

Initial Conditions, Ability, Personality Development and School Outcome: New Evidence from MARS

Dorothea Blomeyer, Katja Coneus, Manfred Laucht and
Friedhelm Pfeiffer

ZEW and ZI Mannheim

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Motivation

Why the Mannheim Longitudinal Study of Children at Risk (MARS = **M**annheimer **R**isikokinder **S**tudie) for economic research?

- Longitudinal data from early childhood to adolescence
- Initial conditions (birth weight, neonatal complications), cognitive (verbal IQ, nonverbal IQ) and non-cognitive abilities (persistence, autonomy)
- Psychological test batteries for measuring abilities
- Intertemporal relationship between abilities and social outcomes (school track, grades, mental health)

Motivation

Main results:

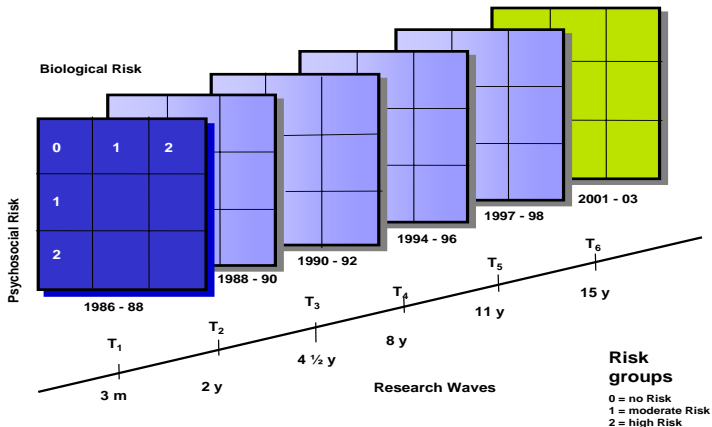
- Higher cognitive and non-cognitive abilities in t-1 increase cognitive and non-cognitive abilities in t
- Higher cognitive abilities foster non-cognitive abilities and vice versa
- Differences in cognitive abilities seem to remain stable at the age of 2 years, while differences in non-cognitive abilities manifest at the age of 8 years
- High cognitive and non-cognitive abilities increase the probability of attending the highest secondary school track by 24 %
- Low educational level of the parents at birth is related to a 19 % reduction in the probability of attending "Gymnasium"

MARS Design

- Children born between February 1986 and February 1988 from Rhine-Neckar Region Germany
- Selection based on the degree of "organic" risk and the degree of "psychosocial" risk
- Organic risk: pregnancy or delivery complications (LBW)
- Psychosocial risk: family background (low education, early parenthood)
- Aim: Separate independent and combined effects of both risk groups
- Each risk factor was scaled as "no" risk, "moderate" risk and "high" risk
- Children were assigned to one of the nine groups

MARS Design

Figure 1: Design of the Mannheim Study of Children at Risk



MARS Design

Control for confounding effects:

Family environment includes...

- Firstborn children with singleton births
- Children from German speaking parents

Infant medical status excludes...

- Children with severe physical handicaps
- Children with obvious genetic defects
- Children with metabolic diseases

Total sample: 382, working sample: 364

Organic and Psychosocial Risk Factors

Initial Conditions

Table 1: Summary statistics: **initial conditions**

initial conditions	birth weight	gestational weeks means (standard deviations)	LBW	preterm	APGAR 5	neonatal complications
Total	2780.56	37.68	0.32	0.29	9.0	0.21
N= 364	(818.60)	(3.50)	(0.47)	(0.45)	(1.48)	(0.41)
Normative	3071.40**	39.17**	0.15**	0.13**	9.81**	0.06**
N= 107	(607.17)	(2.20)	(0.36)	(0.34)	(0.52)	(0.23)
Boys	2884.28**	37.78	0.30	0.27	9.44	0.20
N= 174	(825.28)	(3.43)	(0.46)	(0.44)	(1.25)	(0.40)
Girls	2685.58**	37.58	0.35	0.30	9.48	0.21
N= 190	(802.89)	(3.57)	(0.48)	(0.46)	(1.05)	(0.41)
Low educational level	2809.09	38.08	0.37	0.23	9.0	0.20
of the parents N= 71	(838.81)	(3.16)	(0.49)	(0.42)	(1.56)	(0.40)
Early parenthood	2858.60	38.09	0.26	0.25	8.94	0.19
N= 93	(771.18)	(3.34)	(0.44)	(0.43)	(1.67)	(0.40)
Psychiatric disorder in	2595.20**	37.39**	0.42**	0.43**	8.41**	0.30**
the parents N=76	(932.65)	(4.12)	(0.50)	(0.50)	(1.98)	(0.46)

T-test of significant differences between subsamples at 5% level.

