

**Prevalence and Genetic-
Environmental Etiology of
Symptoms of Disruptive
Behavior Problems in Early
Childhood: A Singleton-
Twin Study**

The Quebec Newborn Twin Study

- 647 pairs of twins
- 222 MZ pairs (sharing 100% of their genes),
425 DZ pairs (sharing 50% of their genes)
- Selected from birth records
- From all twins born in the province of Quebec
between June 95-January 98
- Recruited in 7 administrative health districts of
greater Montreal, Laurentians, de Lanaudière
and Montérégie regions

Hyperactivity Symptoms in the Singleton and Twin Samples

		Singletons	Twins
Can't stay put, moves all the time	Never	32.8%	39.7%
	Sometimes	46.0%	44.5%
	Often	21.1%	15.7%
Squirms and wiggles	Never	30.3%	40.6%
	Sometimes	37.2%	37.0%
	Often	32.5%	22.4%

Inattention Symptoms in the Singleton and Twin Samples

		Singletons	Twins
Can't concentrate	Never	57.7%	59.6%
	Sometimes	35.6%	35.2%
	Often	6.7%	5.2%
Is inattentive	Never	64.6%	60.4%
	Sometimes	33.4%	37.3%
	Often	2.0%	2.2%
Quits a talk easily	Never	58.9%	52.3%
	Sometimes	34.1%	38.1%
	Often	7.0%	9.5%

Aggression Symptoms in the Singleton and Twin Samples

		Singletons	Twins
Physically attacks others	Never	81.9%	70.6%
	Sometimes	16.6%	25.6%
	Often	1.5%	3.8%
Is rough with other children	Never	93.9%	86.9%
	Sometimes	5.6%	11.7%
	Often	.5%	1.4%
Slaps/hits others with fists	Never	54.7%	71.9%
	Sometimes	40.6%	23.7%
	Often	4.7%	4.3%

Hyperactivity

3 classes

L-squared = 31.7789 (.4778)

		Low	Medium	High
		.3799	.4549	.1651
Can't stay put, moves all the time	Never	.8233	.1753	.0247
	Sometimes	.1705	.7845	.1476
	Often	.0063	.0402	.8277
Squirms and wiggles	Never	.8004	.2163	.0243
	Sometimes	.1451	.6653	.0715
	Often	.0545	.1185	.9042
Can't concentrate for + few minutes	Never	.9613	.3736	.0974
	Sometimes	.0308	.5879	.4115
	Often	.008	.0384	.4911

Hyperactivity

All twins	Low	Medium	High	
	<i>.2577</i>	<i>.0554</i>	<i>.0376</i>	<i>.3507</i>
	<i>.0554</i>	<i>.3397</i>	<i>.0676</i>	<i>.4627</i>
	<i>.0376</i>	<i>.0676</i>	<i>.0815</i>	<i>.1867</i>

Hyperactivity

DZ twins	1	2	3	
1	.2252	.0699	.0556	.3507
2	.0699	.3092	.0835	.4626
3	.0556	.0835	.0475	.1866

MZ twins	1	2	3	
1	.3109	.0316	.0082	.3507
2	.0316	.3894	.0416	.4626
3	.0082	.0416	.1368	.1866

	DZ	MZ
Kappa	.3344	.7407
s.e. kappa	.0413	.0416

Inattention

2 classes

L-squared = 46.3443 (.1952)

		Low	High
		.5336	.4664
Can't concentrate	Never	.8871	.2619
	Sometimes	.1129	.626
	Often	0	.112
Quits a task easily	Never	.6996	.3219
	Sometimes	.2419	.5403
	Often	.0585	.1378
Is inattentive	Never	.8693	.2997
	Sometimes	.1166	.6682

Inattention

All twins	Low	High	
Low	.4279	.1082	.5368
High	.1089	.3543	.4632

Inattention

DZ twins	1	2	
1	.4205	.1164	.5369
2	.1164	.3468	.4632
MZ twins	1	2	
1	.4205	.0989	.5369
2	.0989	.3642	.4631
		DZ	MZ
	Kappa	.532	.6021
	s.e. kappa	.0475	.0569

