

Skinny Genes?

An Interdisciplinary Look at a Complex Behavioral Disorder

by

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Part I – Evolution

Megi hopped into the car after soccer practice. “I’m starving!” she said.

As always now when Megi said these words her mother’s eyes lit up. Most active teenagers will talk about how hungry they are after exercising, but Megi was only recently able to express herself in this way.

“I’ll warm up some leftover spaghetti and meatballs for you as soon as we get home,” responded her mother.

Once they arrived home, Megi ran upstairs to quickly shower while her mom made her dinner. After Megi showered, she glanced at herself in the mirror. Her sister’s mirror to be exact. Her therapist had asked her to take her mirror down a few years ago and she hadn’t got around to putting it back up. She was happy with the image that stared back at her. Thin, but not too thin, and curves in all the right places. Was it just a few short years ago that this same image that stared back at her seemed grossly overweight? She was finally able to tolerate her thighs touching while she slept and could dispense with the pillow between her legs.

Idly, Megi’s mind returned to that fateful day in the doctor’s office four years ago when, during her routine physical, the doctor did a double take at her weight. “You’ve lost 20 pounds since your last visit and slipped way off your growth curve!” her doctor had chided. In retrospect that should have immediately set off alarm bells in everyone’s head, especially since Megi had only been 11, but both her doctor and her mom had chalked the weight loss up to the nagging virus that had been plaguing her and that she had been so over scheduled that meals didn’t always happen regularly. “Perhaps a visit to a nutritionist is in order,” was her doctor’s suggestion. “I also want to see you back here in a couple of weeks so I can reweigh you.”

“A couple of extra granola bars after soccer practice, I think,” was what her mom had said to her on the way home. “Yes, definitely,” Megi had answered, with no real intention of consuming more calories. Inside she was filled with a sense of satisfaction. She had secretly decided to go on a diet a few months before, but had not been weighing herself. Her clothes were looser so she knew she had lost weight but didn’t know how much. She was proud that she could diet at such a young age and didn’t understand why so many adults struggled with weight loss.

Although it was four years ago she remembered clearly what she had eaten the day of her doctor’s appointment. Breakfast had been a half of a grapefruit; lunch had been two tangerines; snack after school had been several cans of Diet Coke; and dinner had been half of a stuffed shell with water. Her reverie was interrupted by her mom calling her to dinner. “Remember that your Aunt Lee is coming tomorrow for a few days,” her mom said to her while she ate her spaghetti and meatballs. “Yes, I remember,” replied Megi. “I changed the sheets in the guest room and put out towels so she should be all set.”

Question

1. Provide some possible explanations for Megi’s behavior. Support your answer with details from the case.

Part II – Ancestral Imprint

Settling down at his desk, Brian, Megi's dad, clicked open the familiar genealogy file he had been working on for months. Brian loved doing research. It was like sitting down with an old friend; the process was comforting. In fact, losing himself in the genealogy projects was one of his favorite ways of escaping the stinging arguments he and his wife Jill would have about Megi's illness. He had grown tired of the blame game. Namely, the blame was directed at him for being away from the family so much. What was he supposed to do? His job required him to travel frequently and sometimes for long periods of time. He had been doing this since before Megi and her sister were born and everyone had managed just fine. Nonetheless, Brian had pangs of guilt about his daughter's illness.

Brian had traced his own family back several generations and was beginning to hit dead ends. His latest adventure of exploring his wife's roots was becoming much more interesting anyway. He and Jill had been recently discussing what appeared to be some shared personality and behavioral traits between Jill's deceased sister, Lizzie, and their daughter Megi. The thought of Jill's sister reminded Brian that he was supposed to move his car out of the driveway so that Lee, Jill's sister, could park her big Chevy Suburban.

Lee was an odd duck. As Jill's older sister and Lizzie's surviving identical twin, she seemed to be plagued with a number of vague psychological issues that had never really been diagnosed. Most recently she had become very compulsive in her day to day activities. As Brian rose from his desk and reached for the car keys, he grinned to himself thinking that Lee drove a car that was as big as her mouth.

The sound of car tires on the driveway told Brian that he missed his chance. Now his car was blocked in by the monstrous Suburban. The white vehicle was perfectly clean and spotless. "Always the perfectionist," Brian mused as he walked out into the driveway where the rest of the family was already gathered.

