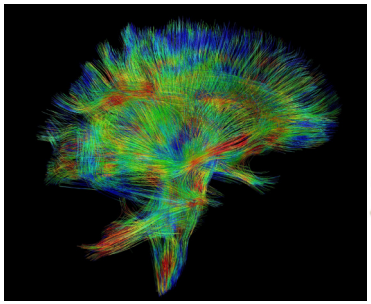
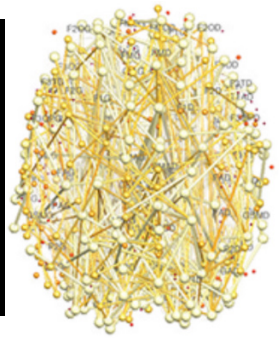
Mapping Human Brain Connectome

The human brain consists of hundreds of billions of neurons, or brain cells, about the same number stars in the Milky Way! Although the brain is only about 2% of total body weight, it uses 20% of the body's oxygen supply to perform its essential functions. The complexity of interconnections of different brain regions is involved in every aspect of daily life, such as integrating sensory information, decision-making and emotion regulation.

The Human Connectome Project is the first large-scale study to map the intricate brain connections. "Connectome" refers to the complex interconnected network of neurons in our brains. (http://www.humanconnectomeproject.org)





In 2014, the Wisconsin Twin Project began to contribute to this scientific endeavor. By comparing more than 400 adolescent identical and fraternal twins' brain images, researchers can disentangle the genetic and environmental effects on brain ***structure*** and ***connection***. The image on the left shows the complexity of white matter tracts, which are analog to the information highways in our brain. Each thin line represents a white matter tract connecting different brain regions. The warmer color indicates brain regions with higher levels of genetic contributions to the white matter *microstructure*, where identical twins are more alike than fraternal twins. Interestingly, brain regions with warmer color are found deep in the brain, whereas cool colors (blue) are found on the periphery, indicating less genetic control.

Additionally, researchers can study the intricate brain *networks of connection*, even to the scale of millimeters (Right Image). Each circle in the picture represents a small brain region with numerous lines connecting to other brain regions. These connectomes underlie the complexity of human brain networks, and will help transform our understanding of the brain and behavior (https://doi.org/10.1101/209635).

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June 2018

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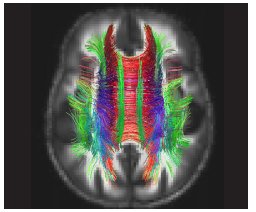
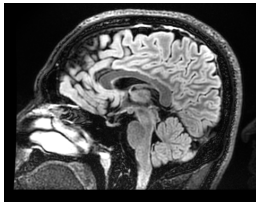
Featured Articles:

Undergraduate Students Contribute to Key Twin Research

Funding for research is provided by grants awards from the National Institute of Health, Waisman Center & private foundations





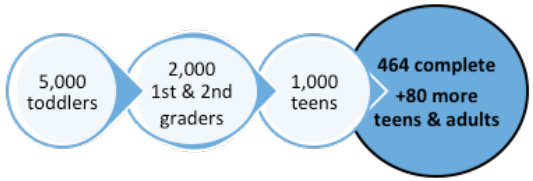
"A good neighbor will babysit. A great neighbor will babysit twins."
-- Anonymous

Research Update

Dear twins and parents,

We are beginning our last summer of data collection for our twin neuroimaging study. Thank you to the 464 twins who visited us from all parts of Wisconsin! We are so grateful for your long-term research participation.

We hope to enroll 80 more twins this summer. A larger number of twins helps us learn more about different life experience twin may have. The neuroimaging study is an exciting opportunity to connect rich perspectives from long ago to new brain measures.



We all share innate curiosity about the underlying themes of our research. From the dinner table, to the campfire, and the laboratory, people are captivated by twins and emotional life. Stories are a foundation for understanding ourselves, friends, and family. Stories about a very shy child who later held the lead role in a high school musical. Stories about twins who are still confused for one another into adulthood, even by their own children. *The scientific community has cited our work over 18,000 times*. Your research participation directly impacts how the world understands individuality.

