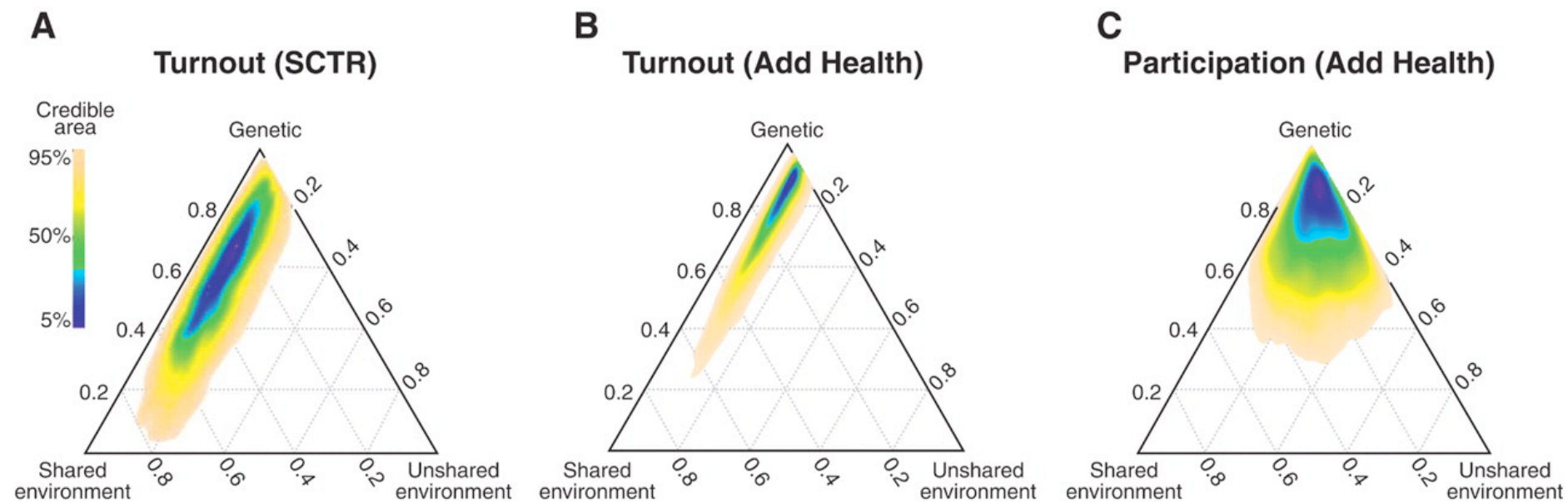# The CHRNA6 gene, patience, and voter turnout

Peter Loewen (Toronto)
Christopher Dawes (UCSD)