Cognitive and motor abilities from early childhood to adolescence

Cognitive and motor abilities

- 3 months - 11 years: IQ
- 2 years - 11 years: verbal and nonverbal IQ
- 3 months - 11 years: MQ

Medical and psychological tests:

3 months, 2 years: IQ (MQ): BSID (= Bayley Scales of Infant Development)

4.5, 8 years: V-IQ, NV-IQ: CMMS, CFT1, ITPA subtest

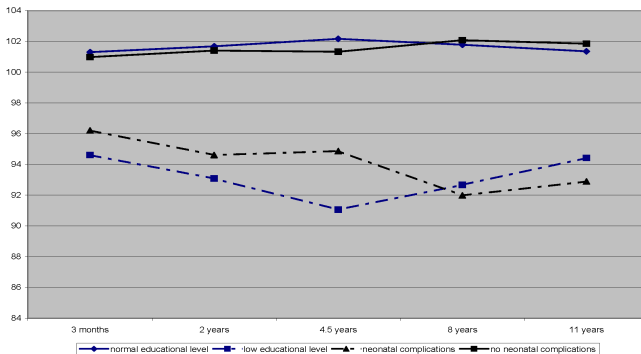
CMMS = Columbia Mental Maturity Scales

CFT1 = Culture Fair Test 1

11 years: V-IQ, NV-IQ: (CFT20), Vocabulary test

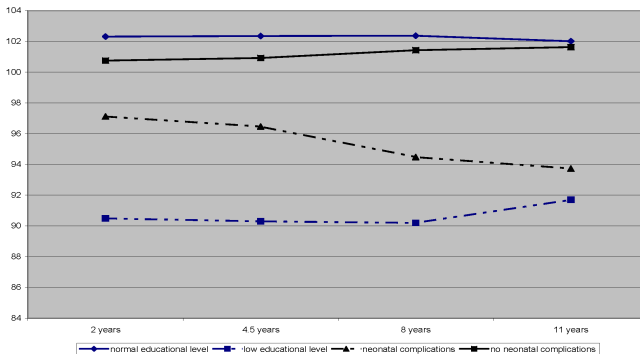
Nonverbal-IQ from early childhood to adolescence

Figure 2: Nonverbal-IQ



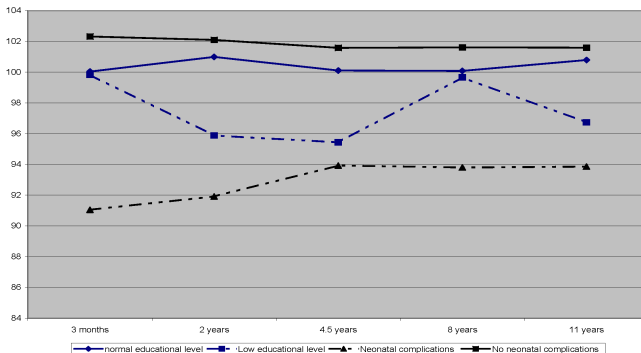
Verbal-IQ from early childhood to adolescence

Figure 3: Verbal-IQ



Motor-IQ from early childhood to adolescence

Figure 4: MQ



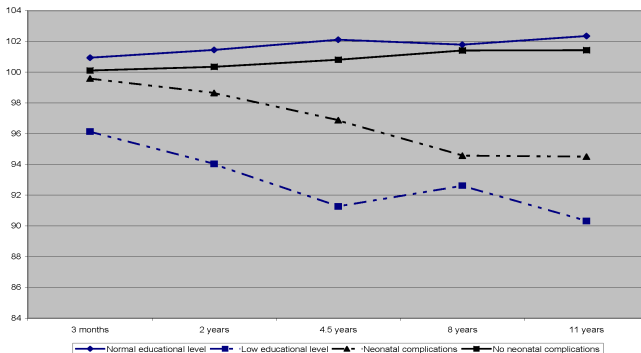
Non-cognitive ability from early childhood to adolescence

