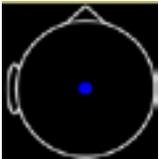


MCTFR *update*

minnesota center for twin and family research spring : summer : 2012



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WHAT TWIN STUDIES CAN TELL US ABOUT EDUCATIONAL ACHIEVEMENT AND POTENTIAL EARNINGS

By: **Kevin Stanek**

The co-twin control method is a research design that, when specific assumptions are met, allows psychologists to examine causality in human behavior. In psychology, we desire to understand the causal relations between traits, behaviors, environments, and genotypes but the rigorously controlled designs used in agriculture, physics, and chemistry are not (ethically) feasible with human participants. Instead, psychologists must rely on novel methods, such as the co-twin control method to infer causal relations without completely controlling the environments and genotypes of individuals.

Since identical (monozygotic, MZ) twins share all of their genetics and much of their environments (e.g., they have the same socioeconomic status in childhood, the same parents, etc) they are sometimes used as controls for one another. An example of this is when researchers are trying to determine the financial benefit or return of university attendance. If two people are identical at the end of high school and one attends university while the other goes straight to work, is there a difference in their earnings later in life? Co-twin control studies try to answer this question by examining identical twin pairs where one twin

goes to university and the other does not, relying on the assumption that the twins in each pair are indistinguishable on all factors that affect later earnings before this divergence in life course. It is widely known that assuming MZ twins are identical copies of one another is not completely true, but Kevin Stanek's study was the first to show how untenable it is, at least for this research question.

Twins from the Minnesota Twin Study who attended a four-year university (about 50% of all twins) and those who did not at age 20 differed in terms of critical personality traits, intelligence levels, and high school grades and these differences were significantly related to salary differences at age 29. Specifically, the personality traits of achievement, low aggression, low alienation, and high control (e.g., being organized and planful) predicted university attendance and higher income as an adult. Academic motivation and effort were related to university attendance and marginally related to adult income. Class standing/grade point average was the best predictor of university attendance and later income. Looking across all individuals in the study, the difference in annual income (before taxes) was about \$7,000 at age 29.

**continued on page 3*

1. Which country has the highest rate of twin births?
2. How old did the oldest living set of twins live to be?
3. What percentage of twin pairs share similar sounding names?
4. T or F, a set of twins always shares the same father.
5. What is the longest gap between the birth dates of a pair of twins?
6. What is the highest combined birth weight of a set of twins?
7. Which company employs the most sets of twins?
8. What percentage of the United States population are twins?
9. How young were the members of the youngest recorded set of twins?
10. Eating a diet rich in this kind of food has been rumored to increase a woman's chances of conceiving twins.

*Answers on page 3

Meet the staff: Psychophysiology Analysis

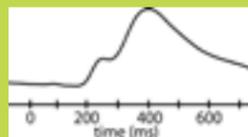


There are many people who work at the MCTFR, some of whom you interact with during your visit and some you never see. We would like to introduce a committee you do not see during your visit, the Psychophysiology Analysis committee. This committee helps researchers process and analyze data collected in the lab.

The Psychophysiology Analysis committee currently consists of Research Assistant Professor Steve Malone and three Psychophysiology Analysts: Micah Hammer, Evan Welo and Jon Klaphake. This includes assisting collaborators, post-doctoral researchers, and graduate students with projects. Previously, the committee had as many as six analysts. Some of these individuals have gone on to Masters and PhD programs.

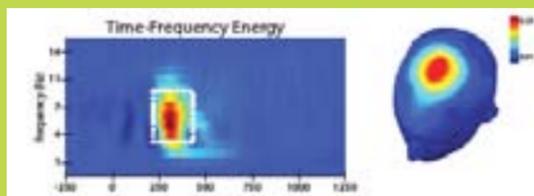
The committee has two broad categories of work. The first is to process the psychophysiological data collected during lab sessions to ensure it is cleaned and ready to use. Psychophysiological data collected in the lab consists of three domains: electroencephalographic (EEG) measures of brain activity, autonomic nervous system (ANS) measures, and eye-tracking tasks. Recording of these types of signals often include signals we are not interested in as well. These can be human factors, unrelated to the psychophysiological processes we are trying to understand, such as blinks and muscle movement, or other issues such as fluorescent lights, poor electrode contacts with the skin, or other non-physiological events. We examine, identify, and clean bad sections of data with the aid of computer algorithms. Recently, the Psychophysiology Analysis group screened and cleaned over 5000 individual rotated heads task files as part of the Genes, Environment, and Development Initiative (GEDI) project. They are currently screening two similarly sized groups of files for GEDI: one consists of resting EEG activity, or spontaneous brain activity recorded while participants rest, and the other consists of measures of skin conductance, reflecting minute changes in the activity. of sweat glands on the fingertips. This activity of the ANS is used to measure a person's reactivity to things like loud noises as well as the degree to which s/he can "tune out" or respond less over time to a repeated loud noise.