Road Map

- Behaviour genetics, *genopolitics*

- Patience and voter turnout

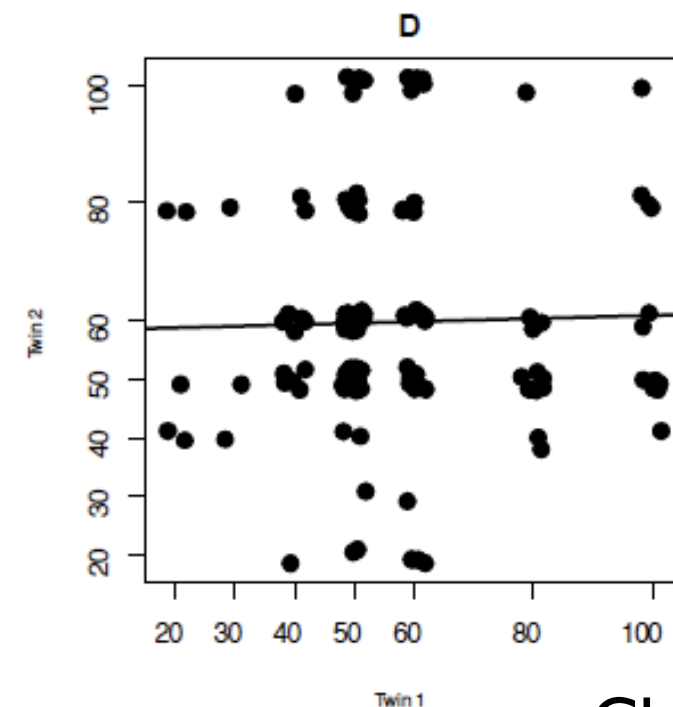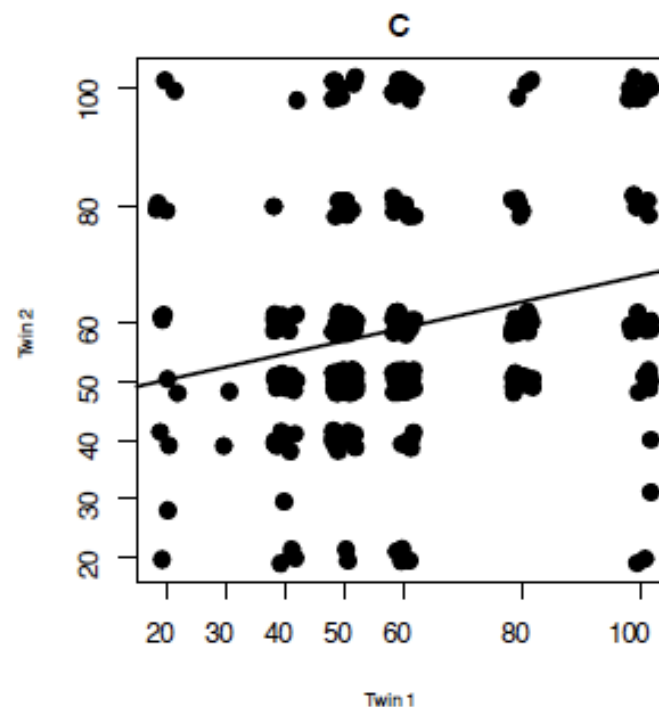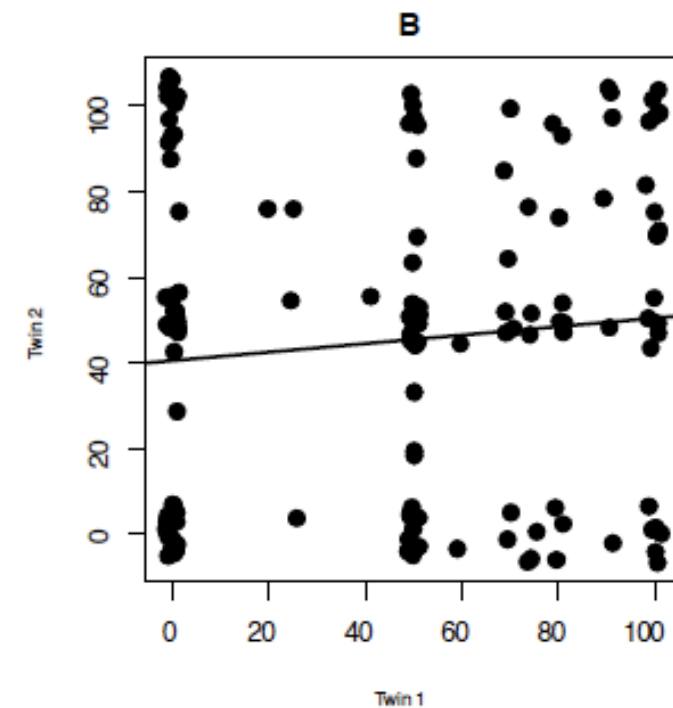- CHRNB3 and CHRNA6

- Results
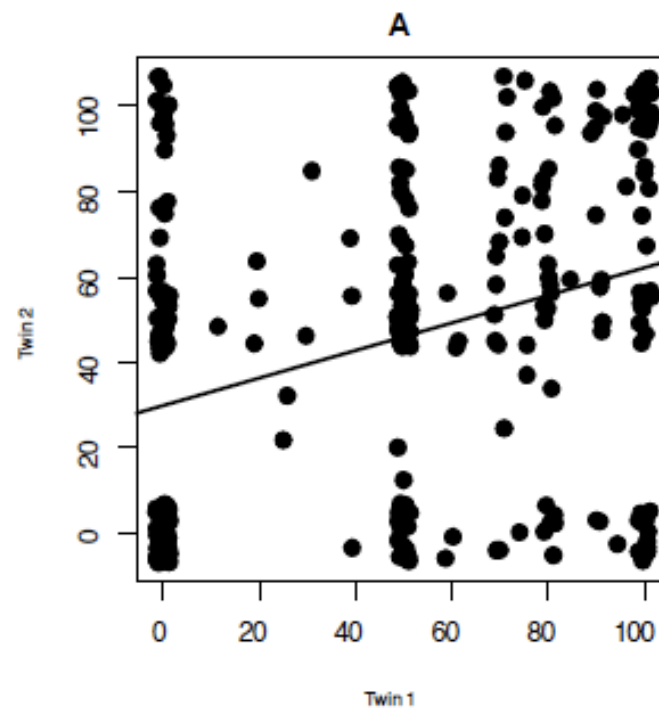
Evidence from twin studies

Fowler, Baker and Dawes. 2008. "Genetic Variation in Political Participation." *APSR*.