Non-cognitive ability: Persistence

- assessed from 3 months- 11 years
- assessment based on standardized parent interview and on structured observations
- in four standardized settings on two different days
- both, familiar (home) and unfamiliar (laboratory) surroundings
- 5-point rating scales

Persistence from early childhood to adolescence

Figure 5: Persistence



Self-productivity and synergies

Table 2: Self-productivity

Abilities in t-1	Abilities in t			
	MQ	V-IQ	NV-IQ	Persistence
3 months				
MQ	0.24*	0.04	0.10*	0.07
IQ	0.05	0.20*	0.18*	0.11*
Persistence	0.13*	0.07	0.12*	-0.08
2 years				
MQ	0.43*	0.02	0.09*	-0.07
V-IQ	0.03	0.61*	0.31*	0.17*
NV-IQ	0.25*	0.17*	0.36*	0.26*
Persistence	0.08*	-0.01	0.02	0.20*
4.5 years				
MQ	0.40*	-0.09*	0.15*	0.07
V-IQ	-0.10	0.53*	0.10*	0.09
NV-IQ	0.27*	0.23*	0.43*	0.26*
Persistence	-0.01	0.05	0.09*	0.40*
8 years				
MQ	0.48*	0.02	0.04	0.01
V-IQ	0.08*	0.42*	0.21*	0.16*
NV-IQ	0.20*	0.34*	0.47*	0.06
Persistence	0.08	0.14*	0.17*	0.51*

MARS, Seemingly unrelated regression results, own calculations, *indicates significance at 10 % level. All models control for initial conditions (low educational level of the parents, psychiatric disorder, early parenthood, LBW, neonatal complication and APGAR).

School outcomes

School track

Table 3: Summary statistic: **school tracking** 15 years

	total	normative	low edu- cation in %	early parent- hood	psychiatric disorder	LBW	neonatal complica- tions
Hauptschule	16.16	13.33	31.43	27.17	21.62	19.13	16.44
Realschule	29.53	28.57	34.29	21.74	33.78	35.65	28.77
Gymnasium	44.85	52.38	14.29	34.78	28.38	31.30	28.77
"Förderschule"	8.08	3.80	18.57	14.13	13.51	12.18	23.29
Waldorfschule	1.39	1.90	1.43	2.17	2.70	1.74	2.74
observations	359	105	70	92	76	118	75

Abilities and initial conditions as predictors of school track

Table 4: Probit results attending **Gymnasium** (marginal effects)

	initial conditions	abilities	initial conditions + abilities
abilities			
IQ (3 months)		-0.002	-.003
MQ (3 months)		0.0004	0.00002
Persistence (3 months, 2 years)		-0.03	-0.03
V-IQ (2-8 years)		0.006**	0.005**
NV-IQ (2-8 years)		0.008***	0.008***
MQ (2-8 years)		0.00003	0.0001
Persistence (4.5-8 years)		0.27***	0.23***
initial conditions			
LBW	-0.15**		-0.08
neonatal complications	-0.10		-0.05
APGAR 5	0.002		0.0008
low educational level	-0.32***		-0.19***
psychiatric disorder	-0.08		-0.01
early parenthood	-0.14**		-0.09
boy	-0.05	0.07	0.06
Observations	357	357	357
Pseudo R^2	0.1296	0.2847	0.3223

MARS (1986-2002). Standard Errors are in parentheses: ***significant at 1% level; **significant at 5% level Own calculations.

Outlook

Further questions:

- Main driving factor for cognitive development between birth and 2 years
- Main driving factor for non-cognitive abilities between between 4-8 years
- Role of parental investments (home score, interventions, kindergarten, eye contact)
- Timing and duration of investments