


**Lea Pulkkinen**

**Genetic and environmental factors in adolescent behavior**



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**Longitudinal Study of Health and Behavior in Twin Children**  
*FinnTwin12-17*

Principal Investigator  
Professor Richard J. Rose  
Indiana University, Bloomington, USA

Co-Principal Investigators  
Professor Lea Pulkkinen  
University of Jyväskylä, Finland

Professor Jaakko Kaprio  
Universities of Helsinki and Oulu, Finland

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*FinnTwin12*

**Participants**

Epidemiological study

- ❖ Five consecutive and complete birth cohorts of Finnish twin children (b. 1983 – 1987)
- ❖ 31 % MZ, 64 % DZ

Intensive sub-study (about 40% of each cohort)

- ❖ Half of the sub-sample is selected at random; this random sample is then enriched with twins at elevated familial risk for alcoholism

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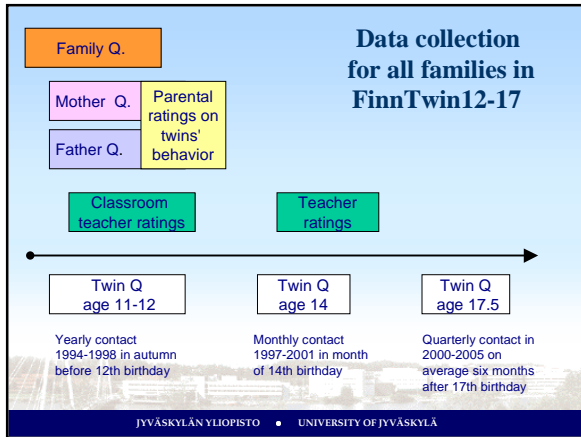
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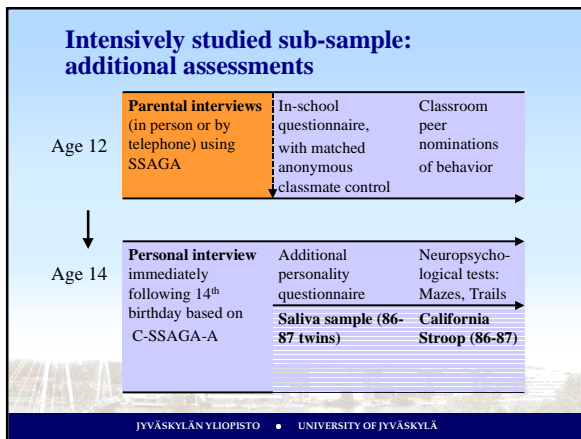
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### Data collection FinnTwin12-17

Birth cohort	11-12 yrs	14 yrs	17½ yrs	Families:
1983	1994	1997	2000	N = 600
1984	1995	1998	2001	N = 549
1985	1996	1999	2002	N = 565
1986	1997	2000	2003	N = 503
1987	1998	2001	2004	N = 498
				<b>N = 2715</b>

<b>Epidemiological study:</b>	Twin inventories Teacher rating Parental rating & inventories	Twin inventories Teacher rating	Twin inventories
<b>Intensive study (40 % twins)</b>	Peer nomination Twin inventories Parental interview	Twin interview, inventories & psychological tests	

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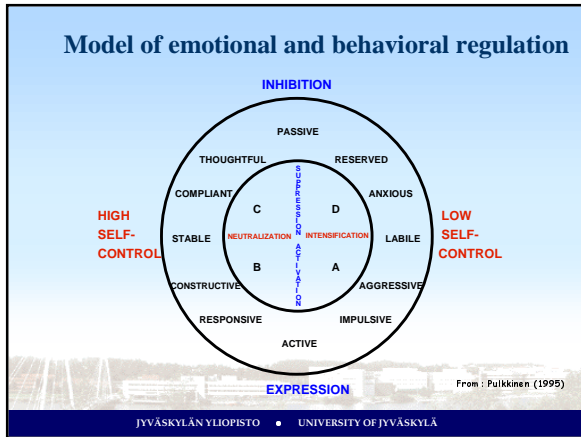
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### Peer Nominations of Twins and Their Classmates Compared