CHRNA6

Evidence from twin studies

Cesarini et al. 2008. "Genetic Variation in Preferences for Giving and Risk-Taking." *Quarterly Journal of Economics.*

Panel A: DG, MZ.
Panel B: DG, DZ.
Panel C: Risk Aver., MZ
Panel D: Risk Aver., DZ

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CHRNA6

Evidence from twin studies

a) TRUST (SWEDEN)

b) TRUST (USA)

c) TRUSTWORTHINESS (SWEDEN)

d) TRUSTWORTHINESS (USA)
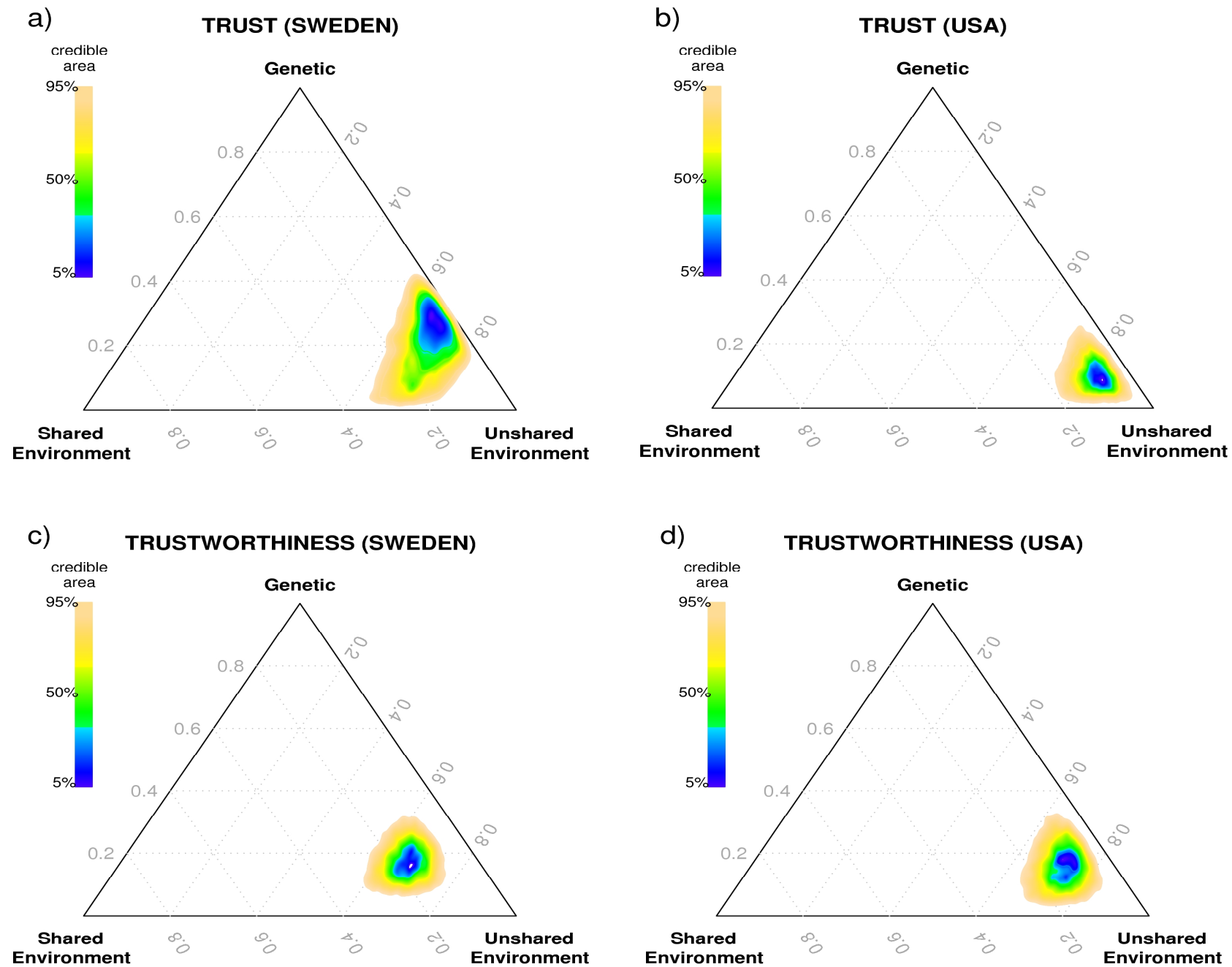
Cesarini et al. 2008. "Heritability of cooperative behavior in the trust game." *PNAS*.

