



# Longitudinal Twin Study NEWS

Volume 14

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## TESTING SCHEDULE:

AGE	TIME	TYPE
12	5 hrs	In-person
13	30 min	Phone
14	1.5 hrs	Phone
15	30 min	Phone
16	4 hrs	In-person
17	6 hrs	In-person

## Why Twins?

Identical twins share the exact same DNA pattern, whereas fraternal twins share only 50% on average. Both are very important in a research setting. When studying a particular trait, such as reading ability, researchers look at how much of that trait is inherited and how much is a product of the environment. A trait that is strongly inherited will show up in identical twins with more frequency and strength than it will in fraternal twins.

## IQ changes through the ages

IQ, or Intelligence Quotient, is a measurement of general intelligence. An individual's IQ is a number that reflects their score on a variety of mental tasks. An IQ score of 100 is the average score. Fifty percent of people score below that number, and fifty percent score above it. In the LTS sample, the average IQ score is slightly higher. During the 7 year testing session twin participants scored an average of 106.

This IQ score, however, is not set in stone. It can and does change as an individual gets older, especially from ages one to ten. After ten years of age IQ tends to become more stable.

Researchers at IBG are interested in finding out why these changes take place. Is it something in the environment that causes an individual's score to change, or is it

something in the genes?

In a paper published in the journal *Intelligence*, researchers looked at IQ scores from twins as well as from participants in the Colorado Adoption Project, another longitu-



dinal study conducted at IBG. Through genetic analyses they found that as children aged, genes strongly contributed to changes in intelligence. They found that new genetic influences affected intelligence at each age (from one to ten), as if cer-

tain genes were turned on as the brain developed. In an ideal environment, these changes allowed an individual to achieve the highest possible IQ within the limits of their genetic inheritance.

Researchers also found that non-shared environment (experiences that are different for one twin than the other) contributed to differences in IQ. For example, if one twin had an injury the other did not, that could influence his or her IQ score.

Overall, the results of this study showed that intelligence is largely an inherited trait. However, family environment also played an important role in IQ development, especially prior to attendance in school.

Bishop, E.G., Cherney, S.S., Corley, R., Plomin, R., DeFries, J.C., Hewitt, J.K. (2003). Development genetic analysis of general cognitive ability from 1 to 12 years in a sample of adoptees, biological siblings and twins. *Intelligence* 31, 31-49.

## Grant renewals continue to support the LTS

When you receive your check for participation this year, you have grants to thank for the money. Grants pay for all aspects of the LTS research: participant payments, data collection, facility upkeep, data analysis, and staff.

For the past 18 years the LTS project has been the recipi-

ent of many grants from public and private institutions. Thanks to the quality of the research and the percentage of families still participating, the LTS continues to receive grant money.

This year the LTS is operating with funds from the National Institute of Mental Health, the National Institute

on Drug Abuse, and the National Institute of Child Health and Human Development.

Grants from these agencies and others like them allow us to continue to make new discoveries about human nature. You can learn more about many of these agencies at <http://www.nih.gov>.



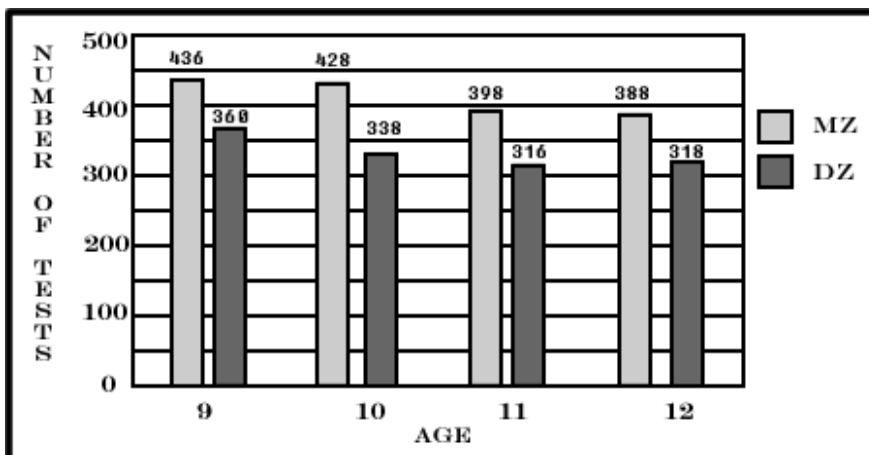
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We're on the Web!  
<http://ibgwww.colorado.edu/lts>

## Thanks for sticking with us!

The following table shows testing progress through the end of last summer. This summer the youngest twins in the project will complete the 12-year-old testing session. Once these sessions are complete, researchers will begin their analysis of the 12-year data.



Of the original 482 families, 389 families are still participating in the LTS project, over 80%! The ratio of MZ (identical) and DZ (fraternal) twins has remained about the same, approximately 55% of twin participants are identical and 45% are fraternal.

## A tour of the DNA lab

Swish, rinse for 10 seconds and spit back into the cup.

No, this isn't a visit to the dentist, but rather a simple process we use to collect DNA.

DNA stands for Deoxy-ribonucleic Acid. It is a form of genetic material that is found in all living creatures. DNA carries the complete instructions necessary for the creation of a living organism.

In genetic and twin research, DNA collection is an important piece of the puzzle. Not only can it be used to determine zygosity (whether or not twins are identical or fraternal) it is also analyzed to find patterns in individuals. These patterns are then compared to an individual's behaviors and traits. Researchers are finding that certain patterns of DNA correspond to certain traits, such as intelligence, addictive behavior, and shyness.



DNA in a test tube, before analyses

So what happens to your DNA once it is spit out from your mouth in the form of cheek cells and into a plastic tube?

At IBG we have a DNA lab where all the work is done on site. Once the DNA is brought over to the lab, it is combined with a solution of soap, salt and buffer. This solution breaks open the cells and kills any organisms that may harm the DNA.

The sample is then heated to 150 degrees Fahrenheit and a chemical called Proteanase K is added for 1 hour. When this process is complete, a small amount of rubbing alcohol is added. This causes the DNA to stick together and it can be "spooled" out of the sample with a glass rod.

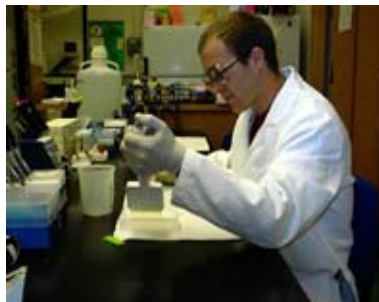
This "spooled" DNA is then reduced further by a centrifuge, which is a lab

instrument that spins very rapidly and separates the DNA from any other material.

At the end of this process, a small amount of pure DNA remains. Researchers can then prepare the DNA for analyses by a specially designed computer.

To determine zygosity, researchers look at 12 different genetic markers (a genetic marker is a sequence of DNA). Each marker must match up identically in order for the twins to be confirmed as identical twins. The odds of sharing these 12 genetic markers and not being identical are less than 1 in 10,000.

This year researchers at IBG will analyze between 10,000 and 15,000 DNA samples from various projects, including reading studies conducted in New Zealand, Norway, and Sweden.



A researcher prepares DNA for computer analysis.