Aggression

3 classes

L-squared = 29.8964 (.5734)

		Low	Medium	High
		.7123	.2642	.0235
Physically attacks others	Never	.9127	.2127	0
	Sometimes	.0854	.7383	0
	Often	.002	.049	1
Treats others roughly	Never	.9973	.5827	.2148
	Sometimes	.0027	.4101	.2904
	Often	0	.0072	.4948
Slaps/hits others with fists	Never	.8724	.3602	.0987
	Sometimes	.1188	.5679	.1359
	Often	.0088	.0719	.7654

Aggression

All twins	Low	Medium	High	
Low	.6163	.046	.0187	.681
Medium	.046	.1689	.0099	.2248
High	.0187	.0099	.0655	.0941

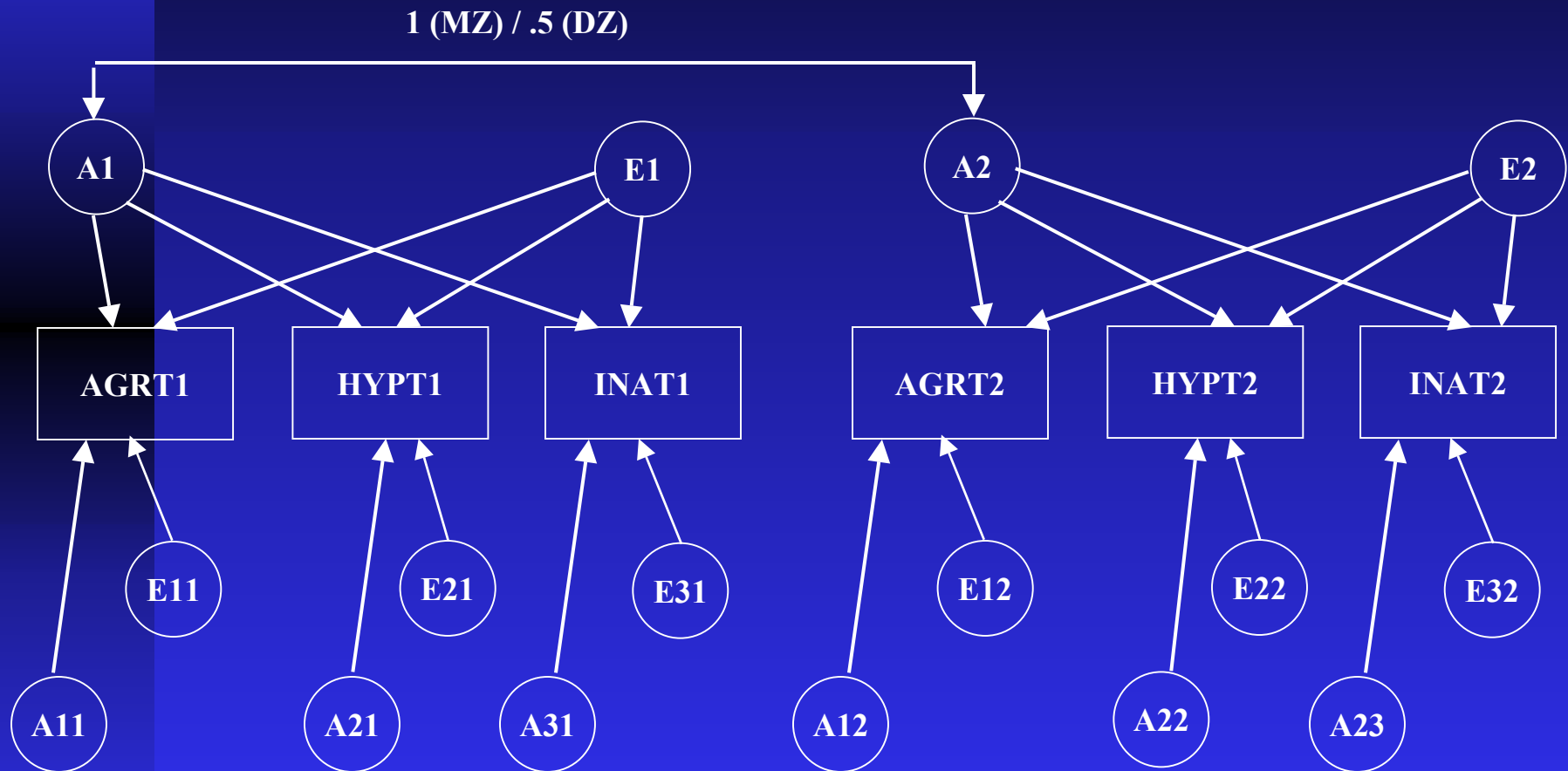
Aggression

DZ twins	1	2	3	
1	.5855	.0721	.0236	.6812
2	.0721	.1517	.0011	.2249
3	.0236	.0011	.0583	.0941

MZ twins	1	2	3	
1	.6709	0	.0102	.6811
2	0	.1993	.0255	.2248
3	.0102	.0255	.0694	.094

	DZ	MZ
Kappa	.5942	.8501
s.e. kappa	.0463	.0361

Best-fitting Multivariate Model



Multivariate analysis

Comparison of fitting genetic and nongenetic multivariate model for behavior problems (aggression, opposition, hyperactivity, inattention) in Females

Model	A	C	E	chi-sq	df	p-value	AIC
ACE				29.8	14	0.0081	1479.0
AGR	0.62	0	0.38				
OPP	0.36	0	0.64				
HYP	0.58	0	0.42				
INA	0.09	0.20	0.71				
AE				31.0	24	0.1538	1460.2
AGR	0.62	-	0.38				
OPP	0.36	-	0.64				
HYP	0.58	-	0.42				
INA	0.32	-	0.68				
CE				41.4	24	0.0151	1470.6
AGR	-	0.51	0.49				
OPP	-	0.31	0.69				
HYP	-	0.45	0.55				
INA	-	0.29	0.71				

Multivariate analysis

Genetic additive correlation in AE model

	AGR	OPP	HYP	INA
AGR				
OPP	0.54			
HYP	0.37	0.58		