web.me.com/peej.loewen

CHRNA6

Evidence from twin studies
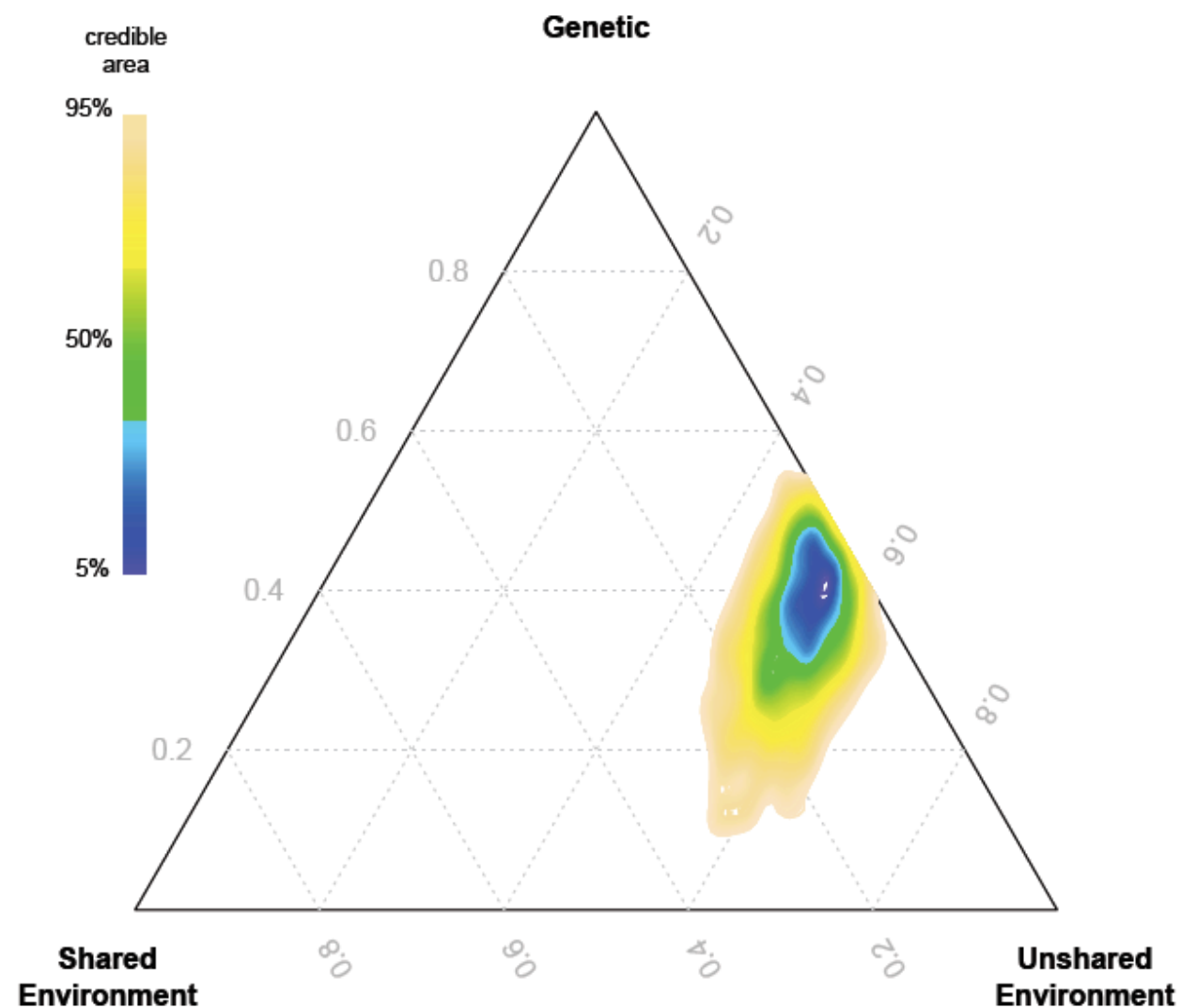
Loewen and Dawes. "The heritability of duty and voter turnout."
R and R, *Political Psychology*