Peer Nomination Scales	Females		Males	
	F	Post hoc	F	Post hoc
Externalizing problem behaviors (F1)	2.20		0.77	
Hyperactivity-impulsivity	2.56		0.40	
Aggression	2.14		0.48	
Inattention	2.37		1.33	
Internalizing problem behaviors (F2)	0.22		1.69	
Depressive symptoms	0.33		2.76 <sup>c</sup>	S.OSDZ>SSDZ
Social anxiety	0.20		0.89	
Adaptive behaviors (F3)	9.79 <sup>a</sup>	OSDZ>S,MZ,SSDZ	5.45 <sup>a</sup>	OSDZ>S
Constructive behavior	9.03 <sup>a</sup>	OSDZ>S	4.98	OSDZ>S,MZ,SSDZ
Compliant behavior	3.67 <sup>c</sup>	OSDZ>S	2.90 <sup>c</sup>	OSDZ>SSDZ
Socially active behavior	10.54 <sup>a</sup>	OSDZ>S,MZ,SSDZ	7.98 <sup>a</sup>	OSDZ,SSDZ>S

Note: <sup>a</sup>p<.001; <sup>b</sup>p<.01; <sup>c</sup>p<.05

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### Alcohol use in adolescence

Variable	A	C	E
Females (95% CI)	0.18 (0.10-0.29)	0.76 (0.68-0.83)	0.06 (0.02-0.10)
Males (95% CI)	- set to zero	0.76 (0.68-0.83)	0.24 (0.17-0.32)

A = additive genetic effect  
C = shared environment  
E = specific environment

(Rose et al., 2001)

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**Likelihood of drinking at age 14**  
**Results of Logistical Regression**

	OR	95 %	CI
Female	1.68	1.34	2.10
Opposite sex	1.26	1.01	1.58
Pubertal Development	1.50	1.34	1.66
Lowest Parental Monitoring	3.13	2.05	4.77
Poor Home Atmosphere	1.72	1.30	2.29
High Behavioral Problems	2.56	1.85	3.53
High Emotional Problems	0.64	0.47	0.86

(Rose et al., 2001)

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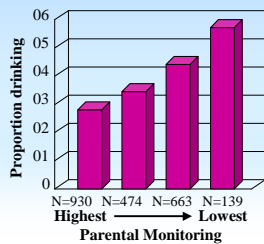
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**Likelihood of drinking at age 14**  
**Results of Logistical Regression**

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(Rose et al., 2001)

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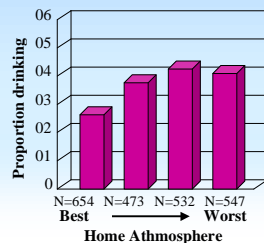
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(Rose et al., 2001)

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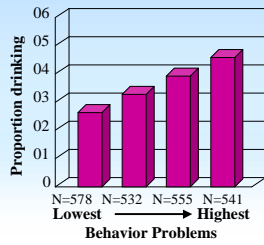
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(Rose et al., 2001)

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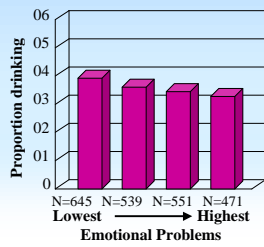
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(Rose et al., 2001)

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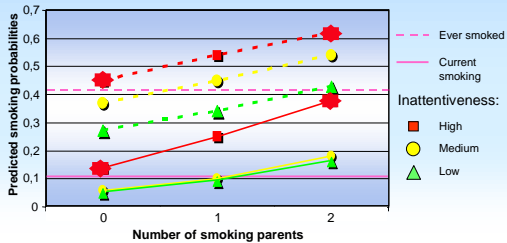
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### Adolescents' inattentiveness and smoking in the context of parental smoking

Satu Barman



(Barman, Pulkkinen, Kaprio, & Rose, resubmitted)

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### Children of smoking parents

What protects these children from smoking?

