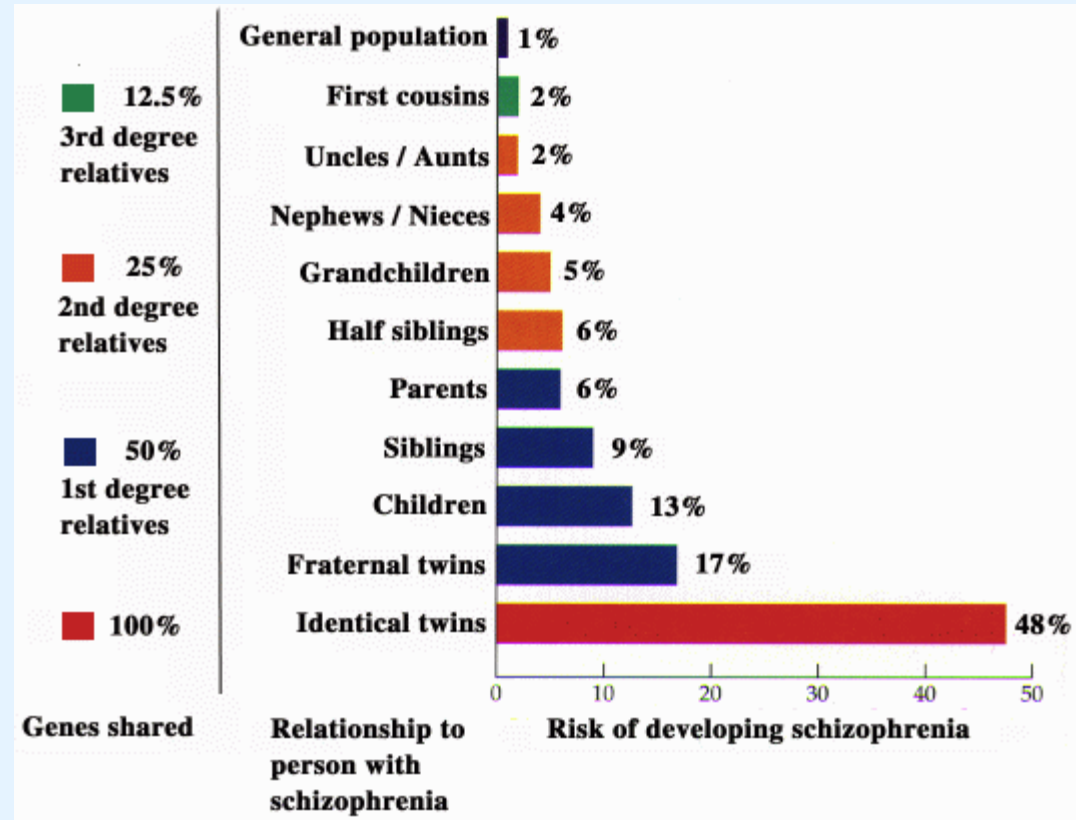


# LO TBAT evaluate the genetic explanation of Schizophrenia

# Keywords to define

- **Concordance rate**
- Heritability
- **Gene**
- COMT gene
- **DISC1 gene**
- Diathesis stress model
- **Synaptic pruning**
- C4 gene

# % chance of Sz if ...



# Heritability

- **Heritability is about 79% for Sz**
- There are possibly 700 genes involved in Sz
- ***We don't know* which exact genes or gene combination is responsible – evidence for C4, COMT and DISC1 genes**