CHRNA6

Evidence from gene association studies
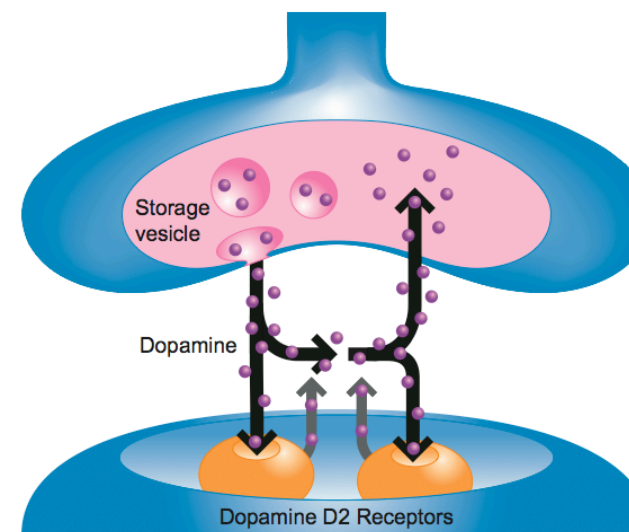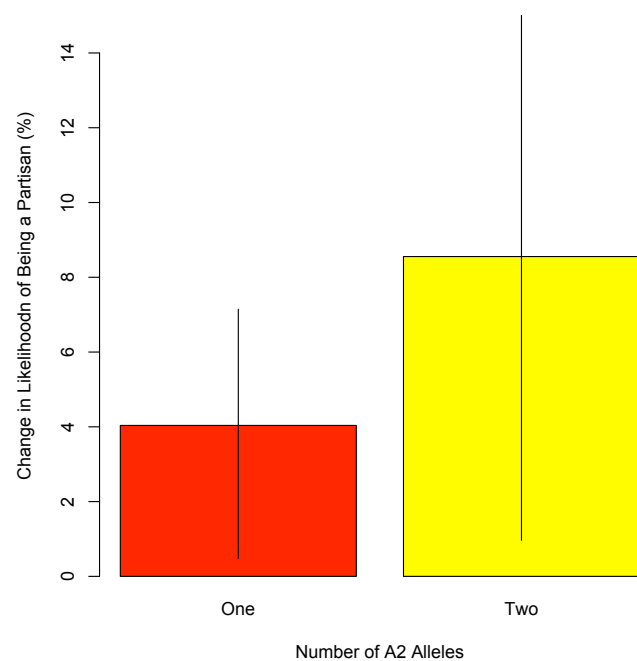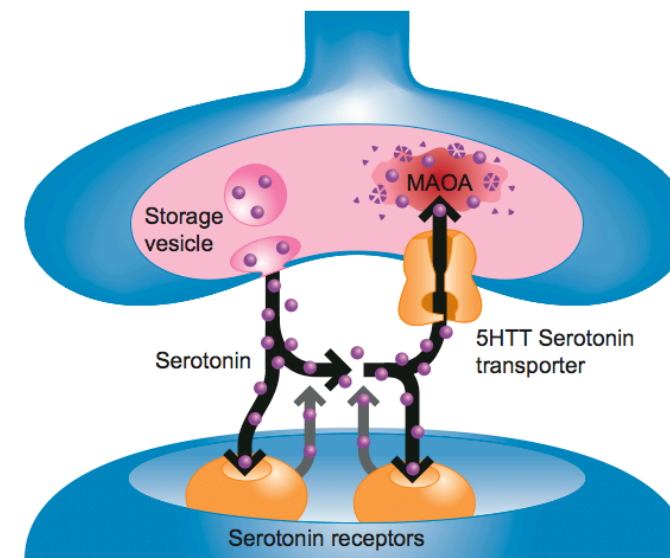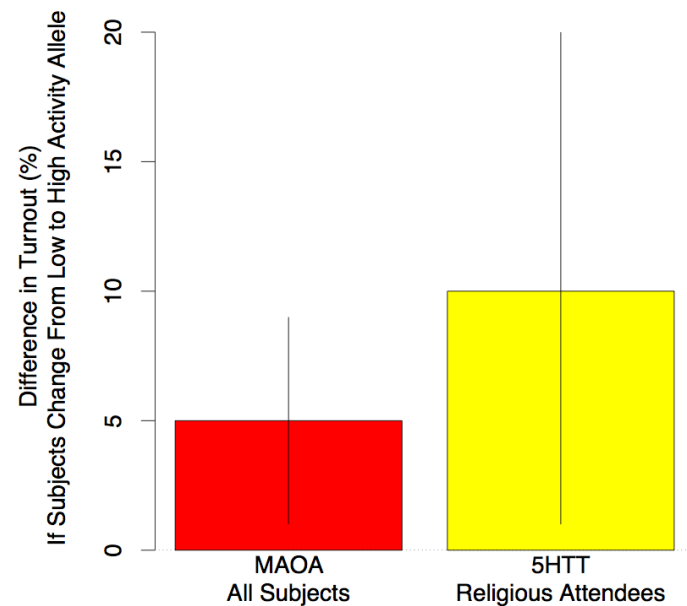
Fowler and Dawes. 2008. "Two Genes Predict Voter Turnout." *JOP.*
Dawes and Fowler. 2009. "Partisanship, Voting, & the Dopamine D2 Receptor Gene." *JOP.*

CHRNA6

CHRNA, Patience and Turnout

- Patience and turnout

- CHRNB3 and CHRNA6

- Results

Saturday, October 2, 2010

The Role of Patience

- The traditional calculus of voting does not take account of time.

- We vote today, but the benefits come later.

- Smaller discount factors should lead to higher turnout.

- This applies to expressive voting with equal felicity.