"I can't believe how grown up you are," exclaimed Auntie Lee as she greeted Megi. "Last time I saw you, you were a pudgy 10-year old." Oh yes, Megi remembered. She remembered how that comment from her aunt had stung all those years ago. It was soon after that when she began her "diet." Her mom glared at Auntie Lee and whispered sharply, "We don't talk like that in this house." Megi knew how uncomfortable any talk of weight made her mother. No matter how many times Megi insisted she was fine now, her mom was sure she was just a comment or two away from resuming the eating disorder behaviors she had fought so hard to recover from: the obsessive counting of calories, the refusal to eat anything with fat in it, and the abject terror that a weight gain of even an ounce elicited. Not only had Megi been fixated on not taking in any calories, but she was also consumed with burning calories any way she could. Soccer was Megi's main outlet until her coach removed her from play due to concerns over her declining health. After that she made sure she went running every day. She also found subtle ways to burn calories. She would never sit when she could stand, she compulsively moved her arms and legs whenever she could, and even went so far as to squat rather than sit when she went to the bathroom because she was convinced it burned more calories.

Megi remembered how out of control her life had felt, particularly with her dad being away all the time. Eating was something over which she had complete control. The constant feeling of hunger provided a twisted comfort, one of the only things she could rely on. On the other hand, she remembered how bad she felt, particularly at her lowest weight. She always had her back to the scale when they weighed her, but later she found out she had lost a total of 30 pounds! A lot for an 11-year-old with such a small frame. She was always cold and her fingers and toes were blue. She remembered the "fur," the fine layer of hair, that began to cover her body and how she spent long periods of time staring into space struggling to stay focused on anything. Again her musing was interrupted when her aunt abruptly said, "OK, let's talk about something else. I've been dying to see the new deck you put on the house!"

"Yes, why don't we barbeque out there for dinner?" Jill said, feeling relieved that the topic of conversation had shifted.

"I'll bring Auntie Lee's bags up to her room!" volunteered Megi. She grabbed her aunt's perfectly matched Gucci suitcases and headed into the house.

"Brian, would you get the grill going?" Jill asked. "I'll bring out the marinated steaks in a few minutes."

Questions

1. Why was the mention of weight so upsetting to Megi's mom?
2. What is the difference between being thin and being anorexic?
3. How would you define the term "eating disorder"?
4. What is the physiological basis for Megi's "fur," her fingers and toes being blue, and the constant staring into space?
5. Do you think that anorexia nervosa is a choice or a medical condition?

Part III – Relative Correlations

Mom and Auntie Lee didn't see each other much because Auntie Lee lived so far away. When they did get together, they both loved to reminisce. As they sat on the deck, they watched Megi and her sister splashing around in the pool. "Remember when you talked our cousin into jumping into the pool in his brand new Easter outfit?" chortled Mom. "Remember when you and Lizzie almost blew up the house with your chemistry experiments?" chuckled Auntie Lee.

The mention of Lee's identical twin caused each to pause. Lizzie, their sister and Lee's twin, had died of heart failure when she was only 25. She had basically starved herself to death in response to her controlling parents, at least that was the prevailing wisdom of the time.

Megi's head jerked up. "You mean there was someone else in our family with an eating disorder?" she exclaimed.

Her mom was startled. "You know, I have been thinking a lot about Lizzie lately, but never once thought of her intentional death march as an eating disorder."

Jill thought about how long it had taken her daughter to recover, close to four years in fact. Looking back she wondered how she had managed to take Megi to the seemingly endless appointments; the pediatrician once a week for weight and blood pressure checks, the nutritionist for slow modifications to a meal plan that would eventually bring Megi to a healthy weight, and the therapist who provided strategies for dealing with the ever-present voice in Megi's head telling her not to eat. She had never realized how complex eating disorders were. Recovery was so much more than just forcing calories on her daughter so she could gain back the weight she lost. She also thought about how Megi's physical health was restored long before her emotional health.

Jill wondered if more information on eating disorders were available 25 years ago, might her sister Lizzie still be alive?

Questions

1. What do you think are some of the underlying factors that contribute to anorexia?
2. How does the *Diagnostic and Statistical Manual of Mental Disorders*, 5th edition (*DSM-V*) characterize anorexia nervosa? (The *DSM-V* is a taxonomy of psychological disorders published by the American Psychological Association.) Note that the criteria can be obtained from a simple Google search and it is not necessary to have the reference manual on hand.
3. Anorexia nervosa is the most serious of psychological disorders. What do you think the mortality rate is for anorexia?
4. Is it significant that Megi was only 11 years old when diagnosed with anorexia?