Simply stated, there is no other study like it in the world. We are incredibly grateful for your participation and look forward to visiting with you soon!

Warmest wishes for a fun-filled summer!
Sincerely,

Fun Twin Fest Event!

Helping get the words out about this twin event!
NOON - 3 pm, June 17, 2018
East Side Club 3735 Monona Drive, Madison WI
Family friendly festival celebrating all-things twins, including twin contests, twin trivia, photo-ops, festival T-shirts.
All proceeds benefit The River Food Pantry

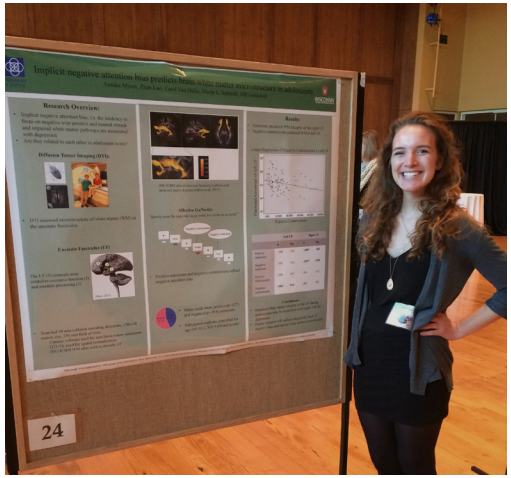
TWINS & CHILDREN UNDER 10: FREE; PARENTS OF TWINS: $1/PER PERSON; SINGLETONS: $2

Featured Results

Undergraduate Students Contribute to Key Twin Research

Undergraduate research assistants make important scientific contributions while pursuing their degrees. Students are among the friendly faces during the neuroimaging visits.

Students pursue a diverse range of majors that include psychology, neurobiology, pre-med & nursing. Students apply their research experience in a variety of professional settings in psychology, medicine, education, industry, non-profits and more. This year six students presented their independent research projects at the annual Undergraduate Symposium hosted by UW Madison.



Annika Myers completed her honor's thesis in the Department of Psychology by examining how individual brain differences are related to emotional patterns like negative attention bias. Negative attention bias is the tendency to focus on negative instead of positive information. Adolescent twins completed a brain scan using diffusion tensor imaging and a cognitive computer task. The brain scan mapped out a major white matter pathway in the brain called the uncinate fasciculus, which allow communication between regulatory and emotion areas of the brain. Higher level of structural connectivity of this pathway should reflect more efficient communication between these brain regions. Results showed that *greater* structural connectivity of this crucial pathway was associated with *less* attention bias to negative information during the computer task.

Featured Lab Member

Amanda Mix (Right) is an undergraduate research assistant for our twin neuroimaging study. She is a neuroscience/psychology double major in her junior year at UW Madison. Amanda has a fraternal twin sister who studies at U of Illinois Urbana-Champaign.

Q: What's your favorite part about having a twin?

A: I always have somebody to talk to about anything. She is one of the few people who I have been close to throughout my entire life, so she can always relate to me.

Q: How do you think having a fraternal twin sister is different than having a regular sibling?

A: I think having a sibling who is the same age as you automatically makes you spend a lot more time together (same sports teams, classes, friend groups etc.), which has made us so much closer. We were able to go through the same milestones at the same time, which makes twins extra special!

Q: Do people get you confused?

A: When we were growing up, teachers and coaches would sometimes confuse us even though we don't look alike. There were a couple of instances when teachers accidentally swapped our test scores and entered our grades wrong.

Q: How do you and your sister differ in your school / future career choice?

A: While we both want to go into the healthcare field, our career aspirations are a little different. My sister currently is majoring in Psychology with a minor in Spanish. She plans on going to graduate school for occupational therapy. Similarly, I am majoring in Psychology and Neurobiology with a certificate in global health. I hope to go to medical school and get a master's degree in public health.

Contact Info Request

Help us keep our records up to date. Please email or call us with your current telephone numbers and address.

☺ Enjoy the Summer!

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