

Genetics of common complex psychiatric disorders

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Genetics and Environmental Influences on Behaviour and Mental Health

Topics:

- Quantitative genetics and heritability
- Candidate gene studies
- Genome-wide studies
- Prediction
- Causality

What is a “common”, “complex” psychiatric disorder?

Common: Affects 1% or more of the population

Complex: Inheritance cannot be explained by a single gene

Psychiatric disorders are defined by disruption to higher-order brain functions of moods, perceptions, thoughts, beliefs, and behaviours but usually in the absence of major neurological impairments (consciousness, senses, memory). Psychiatric disorders include depressive and anxiety disorders (major depressive disorder, panic disorder), manic and psychotic disorders (bipolar disorder, schizophrenia), obsessive-compulsive disorders, eating disorders (anorexia nervosa, bulimia nervosa), substance-use disorders and personality disorders. Childhood conditions like attention-deficit/hyperactivity and autism can also be included, but only when they lead to clinically-salient impairment or distress. There are also many shades of sadness, hallucinations, eccentricities, mood swings, body-image preoccupations, recreational substances

use, personalities, etc that are not psychiatric disorders but may still be informative to study from an aetiological and genetic standpoint.

- Sullivan PF and Geschwind DH (2019) [Defining the Genetic, Genomic, Cellular, and Diagnostic Architectures of Psychiatric Disorders](#). *Cell* doi:10.1016/j.cell.2019.01.015

- Depression: 3% in a week
- Schizophrenia: 1% in lifetime
- Bipolar disorder: 2% in lifetime
- Anxiety disorder: 6% in a week

Psychiatric disorders have many causes, correlates, and consequences (genetics, environment, family life, substance use, relationships)

Incidence of psychiatric disorders range from the common (depression, anxiety) to the rare (bipolar disorder, schizophrenia).

Why genetics?

Why use genetics to study mental health and psychiatric disorders?

- Biological understanding of genes, pathways
- Shared aetiology with other disorders
- Risk prediction
- Drug retargeting
- Causal analysis of environmental risk factors

Genetics of categorical traits















Seed		Flower	Pod		Stem	
Form	Cotyledons	Color	Form	Color	Place	Size
						
Grey & Round	Yellow	White	Full	Yellow	Axial pods, Flowers along	Long (6-7ft)
						
White & Wrinkled	Green	Violet	Constricted	Green	Terminal pods, Flowers top	Short (1/2 - 1ft)
1	2	3	4	5	6	7

Figure 1: Diagram showing the seven “characters” observed by Mendel

Gregor Mendel (1822–1884), working in what is now Czechia, discovered the transmission of traits from parents to offspring could be explained by the inheritance of two “elements”, which we now call alleles. Mendel was concerned with discrete or categorical phenotypes.

[Mendel pea plant figure](#) by Mariana Ruiz (LadyofHats) [public domain]