twin study was initiated by Michel Boivin of Laval University and Richard Tremblay, who is also affiliated with the University of Montreal and University College Dublin. All parents of twins born between April 1995 and December 1998 in the Greater Montreal area (Canada) were invited to participate, which resulted in the participation of 667 monozygotic and dizygotic twin pairs. Monozygotic means the twins originated from the same embryo – they are genetically identical. Dizogytic means they developed in separate embryos, meaning they are not identical.

Mothers were ask to rate their twins physical aggression, by reporting behaviour such as hitting, biting, kicking and fighting, at the ages of 20, 32 and 50 months. "The results of the gene-environment analyses provided some support for the genetic set-point hypotheses, but mostly

for the genetic maturation hypotheses," Lacourse said. "Genetic factors always explained a substantial part of individual differences in physical aggression. More generally, the limited role of shared environmental factors in physical aggression clashes with the results of studies of singletons in which many family or parent level factors were found to predict developmental trajectories of physical aggression during preschool." Our results suggest that the effect of those factors may not be as direct as was previously though.

Long-term studies of physical aggression clearly show that most children, adolescent and adults eventually learn to use alternatives to physical aggression. "Because early childhood propensities may evoke negative responses from parents and peers, and consequently create contexts where the use of physical aggression is maintained and reinforced, early physical aggression needs to be dealt with care," Lacourse said. "These cycles of aggression between children and siblings or parents, as well as between children and their peers, could support the development of chronic physical aggression." We are presently exploring the impact of these gene and social environment interactions.

More information: Eric Lacourse, PhD, Michel Boivin, PhD, Mara Brendgen, PhD, Amélie Petitclerc, PhD, Alain Girard, MSc, Frank Vitaro, PhD, Stéphane Paquin, PhD candidate, Isabelle Ouellet-Morin, PhD, Ginette Dionne, PhD and Richard E. Tremblay, PhD published "A longitudinal twin study of physical aggression during early childhood: Evidence for a developmentally dynamic genome" in *Psychological Medicine* on January 21, 2014.

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