

Genetics explain why some boys and girls are bigger than others

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This is an image of a weight scale. Credit: CDC/Debora Cartagena

The influence of genetic factors on differences between children's Body Mass Index (BMI) increases from 43% at age 4 to 82% at age 10, reports a new study by researchers at UCL and King's College London.

The research, published in the journal *Obesity*, combined twin and genomic analyses in 2556 pairs of twins from the Twins Early

Development Study. Data were collected in England and Wales in 1999 and 2005 when the twins were 4 and 10 years old respectively. The study was supported by the UK Medical Research Council (MRC) with additional funding from the Wellcome Trust and the Biotechnology and Biological Sciences Research Council.

The twin analysis confirmed previous studies with a doubling of [genetic influence](#), called 'heritability', showing that the reasons that some boys and girls are bigger than others are 43% genetic at age 4 and 82% genetic at age 10. One explanation for this may be that as [children](#) get older, they have increased independence to seek out environmental opportunities to express their genetic predispositions, a process 'termed gene-environment correlation'.

Since twin analyses don't involve direct measurement of genes, the researchers used genomic data in the same sample to compare with the twin findings. They first used Genome-wide Complex Trait Analysis (GCTA) which estimates the combined effects of over 1.7 million common genetic variants across the whole genome, to demonstrate that the total effect of common genes increased by 50% between ages 4 and 10.

As GCTA doesn't identify the effect of specific genes, the researchers then created a genetic predisposition score from 28 genetic variants known to be associated with obesity risk, and replicated the rising association with BMI for this set of genes from ages 4 to 10. Together, these findings demonstrate beyond doubt that genetic influence on body weight increases over childhood.

"Our results demonstrate that [genetic predisposition](#) to obesity is increasingly expressed throughout childhood," says Dr Clare Llewellyn, UCL Epidemiology & Public Health, who co-led the study. "This underlines the importance of intervening at an early age to try to

counteract these genetic effects and reduce childhood obesity."

"The fact that the twin-based estimates of increasing heritability of BMI were supported by genomic data provides strong support for the reliability of twin analyses," says Dr Maciej Trzaskowski of the MRC Social, Genetic and Developmental Psychiatry Centre at King's College London, who co-led the study. "Given the time and expense incurred collecting DNA in large studies, twins offer a convenient and affordable alternative to describing the genetic architecture of a range of health-related characteristics such as body weight."

Provided by University College London

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