The second major type of work done by the group is data analysis. This involves taking the processed and cleaned data and looking at it in different ways to see what is there. There are different levels at which the data can be analyzed. A common approach is to look at average waveforms for different EEG data shown here:



We are also able to utilize advances in computer and recording technology to look at more complex levels of data. In the case of EEG, we originally recorded at three

or four electrode sites on the scalp. We now use high density electrodes capable of recording at 61 sites on the head. This allows us to better localize the sources of brain activity. Furthermore, with this technique we can represent the data in more informative ways. An average waveform tells us about activity amplitude over time. We gain more information by including the frequency (rate of peaks and valleys of a wave) over time as well. This is called Time-Frequency analysis:



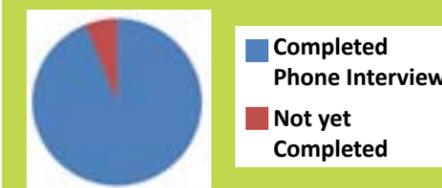
In addition to looking at levels of brain activation, we also look at the relationships between regions of the brain. One way to do this is to compare data between two locations on the scalp, and for a given frequency of activation, look for similarities between the two signals in the timing of peaks and valleys, to see if certain regions are "firing" in synchrony. We can then illustrate the relationship between these areas as shown below as well as examine how these patterns relate to performance on the tasks and how they change with development.



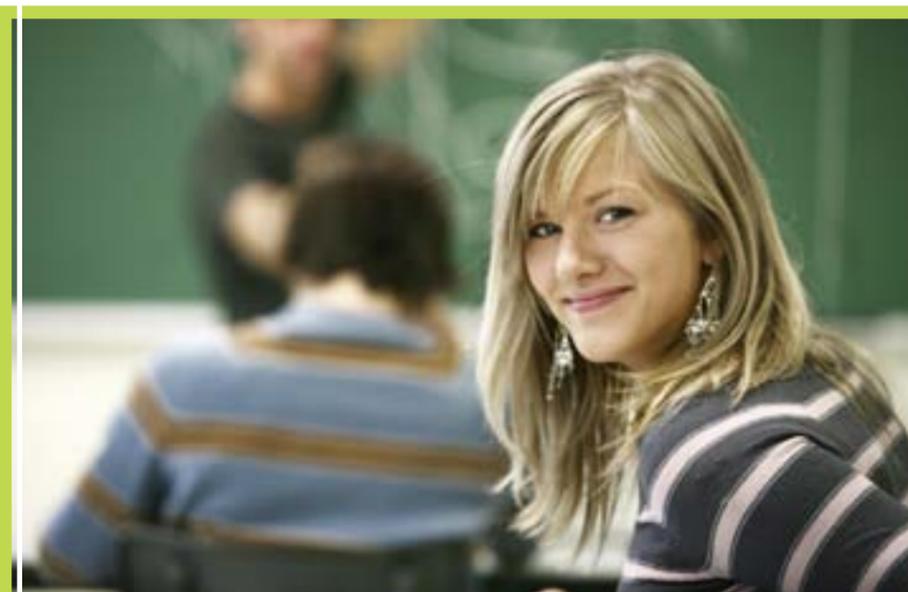
These are just some of the exciting ways the psychophysiology analysis group uses technology to dig deeper into the data. With over 7000 participants coming through the psychophysiology lab at least once, doing multiple tasks, and many more at follow-up visits, there is a lot of data to process and analyze. It is very challenging work but the psychophysiology analysis group enjoys what they do very much. We would like to thank all of our participants who allow us to better understand how psychophysiology and behavior are related. We couldn't do such interesting work without you!

Sibling Study *update*

Sibling Study Participation Rates



We are very close to completing the second follow-up of the Sibling Interaction and Behavior Study (SIBS). We have had an amazing number of siblings participate in this follow-up! Of the 1220 possible participants, 1093 have already completed their phone interview assessment. Thanks to everyone who has participated in this study and we look forward to speaking to those of you who are left to complete this phone interview. We will soon be busy analyzing the data that we have gathered and look forward to learning more about influences on adolescent and young adult development.



Education and Twin Studies

***Continued from page 1.** However, most of this income discrepancy was related to pre-existing differences in grade point average, personality, and intelligence rather than university attendance itself. This finding is contrary to other studies of the returns to education (which find substantial positive returns) and even other twin studies so the team is continuing to collect the age 29 data (only about half of which was available when the study was carried out) to get a better estimate and understanding of this difference. Additionally, it is important to bear in mind that university attendance is associated with other non-monetary, positive outcomes (e.g., university graduates donate more blood, volunteer more, vote more,

smoke less, and live longer than non-graduates), which were beyond the scope of this study. Kevin Stanek is a 4th year doctoral student under Dr. Matt McGue. He has conducted research on the Minnesota Twin and Family Studies for the past three years with his primary focus on the domains of personality and intelligence. He is from California and after graduation plans to consult with organizations to help them understand and implement psychological research findings to improve employee selection and organizational development. From: Stanek, K. C., Iacono, W. G. & McGue, M. (2011). Returns to education: What do twin studies control? *Twin Research and Human Genetics*, 14, 6, 509–515. "

Twin Trivia Answers

1. Nigeria has the world's highest rate of twins.
2. Eli and John Phipps, born in 1803, were the oldest known twins, living to 108 and 113.
3. 67%. Of 3,000 families polled, 33% said they chose to give each multiple a totally unique name rather than names that sound similar.
4. F. One egg can be fertilized by 2 different fathers within 5 days resulting in twins with different fathers.
5. Twins do not have to be born on the same date. The longest gap between births is 85 days.
6. 27 lbs. and 12oz. This translates to each twin weighing in at close to 14lbs.!
7. Cirque du Soleil employs the most sets of twins, with the exception of the Twins restaurant in New York City which only employs identical twins.
8. About 2% of the US population is twins, which translates to approximately 4.5 million twin individuals.
9. The youngest living twins were 22 weeks old! Each of the twins were less than 12 inches long, and weighed only slightly more than a pound.
10. Yams. Yams contain the chemical gonadotrophins, which helps women produce multiple eggs.



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Fun in the sun!

Pictures from the MCTFR summer picnic!



Thanks again to all our participants who make our work possible.