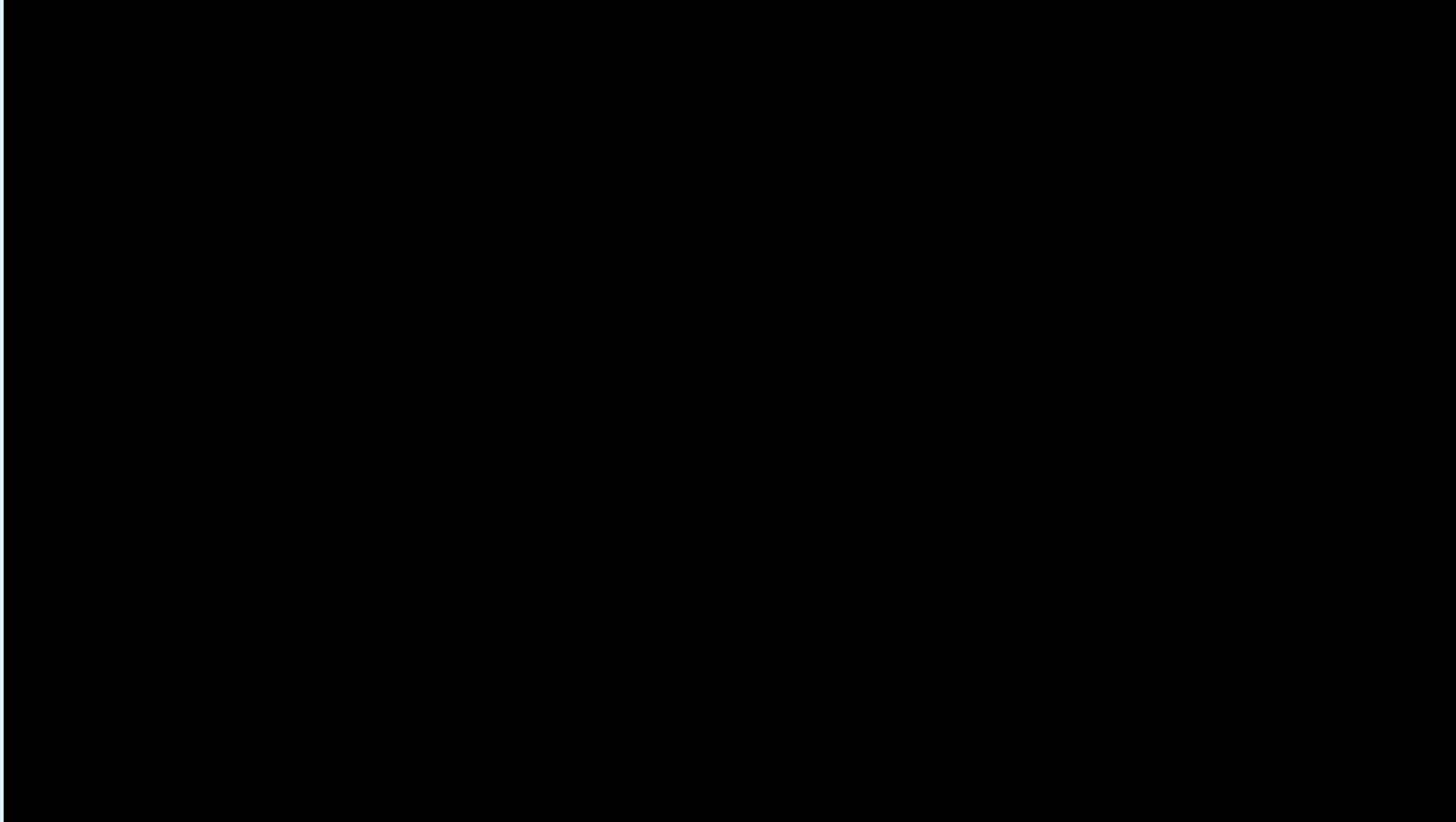
# The C4 Gene - Sakar et al. (2016)

- **Genetic analysis of 65,000 people found that those who had overactive forms of the C4 gene showed higher risk of developing schizophrenia.**
- C4 helps with synaptic pruning - removing unused or damaged connections to make way for new ones.
- **In adolescence this is a particularly important process as the brain develops**
- If C4 is overactive → too much synaptic pruning → Sz symptoms develop

