

# *What Makes You Sweat: Genetic and Environmental Influences on Skin Conductance Response*

By Deborah Lee, Sophomore majoring in Neuroscience



## **Twins—genetically similar, but developmentally different**

There is something confounding about the nature of twins. Twins are defined by two children produced in the same pregnancy and born during the same birth process. Though identical twins are genetically identical, many possess completely different personalities! In efforts to better understand the psychology of twins, Tiffany Pouldar researched the environmental impacts that may or may not factor into twin development. This was done by studying the effects of skin conductance produced by stress. Pouldar, a senior majoring in Psychology and an undergraduate researcher for the Baker Lab, explained that she first got started with this lab during the end of her freshman year when after she declared her major and wanted to gain more experience in the field. This lab studies twins and actually formed the USC Twin Project,



which conducts studies about the role of heredity and environment on individual interaction and behavior. The lab looks into all kinds of aspects, including personality development, academic performance, and antisocial behavior. The Baker Lab works with data from Southern California Twin Project, a longitudinal twin study following over 750 pairs of twins in the greater Los Angeles area. They are now in their 5<sup>th</sup> wave of testing.

### **Birth of Experiment**

Tiffany and the Baker lab recognized that there has been a general lack of information on genetic and environmental information regarding stress response. Because in past experiments it was indicated that math tests were difficult and stressful, they chose to use this as their stress inducer. In past years there has been a constant stereotype that males performed better than girls in areas of mathematics. They decided to run tests to determine whether this was indeed true. Thus, *What Makes you Sweat: Genetic and Environmental Influences on Skin Conductance Response* was born. Tiffany says, “We wanted to look into the contributions of genetic and environmental effects on mathematical performance through stressful stimuli. More specifically, we wanted to see how the body responds when under nerve-racking circumstances.”

### **Administering the Stress—Experiment Protocol**

Before the subjects were asked to complete a math test, each twin had two electrodes individually attached to their index and middle fingers to measure their **NS-SCR**. (Non Specific Skin Conductance Response) Each twin was given a mental arithmetic stressor in which they had to start with the number 1,023 and continuously subtract 13 from each following value. Their times were measured to increase the stress level. If they answered incorrectly, they would have to start from the beginning. (**SCR**: Non-Specific Skin Conductance Response and **SCL**: Skin Conductance Level.)

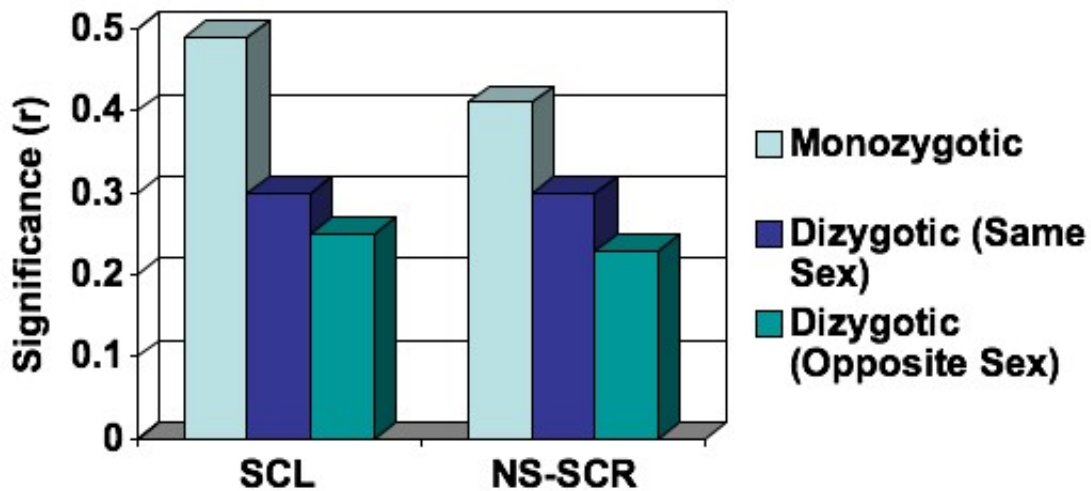
### **The Surprising Results—Girls and Boys**

From this experiment they learned that males elicited a higher physiological response to stress than females. However, males were less likely to admit to feeling stressed during the task. While males typically showed greater numbers of SCRs in comparison to females during the math stressor, females reported greater levels of negativity affect after the task. The study indicates that for ages 14-16, although there is no gender difference in math skills (based on caregiver reports of school grades), there is a significant gender difference in the stress responses on the math task (based on NS-SCR or SCL). This may indicate that males are more physiologically stressed during the math task. The stress may be a result of the pressures in maintaining the positive stereotype that males are better at math. Despite the greater number of SCRs for males, they typically reported lower levels of stress on self-report measures in comparison to females. We also compared stress responses for the twins based on their academic performance in math and we discovered that students with higher academic performance in math typically had more NS-SCR compared to those who were failing or doing below average in math. This pattern was

present between boys as well as girls. The fewer responses may be due to antisocial characteristics found amongst students who perform poorly in school. A typical characteristic of individuals with antisocial characteristics is low degrees of arousal; therefore, individuals who have fewer SCRs or lower SCLs may have antisocial tendencies. Although results suggest that males rather than females appear to be more stressed during the math task, further research will better correlate this increased number of SCRs to the positive stereotype that males face regarding their math abilities.

**More Surprising Information—Beyond the Stereotypes**

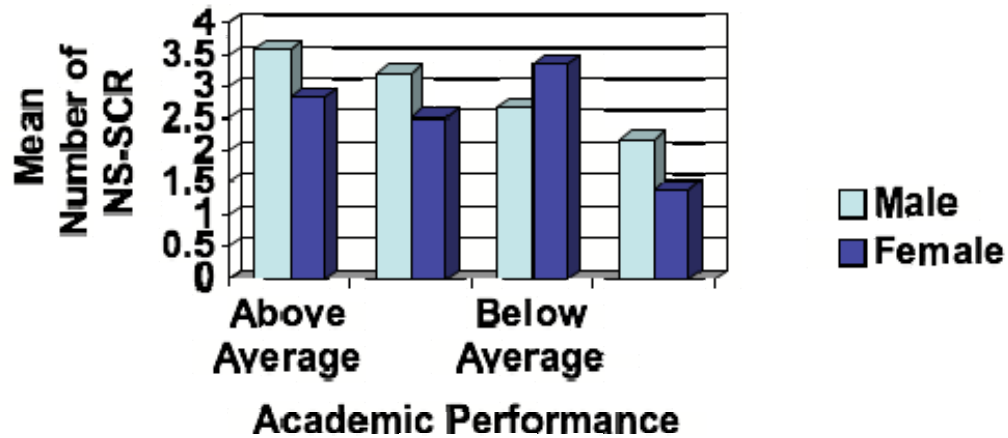
**FIGURE 2: Zygosity**



NS-SCR: Non-Specific Skin Conductance Response and SCL: Skin Conductance Level—this shows the similarities in results for monozygotic and dizygotic twins.

This shows how the average number of NS-SCR per minute correlates to academic performance in school. Males showed higher levels of skin conductance responses than females.

**FIGURE 3: NS-SCR based on Math Performance in School**



**Future Studies—What is next for the Baker Lab?**

The Baker lab will continue to study the confounding factors of the timeless conundrum: nature vs nurture. In the future, they hope to understand how genes and environmental factors contribute to specific behaviors. They are also looking into personality disorders and more behavioral disorders as well. The past waves have focused on psychopathy and antisocial behavior. These longitudinal studies will be are still in their preliminary cycles, and it will be interesting to see how the twins progress as time passes.