	OR (95% CI) for daily smoking
Parental monitoring	0.18 (0.10–0.34)***
Unjust atmosphere	1.71 (1.06–2.74)*

*Adjusting for age 12 smoking experimentation:*

	OR (95% CI) for daily smoking
Age 12 smoking	24.6 (5.33–113.50)***
Parental monitoring	0.21 (0.08–0.60)**
Unjust atmosphere	2.43 (0.89–6.64) ns.

*Adjusted for family type (single parent vs. two parent families) and child gender. Corrected for the clustered twin design.*

(Barman, Pulkinen, Kaprio, & Rose, in preparation)

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### Elina Vierikko

#### Bivariate Cholesky decomposition model of genetic and environmental continuity and change

Note. A is correlated ( $r_A$ ) 1.0 for MZ, 0.5 for DZ twins; C is correlated ( $r_C$ ) 1.0 for both MZ and DZ twins; A=C is fitted, and thus correlated only for the same-sex male twin pairs (thus not depicted here) 1.0 for MZ, 0.5/1.0 for DZ twins.

Vierikko, Pulkinen, Kaprio, & Rose (submitted for publication)

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### Aggression at ages 12 and 14

Group	Age	Additive genetic effects (%)	Common environment (%)	Sex-specific common environment (%)	Unique environment (%)
Boys	Age 12	~25	~15	~10	~50
Boys	Age 14	~45	~5	~5	~45
Girls	Age 12	~70	~10	~10	~10
Girls	Age 14	~40	~10	~10	~40

Vierikko, Pulkinen, Kaprio, & Rose (submitted for publication)

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### Genetic and environmental factors in continuity of aggression from age 12 to 14

Genetic and environmental correlations

	rA	rC	rE	rC'
Boys	.40 (.17-.58)	-	-	1.00 (1.00-1.00)
Girls	-	1.00 (1.00-1.00)	.18 (.06-.31)	-

Vierikko, Pulkkinen, Kaprio, & Rose (submitted for publication)

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### Genetic and environmental factors in the correlation between aggression and hyperactivity-impulsivity

Genetic and environmental correlations

	rA	rC	rE	rC'
Boys	.70 (.63-.76)	1.00 (1.00-1.00)	.59 (.53-.64)	.81 (.73-.89)
Girls	.70 (.63-.76)	.69 (.53-.80)	.59 (.53-.64)	-

Vierikko, Pulkkinen, Kaprio, & Rose (in press)

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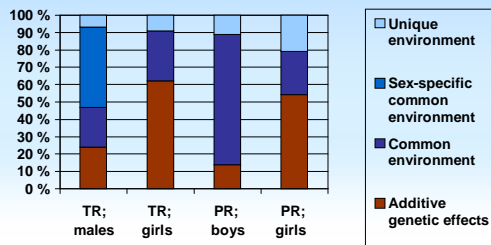
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### Genetic and environmental effects on teacher- and parent-rated aggression



Vierikko, Pulkkinen, Kaprio, Viken, & Rose (2003)

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### Parameter Estimates for Effects on Depression

	Males			Females		
	A	C	E	A	C	E
Teacher	.28	.39	.34	.42	.39	.20
	Males/Females					
	A	C	E			
Parent	.43	.19	.38			
Peers	.71	0	.29			
CDI	.45	0	.55			

(Happonen et al., 2003)

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### Correlations

	Peer nomination			Teacher			Parent		
	OSDZ	SSDZ	MZ	OSDZ	SSDZ	MZ	OSDZ	SSDZ	MZ
Aggression	.33	.51	.76	.46	.59	.82	.53	.55	.74
Depression	.42	.39	.77	.49	.54	.57	.36	.42	.43
Adaptation	.42	.37	.79	.44	.60	.82	.37	.46	.83

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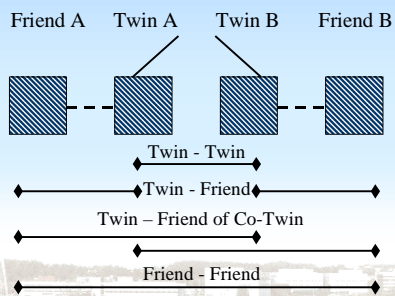
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### Friendship associations of twins




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