

# Twins and Twin Studies

We recognize two types of twins - **monozygotic** (the egg is fertilized by one sperm and its split occurs after the conception) and **dizygotic** (two eggs are fertilized by two separated sperms).

Monozygotic twins have all the same genes and they are the same sex too. However, they are more interesting for the twin studies, just one third of twins are monozygotic. On the other hand, **dizygotic** twins are much more common and share only some part of their genes, so we can say that their relationship corresponds to the relationship of siblings. The dizygotic twins studies have the same significance like normal family studies.

## Types of Twin studies

### Twins-reared-together

Both of the twins grow up in the same family and they are exposed to the same external influences. In the case of monozygotic twins we can then recognize their genetic susceptibility to disease. The probability that just one of monozygotic twins from the same family becomes ill is very low, as compared with dizygotic twins.

### Twins-reared-apart

This type of studies are based on the comparisons of twins, who were adopted into different families and the conditions in which they grew up were not the same, so we can evaluate the role of environment on the disease. If no or very few cases of a disease are found in only one of two monozygotic twins then it can be assumed that the trait has a high value of "heritability" meaning that it is determined primarily by genetic factors.

If just one of the twins suffers from the genetic disease, we assume the influence of **threshold effect** - it is the situation when the symptoms occur after long asymptomatic period, because some critical limits were crossed (e.g. physical, chemical, biological factors).

### Co-twin Control Studies

If both of the twins have some health problem, we offer the treatment to only one of them and then we compared the results of the cure. It is not ethical to try with the drug therapy.

*E.g.* there was a research few years ago, when the doctor tried to teach one of the twin to climb the stairs, the second twin didn't practice it. However, both of them were able to climb the stairs after few weeks, the trained one did it a week earlier. It shows that the environmental influence could help them to learn something faster, but at the end the results were the same for both of the children.

## Use of Twin Studies

Thanks to studies of twin pool the link between certain genes and some diseases - **heart** diseases, **vascular** diseases or **kidney** diseases. We always expected the role of genes in these diseases, but nowadays we know much more about their origin, *e.g.* there is a genetic base of CRP (C-reactive protein) and albumin (renal protein) production. The more CRP is produced, the higher risk of cardiovascular disease.

Narrow Sense heritability can be calculated using data obtained from twin studies, "heritability" is a measure of the role that genetic factors have in the determining of a trait (and therefore the role they have in dictating variance of that trait). Narrow sense heritability only takes into account additive allelic interactions and is deemed as a more accurate measure of heritability than broad sense.

$$h^2 = \frac{\text{variance in Dizygotic twins} - \text{variance in Monozygotic twins}}{\text{variance in Dizygotic twins}}$$

If a trait is completely genetically determined then the value for heritability will be around 1 as the variance in monozygotic twins will be 0. In contrast if the trait is determined mainly by environmental factors then the value for heritability will be lower as variation will occur in monozygotic twins, for a hypothetical trait that is completely governed by environmental factors heritability would equal 0.

## Links

### Related articles

- Family Studies, Pedigree Analysis
- CRP
- Albumin

- Heritability

## External links

- Twin Studies (<http://social.jrank.org/pages/666/Twin-Studies.html>)
- Twin studies reveal genetic components leading to cardiac and kidney disease ([http://www.eurekalert.org/pub\\_releases/2007-04/uoc--tsr041707.php](http://www.eurekalert.org/pub_releases/2007-04/uoc--tsr041707.php))