Part IV – Familial Insights

“Maybe it was in my genes all along,” Megi mused. After the revelation that her aunt had likely died from complications from an eating disorder Megi was totally convinced that she had bad genes. Many of Megi’s friends treated eating disorders as a fad that came and went weekly. Her friends had never understood the seriousness of her illness. However, Megi always knew her anorexia was real because she knew nothing about the culture of eating disorders until she started to recover from one. And now she had an explanation beyond a voice in her head telling her not to eat. She must have inherited the gene from her mom’s side of the family!

Her dad’s genealogy research had dug up all sorts of interesting dirt about others in the family with psychological issues: a couple of alcoholics in her mom’s family and some distant cousin who had supposedly killed himself after a bout with depression. The DNA connection was strengthened in her mind when she considered the personality traits she supposedly shared with her Aunt Lizzie. Her mom said that Lizzie was a high achiever and perfectionist just like Megi. She had even fished out some old photographs and the physical similarities were startling. Their faces were shaped the same and both had blue eyes, deep auburn hair, and the same distinct ringlet curls that had always defined Megi. Megi remembered when her beautiful hair had become stringy and fell out in clumps in the shower. She also remembered how thickly it had grown back once she started to eat that mega-calorie high-protein diet that her nutritionist had laid out for her.

Questions

1. Why do you think Megi was surprised to discover there might be someone else in her family with an eating disorder?
2. Do you think there is any connection between Auntie Lee’s vague psychological issues, other family members with psychological issues, and Megi’s eating disorder? Explain.
3. Is it significant that only one twin in a set of identical twins struggled with anorexia?
4. How is Megi misinterpreting the genetics of anorexia when she talks about inheriting a gene from her mother’s side of the family?

Part V – Megi’s Explorations

Megi wanted to do some more research on anorexia and genetics so she typed the two terms into the Google search engine on her computer. She was surprised with the large number of hits that appeared. One particularly interesting figure caught her eye.

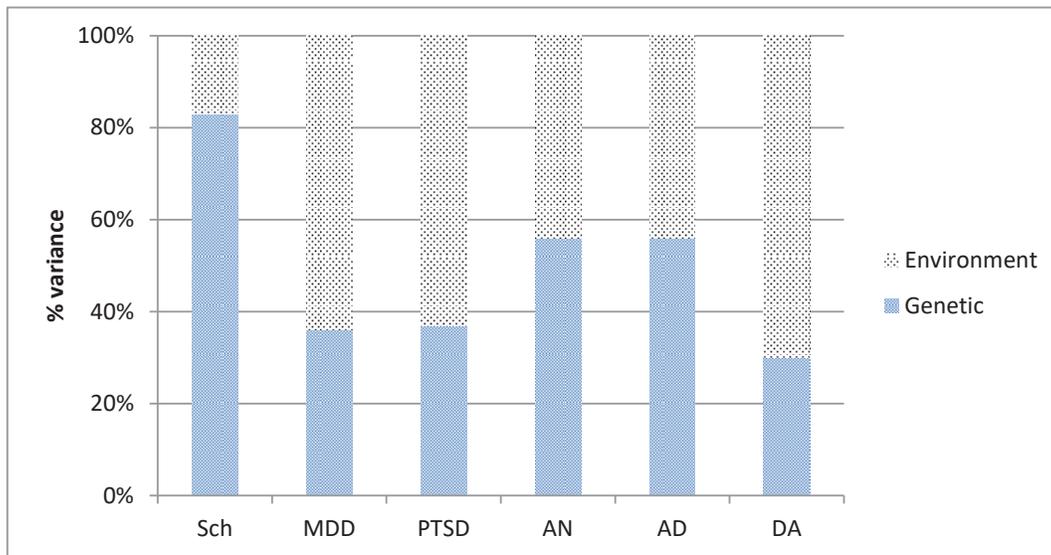


Figure 1. “Proportion of variance attributable to genetic and environmental effects according to twin studies of schizophrenia (Sch), major depressive disorder (MDD), post-traumatic stress disorder (PTSD), anorexia nervosa (AN), alcohol dependence (AD), and drug addiction (DA).” Adapted from Figure 1 in Toyokawa et al. 2012.

Questions

1. How would you interpret this histogram?
2. For anorexia nervosa, what percent of the disorder is believed to be attributable to genetics? What percent is believed to be attributable to the environment?
3. What are the statistics for the other disorders shown in the histogram? How do they compare?
4. What is meant by the phrase “nature vs. nurture”? Which do you think plays a greater role in the development of eating disorders?

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