INA	0	0.37	0.63	

Multivariate analysis

Comparison of fitting genetic and nongenetic multivariate model for the behaviors (aggression, opposition, hyperactivity, inattention) in Males.

Model	A	C	E	chi-sq	df	p-value	AIC
ACE				24.7	14	0.0376	1422.3
AGR	0.46	0	0.54				
OPP	0.66	0	0.34				
HYP	0.61	0	0.39				
INA	0.47	0	0.53				
AE				24.7	24	0.4222	1402.3
AGR	0.46	-	0.54				
OPP	0.66	-	0.34				
HYP	0.61	-	0.39				
INA	0.47	-	0.53				
CE				52.7	24	0.0006	1430.3
AGR	-	0.40	0.60				
OPP	-	0.49	0.51				
HYP	-	0.46	0.54				
INA	-	0.38	0.62				

Multivariate analysis

Genetic additive correlation in AE model

	AGR	OPP	HYP	INA
AGR				
OPP	0.53			
HYP	0	0.39		
INA	0	0.47	0.47	

Conclusion

- Moderate to strong heritability for symptoms of disruptive disorders at 18 months
- No influence of the common environment except for inattention symptoms
- Common genetic factors explain observed comorbidity between aggression, opposition hyperactivity, and inattention symptoms in boys and in girls

Aggression (constrained)

DZ twins	1	2	3	
1	.5855	.0721	.0236	.6812
2	.0721	.1517	.0011	.2249
3	.0236	.0011	.0694	.0941
MZ twins	1	2	3	
1	.6709	0	.0102	.6811
2	0	.1993	.0255	.2248
3	.0102	.0255	.583	.094
		DZ	MZ	
	Kappa	.5942	.8501	
	s.e. kappa	.0463	.0361	

Aggression (unconstrained)

	1	2	3	
1	0,7139	0	0,0129	0,7268
2	0	0,1178	0,027	0,1448
3	0,0129	0,027	0,0884	0,1283
	1	2	3	
1	0,5561	0,076	0,0211	0,6532
2	0,076	0,1857	0,0001	0,2618
3	0,0211	0,0001	0,0637	0,0849

chi-sq	dl	p
8,9171	2	0,01157914