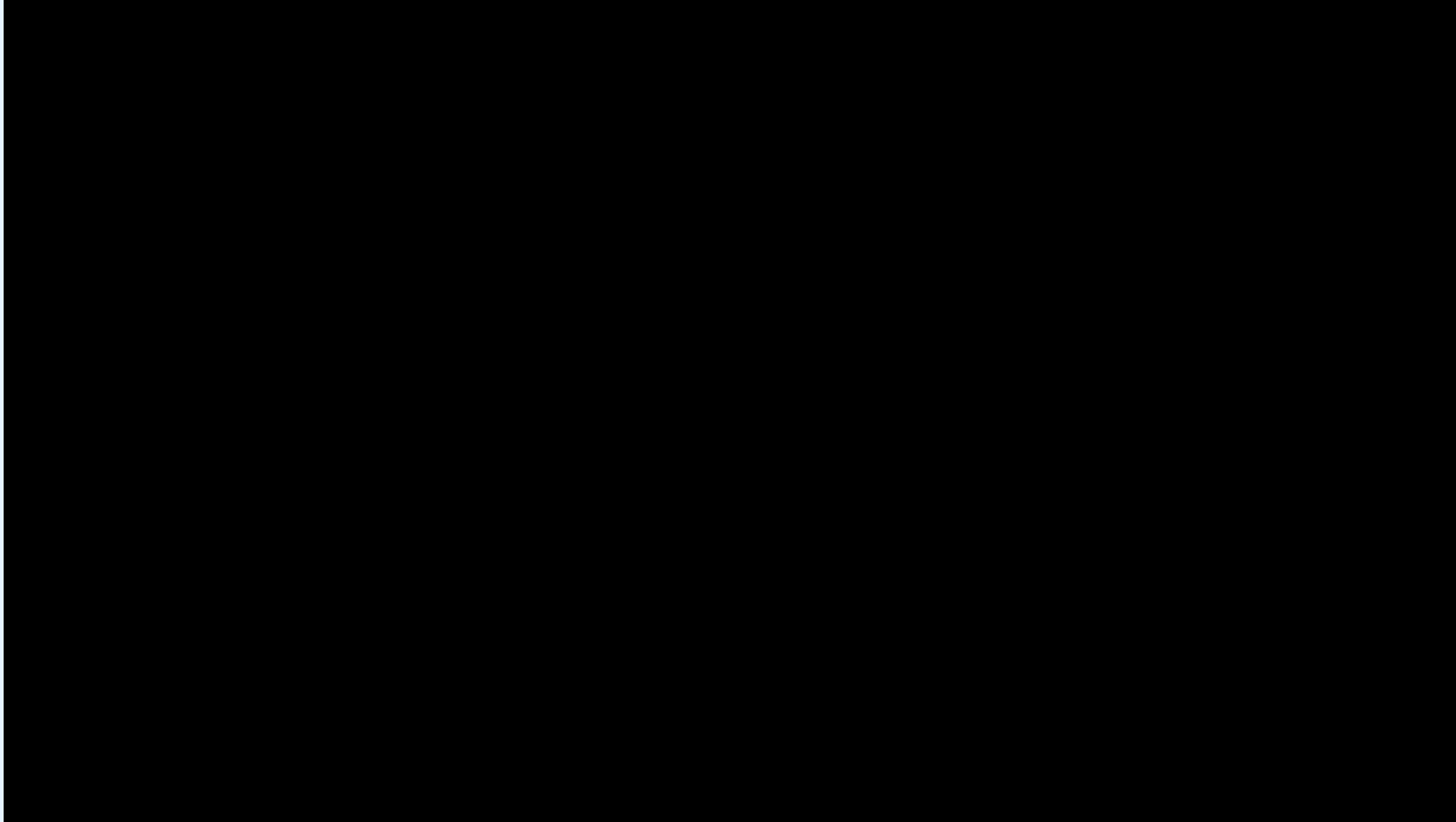
# The C4 Gene - ????? et al. (2016)

- Genetic analysis of ????? people found that those who had ????? forms of the C4 gene showed higher risk of developing schizophrenia.
- C4 helps with synaptic ????? - removing unused or ????? connections to make way for new ones.
- In ????? this is a particularly important process as the brain develops
- If C4 is overactive → too much ????? → Sz symptoms develop

# The C4 Gene – Video 1



# The C4 Gene - Video 2





# DiGeorge Syndrome

- [Disability and the cost of living: 'It's our son's life' - BBC News](#)

# Questions to answer for A01

- What happens if families don't have a history of the disorder? (genetic mutation)
- What is *DiGeorge Syndrome*?
- What does the COMT gene do and why does its deletion → Sz symptoms
- What is the DISC1 gene, and how does it impact Sz and neurotransmitters?
- What is the *diathesis-stress model* and how does it explain the development of Sz?
- EXTENSION: epigenetics and diathesis-stress

# Evaluation for A03 (evidence!)

- Evidence for family running in families *and* competing argument
- Environment risk factors (concordance never 100%!) **Evidence to support COMT and DISC1 theories**
- Application to genetic counselling
- **EXTENSION: nature and nurture**

# Quick A01 questions (1)

1. **How many genes are estimated to comprise the human genome?**
2. What does DNA hold instructions for in organisms?
3. **What is the heritability estimate for schizophrenia mentioned in the text?**
4. How is one approach to understanding the genetic underpinnings of schizophrenia described?
5. **Approximately how many genes have been linked to schizophrenia, according to Jessica Wright (2014)?**
6. How can schizophrenia appear in individuals without a family history of the disorder?
7. **What is DiGeorge Syndrome, and how is it related to schizophrenia?**

# Quick A01 questions (2)

8. **What is the function of the COMT gene, and how is it linked to schizophrenia?**
9. How does the abnormality in the DISC1 gene relate to the likelihood of developing schizophrenia?
10. **What role does GABA play in the development of schizophrenia?**
11. Do genes directly cause schizophrenia, according to the text? Explain.
12. **In the original diathesis-stress model of schizophrenia, what was considered as "stress"?**
13. How has the definition of "stress" evolved in relation to schizophrenia research?
14. **What is one factor mentioned in the text that increases the risk of schizophrenia by up to seven times?**
15. How does cannabis use relate to the risk of developing schizophrenia?