The Role of Patience
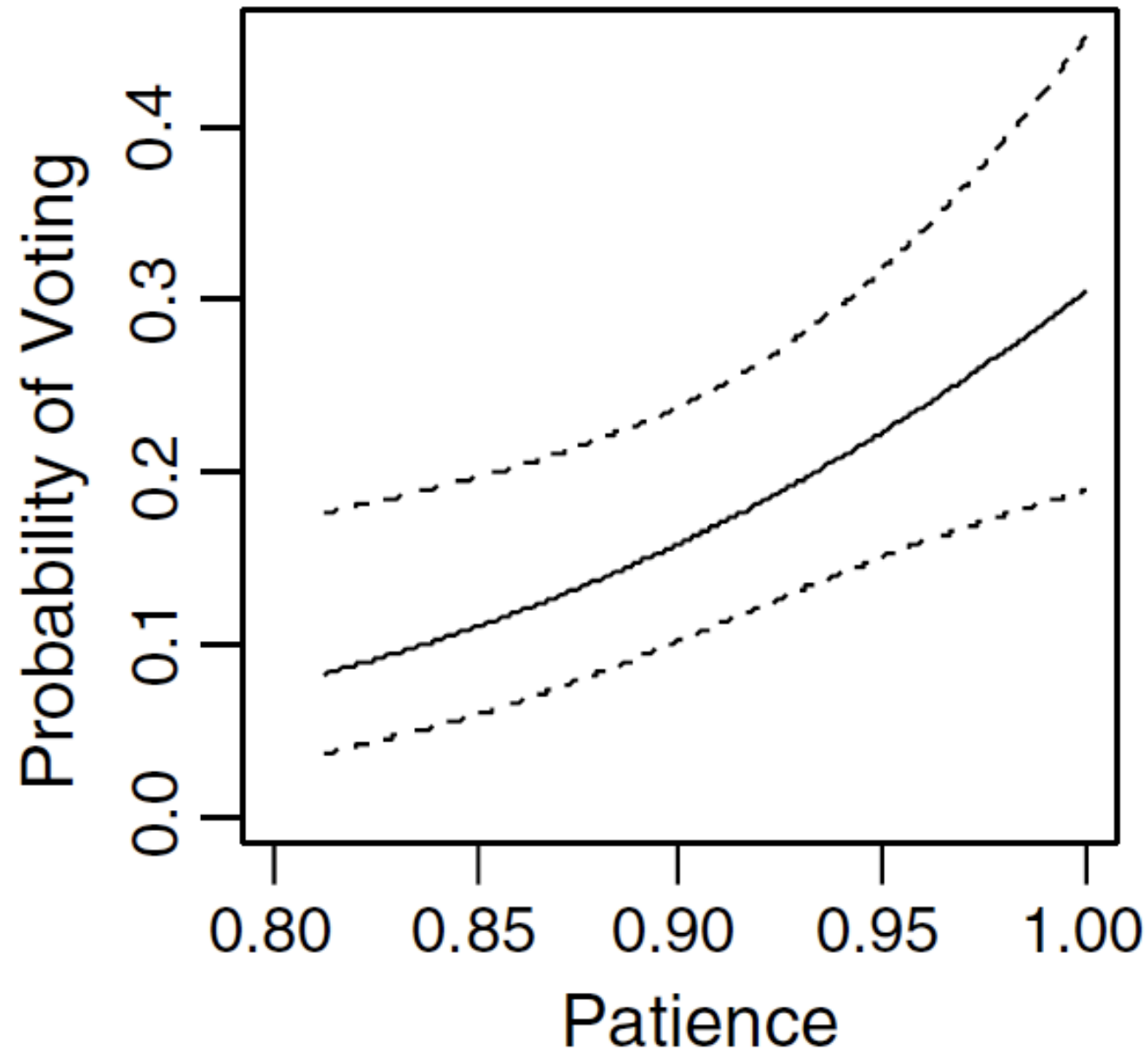
Fowler and Kam. 2006. "Patience as a Political Virtue: Delayed Gratification and Turnout." *Political Behavior.*

CHRNA6

CHRNA

- Nicotine acetycholine receptors (nAChRs)

- Implicated in neurotransmission on the sending side.

- Two subunits (in CHRNA6 and CHRNB3) influence the release of dopamine.

- Dopamine has been related to behaviour in delay discounting tasks (Cui et al 2008)

- CHRNA6 and CHRNB3 have been shown to be related to nicotine initiation and dependence (e.g. Lie et al 2005) and alcohol abuse (Hoft et al 2009).

- In turn, these behaviours are related to delay discounting behaviour.

- Note, finally, the central role of dopamine in regulating (social) behaviour.

