Nature vs. Nurture: New Science Stirs Debate

How Behavior Is Shaped; Who's an Orchid, Who's a Dandelion

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Wall Street Journal

September 17, 2013, on page D2 in the U.S. edition

http://online.wsj.com/article/SB10001424127887323527004579079132234671374.html?mod=WSJ_LifeStyle_Lifestyle_5

Researchers are making big strides understanding how genes work with the environment to shape behavior. Jonathan Rockoff and University of Arizona human development professor Bruce Ellis explain on Lunch Break. Photo: Getty Images.

Researchers are making strides in understanding how genes work with the environment to shape behavior, adding a new twist to the age-old debate over whether nature or nurture is mostly responsible for how people develop.

They are finding that sensitivity to the environment resides in the biology of the nervous system. And some people, because of their genetic makeup and life experiences, are more sensitive to outside influences than others. Scientists point to a type they call orchids—people who wilt under poor conditions but flourish in supportive climes. Meanwhile, dandelions aren't much affected by the world around them, whether supportive or harsh.

Part of the difference stems from variation in genes like DRD4, which helps regulate a chemical in the brain called dopamine, a neurotransmitter that helps people experience pleasure and reward. Evidence suggests that people who produce less dopamine—the orchids—don't learn as well from negative feedback or in a distracting environment, but do perform well in a warm but strict setting.

About 30% of Caucasians could be called orchids as a result of the genetic variation to DRD4, one review of research on the subject has shown. Prevalence in other ethnicities is less well known.

Researchers say the most startling discovery is that while sensitive orchids are hurt by bad outside influences, they can benefit profoundly from positive environments. Children who acted out more and did worse in school than classmates while coping with fighting parents, for example, shared more and

performed better than peers after an intervention to promote a happier home life, according to a 2010 study of 338 children in the journal Child Development.

"The very characteristics that were often thought of as children's greatest frailties can also be their greatest strengths," says Bruce Ellis, a University of Arizona professor of family studies and human development who helped coin the orchid and dandelion designations and develop the theory.

The most recent study, published in August in the Proceedings of the National Academy of Sciences, looked at the impact of the economy on mothers' parenting.

The study found mothers with a particular genetic variation yelled, cursed and slapped their children more as the economy plunged during the recent downturn of 2008, though they parented less harshly than mothers who didn't have the genetic change as the economy improved in the early 2000s.

Mothers with the sensitive kind of gene do parenting "worse when conditions are deteriorating," says Irwin Garfinkel, a professor at Columbia University's School of Social Work who helped author the study. "But those with the sensitive gene do better when conditions are improving."

The findings that only certain people may be sensitive to outside influences have triggered a spirited debate about how best to help troubled youths and adults. Some say treatment might need to be different for those identified as orchids than those who are dandelions.

Much is still unknown about the mechanics behind people's environmental susceptibility. It is likely that most people aren't either an orchid or a dandelion, but have the qualities of each to varying degrees.

Critics like Glenn Roisman, a professor at the University of Minnesota's Institute of Child Development, question the strength of the evidence implicating particular genetic hitches in environmental sensitivity and say more rigorous study is needed.

Dr. Roisman says the research must better distinguish how good or how bad outside influences need to be to have a significant effect, and whether a person's susceptibility is specific to certain factors.

"If you're an orchid, you may be an orchid susceptible to specific environmental circumstances," such as parenting but not peer pressure, Dr. Roisman says.

Jay Belsky, a University of California, Davis, professor of human development, was among those who pioneered the idea that certain people are developmentally malleable.

Researchers had long thought that childhood experiences shaped how people turned out later in life. Dr. Belsky figured it made evolutionary sense that some children would be more susceptible to early influences than others because the future is uncertain.

If the future turned out as anticipated, these developmentally malleable children would be in a great position to flourish because they wound up fitting the environment in which they found themselves. But if the future was unexpected, these same kids would be mismatched, perhaps disastrously so.

To ensure survival over generations regardless of what the future brought, parents would have both orchid and dandelion offspring, Dr. Belsky thought.

Evidence hashing out the biology behind the theory and supporting its validity began pouring in about five years ago, once the technology for parsing genetic data was more widely available to researchers.

Researcher Marinus Van IJzendoorn and colleagues at Leiden University in the Netherlands took a sample of 157 children at risk for aggression and disobedience. They swabbed the inside of the study subjects' cheeks and analyzed the cells to see who had a variation of DRD4, the dopamine-regulating gene.

At a laboratory, Dr. Van IJzendoorn filmed the study subjects' mothers working with their at-risk children. Half of the parents in the study were visited six times by a social worker who reviewed the video and discussed how to be warmer while setting limits more strictly; the other parents didn't receive such training. The mothers answered questionnaires designed to assess the children's behavior.

"We found clear-cut evidence" that the children with the DRD4 variant "were more open to the changes in their parents' behavior: These children who showed most aggressive behavior without the parent training, displayed least problem behaviors after the training," Dr. Van IJzendoorn said in an email. The study was published in 2008 in the journal Developmental Psychology.

In 2011, Dr. Van IJzendoorn and colleagues published in the journal Development and Psychopathology an analysis of 15 studies involving more than 1,200 children confirming the hypothesis that dopamine-system related genes mark a person's susceptibility to the environment.

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A version of this article appeared September 17, 2013, on page D2 in the U.S. edition of The Wall Street Journal, with the headline: New Science Stirs Nature vs. Nurture Debate.

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