# Quick A01 questions – answers (1)

1. **Around 30,000 genes.**
2. DNA holds instructions for general physical features and specific physical features related to psychological functioning.
3. **79%.**
4. By identifying responsible genes in family members diagnosed with schizophrenia.
5. **As many as 700 genes (now likely in the thousands).**
6. Spontaneous changes (mutations) in one or more genes.
7. **DiGeorge Syndrome is caused by the deletion of genes on chromosome 22 and is related to schizophrenia in some cases.**

# Quick A01 questions – answers (2)

8. **COMT gene regulates dopamine levels, and its deletion can lead to poor dopamine regulation and schizophrenic symptoms.**
9. People with an abnormality in the DISC1 gene are 1.4 times more likely to develop schizophrenia.
10. **GABA regulates neurotransmitters like glutamate and dopamine in the limbic system.**
11. Genes create vulnerability, but other factors trigger schizophrenia.
12. **Psychological stress, such as harsh parenting (the 'refrigerator mother').**
13. The definition of "stress" has broadened to include factors like cannabis use.
14. **Cannabis use increases the risk of schizophrenia by up to seven times.**
15. Cannabis use interferes with the dopamine system and is a risk factor for schizophrenia.

# Quick A03 questions (1)

1. **Who conducted research on concordance rates for schizophrenia among twins?**
2. **What is the concordance rate for MZ twins in Irving Gottesman and James Shields' study?**
3. **What is the concordance rate for DZ twins in Irving Gottesman and James Shields' study?**
4. What does a higher concordance rate for MZ twins compared to DZ twins suggest about schizophrenia?
5. **What caution should be exercised when interpreting results from MZ/DZ twin studies?**
6. What does Carsten Pedersen and Preben Mortensen's research suggest about the relationship between city life and schizophrenia?
7. **How can environmental risk factors influence the development of schizophrenia in genetically predisposed individuals?**



# Quick A03 questions (1)

8. Which gene is associated with presynaptic dopamine dysregulation in schizophrenia, according to Tarik Dahoun et al. (2017)?
9. How does Michael Egan et al. (2001) link the COMT gene to schizophrenia risk?
10. What does the inheritance of two copies of the Val allele from both parents signify for schizophrenia risk, according to Michael Egan et al. (2001)?
11. How has the genetic approach to schizophrenia been used to inform genetic counseling?
12. What does "recurrence risk" refer to in the context of genetic counseling for schizophrenia?
13. How does Pekka Tienari et al.'s (1994) adoption study support the diathesis-stress model?
14. What is epigenetics, and how can it influence the expression of genetic vulnerabilities for schizophrenia?
15. How did the Dutch Hunger Winter relate to the development of schizophrenia, as reported by Ezra Susser and Shang Lin (1992)?

# Quick A03 questions – answers (1)

1. **Gottesman conducted research on concordance rates for schizophrenia among twins.**
2. The concordance rate for MZ twins in Gottesman and Shields' study is 42%.
3. **The concordance rate for DZ twins in Gottesman and Shields' study is 9%.**
4. A higher concordance rate for MZ twins compared to DZ twins suggests that genetics play a significant role in schizophrenia.
5. **Caution should be exercised when interpreting results from MZ/DZ twin studies because MZ twins share more DNA and are treated more similarly, and shared environment may also contribute to similarity.**
6. Pedersen and Mortensen's research suggests that the longer a person is exposed to city life and the denser the population, the greater the risk of developing schizophrenia.
7. **Environmental risk factors can affect genetically predisposed individuals by increasing their susceptibility to schizophrenia.**

# Quick A03 questions – answers (2)

8. **DISC1 is associated with presynaptic dopamine dysregulation in schizophrenia, according to Dahoun et al. (2017).**
9. Egan et al. (2001) link the COMT gene to schizophrenia risk through decreased dopamine activity in the prefrontal cortex.
10. **Inheriting two copies of the Val allele (one from each parent) increases the risk of schizophrenia by 50%, according to Egan et al. (2001).**
11. The genetic approach to schizophrenia has been used to inform genetic counselling.
12. **"Recurrence risk" refers to the likelihood of schizophrenia recurring in a family based on genetic factors.**
13. Tienari et al.'s (1994) adoption study supports the diathesis-stress model by showing that adopted children with biological mothers diagnosed with schizophrenia are more sensitive to family dysfunction.
14. **Epigenetics is the understanding of how genes are turned on and off by environmental changes (stressors), which can activate genetic vulnerabilities due to environmental events.**
15. The Dutch Hunger Winter led to low birth weight babies, who were twice as likely to develop schizophrenia when they grew up, as reported by Susser and Lin (1992).