CHRNA

Four SNPs
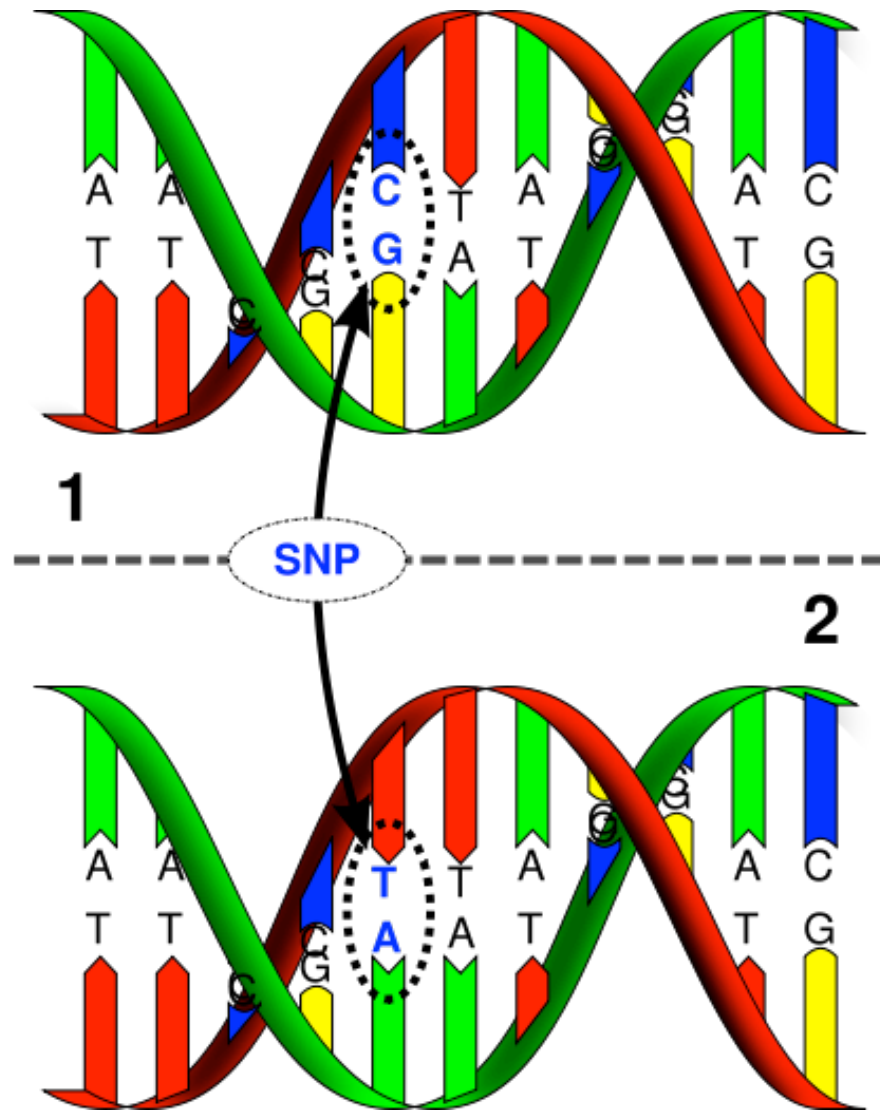
CHRNA6:
rs2304297 (G)
rs892413 (G)

CHRNB3:
rs4950 (C)
rs13280604 (G)

	0	1	2
SNP1	0.46	0.39	0.15
SNP2	0.51	0.36	0.13
SNP3	0.48	0.38	0.14
SNP4	0.49	0.35	0.16

Data

- Add Health

- Limited genetic sample

- 2574 respondents in the third wave of the study.

- 18-26 years old.

- Surveyed in 2001 or 2002.

- DV: Voting in the 2000 Presidential election.

Results

$$logit(P[Y_{ij} = 1 | Z_{ij}, U_j]) = \beta_0 + \beta_X X_{ij} + \beta_Z Z_{ij} + U_j$$

Table 2: Association between CHRNA6 and CHRNB3 SNPs and Turnout

	SNP1 OR	SNP1 p	SNP2 OR	SNP2 p	SNP3 OR	SNP3 p	SNP4 OR	SNP4 p	SNP1 (whites) OR	SNP1 (whites) p
SNP1: G	**0.79**	**0.01**							**0.73**	**0.01**
SNP2: C			0.84	0.04						
SNP3: C					0.88	0.11	0.89	0.15		
SNP4: G	1.13	0.00	1.12	0.00	1.11	0.00	1.13	0.15		
Age	1.07	0.51	1.03	0.78	1.06	0.55	1.08	0.46	1.10	0.01
Male	1.07	0.51	1.03	0.78	1.06	0.55	1.08	0.46	1.20	0.16
Black	2.06	0.00	1.86	0.00	1.66	0.00	1.77	0.00		
Asian	0.73	0.16	0.82	0.37	0.86	0.48	0.78	0.27		
Native American	0.87	0.71	0.84	0.64	0.78	0.49	0.90	0.77		
Hispanic	0.83	0.30	0.81	0.22	0.78	0.15	0.80	0.19		
N	2117		2193		2175		2068		1340	
LL	-1425		-1478		-1472		-1399		-904	
LL (constant)	-1443		-1493		-1484		-1415		-911	

Table 2: Models of association between CHRNA6 and CHRNB3 SNPs and voter turnout. All results are expressed in odds ratios (OR). The model is a mixed-effects logit which estimates a random intercept for each family (not shown).
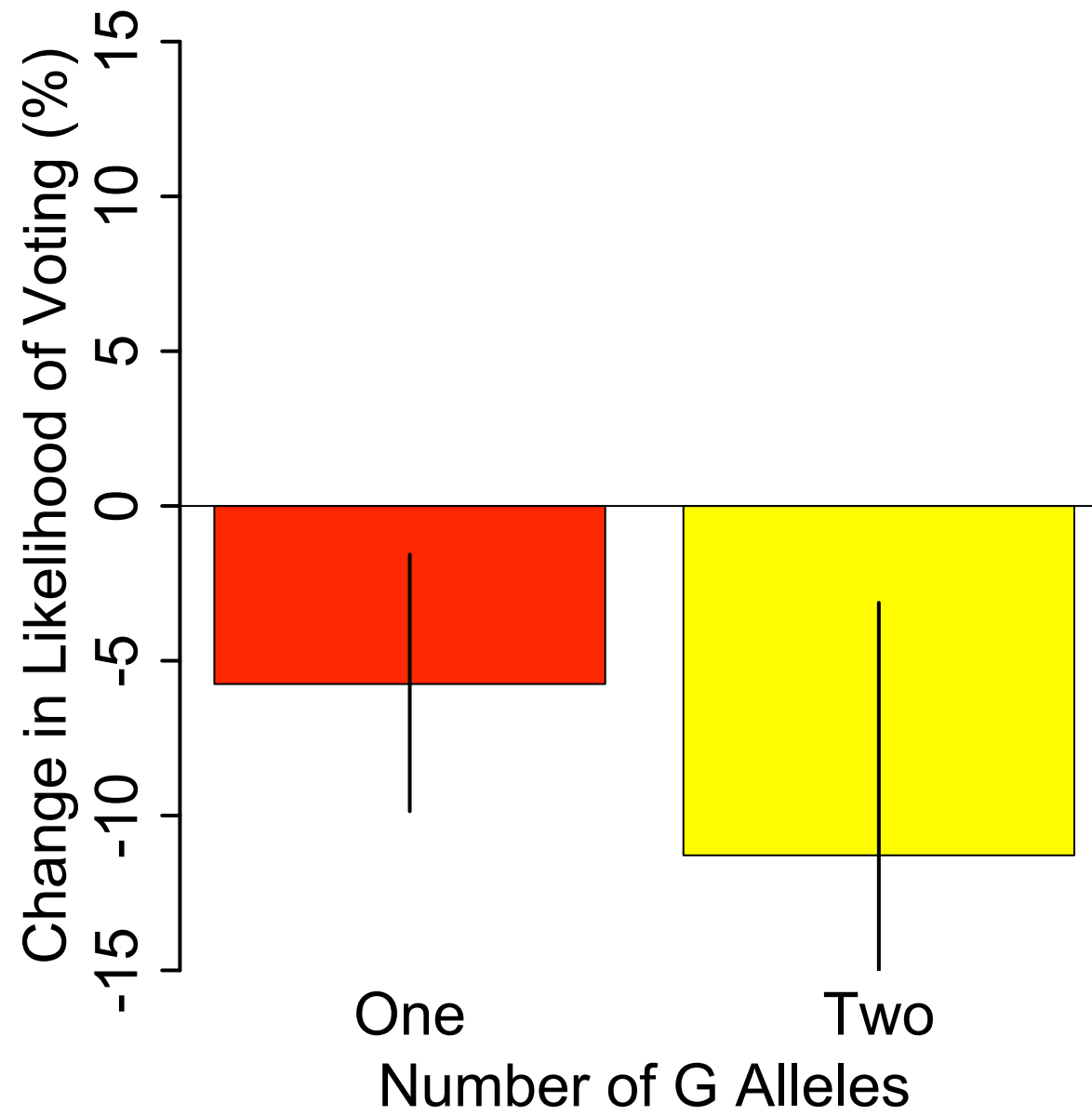
CHRNA6

Results

Replication

- 400 adults, principally in California

- *Imputed* SNP, where the measure is the "dosage" of CHRNA6.

- Control for age, gender, and ethnicity.

Replication results

Table 4: Model of association between CHRNA6 and voting in replication sample

	SNP1	
	OR	p value
rs2304297	0.54	0.00
MDS	0.01	0.38
Age	1.08	0.00
Male	0.61	0.05
N	400	
LL	-661.57	
LL(constant)	-725.41	

Table 4: Model of association between CHRNA6 and voting in replication sample. The model is a mixed-effects ordered logit regression which estimates a random intercept for each family (not shown).

Conclusions

- Voting may be an act of the patient.

- We can link genes to political behaviour through behavioural mediators/mechanisms.

- Next steps include risk, trust, inequality aversion, and strategic inference.

- Genes are the institutions of the human body.

Thanks

Chris Dawes

James Fowler

Jaime Settle

CHRNA6

Results

	Retrospective Logit	
	OR	P value
Vote	0.62	0.03
Age	1.07	0.34
Male	0.85	0.48
Intercept	0.23	0.33
N		328
LL		441
$LL(constant)$		446

Table 3: Family-based test of association between CHRNA6 and turnout. The model is a mixed-effects logit which estimates a random intercept for each family (not shown). The dichotomous dependent variable is whether or not the kth allele ($k = 1, 2$) is an G allele [G allele = 1, G allele = 0]. Odds ratios (OR) are presented. Detailed variable descriptions are provided in the appendix.

CHRNA6