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Influences on trajectories of internalizing and externalizing problems, and substance use in youths at risk

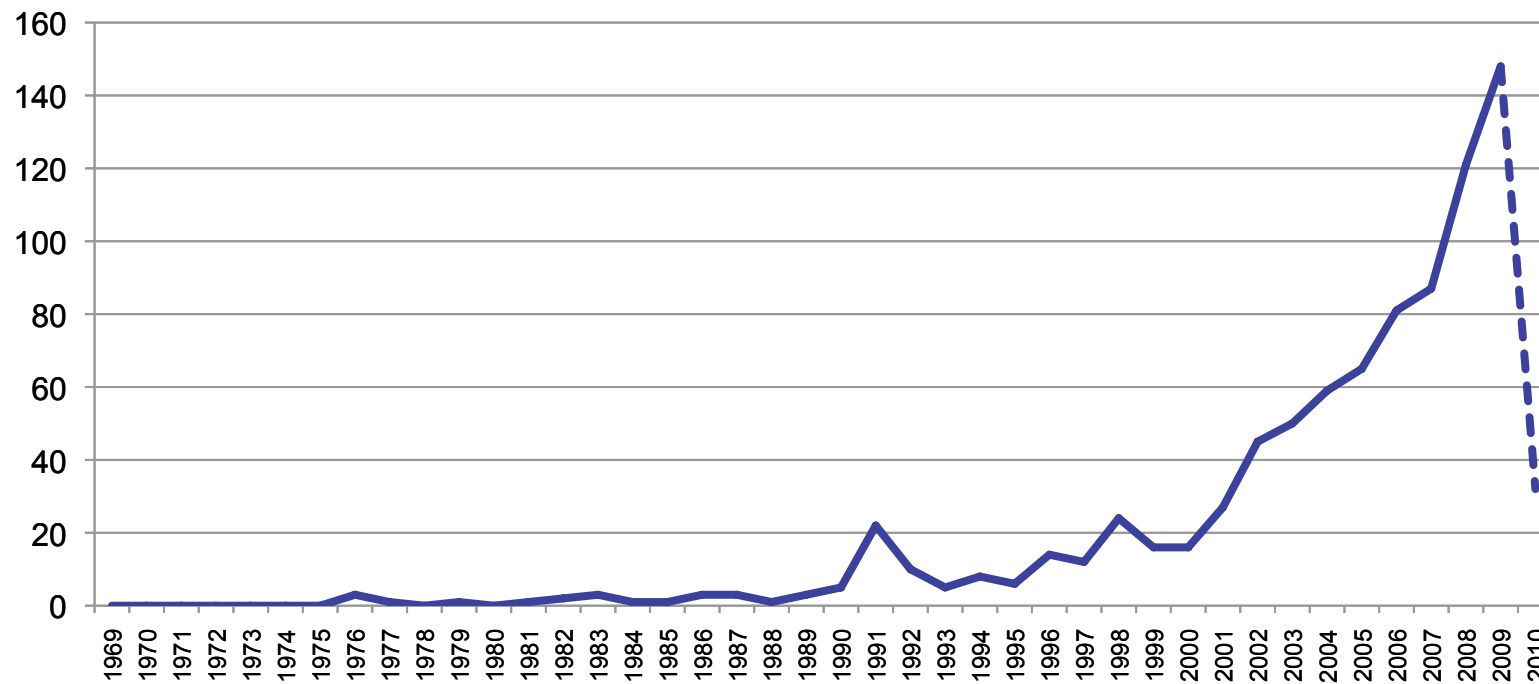
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Trajectories in psychological research

"Trajectories" in PsychINFO





Trajectories of internalizing, externalizing problems and substance use

In publications we often find two types of trajectories:

short term studies

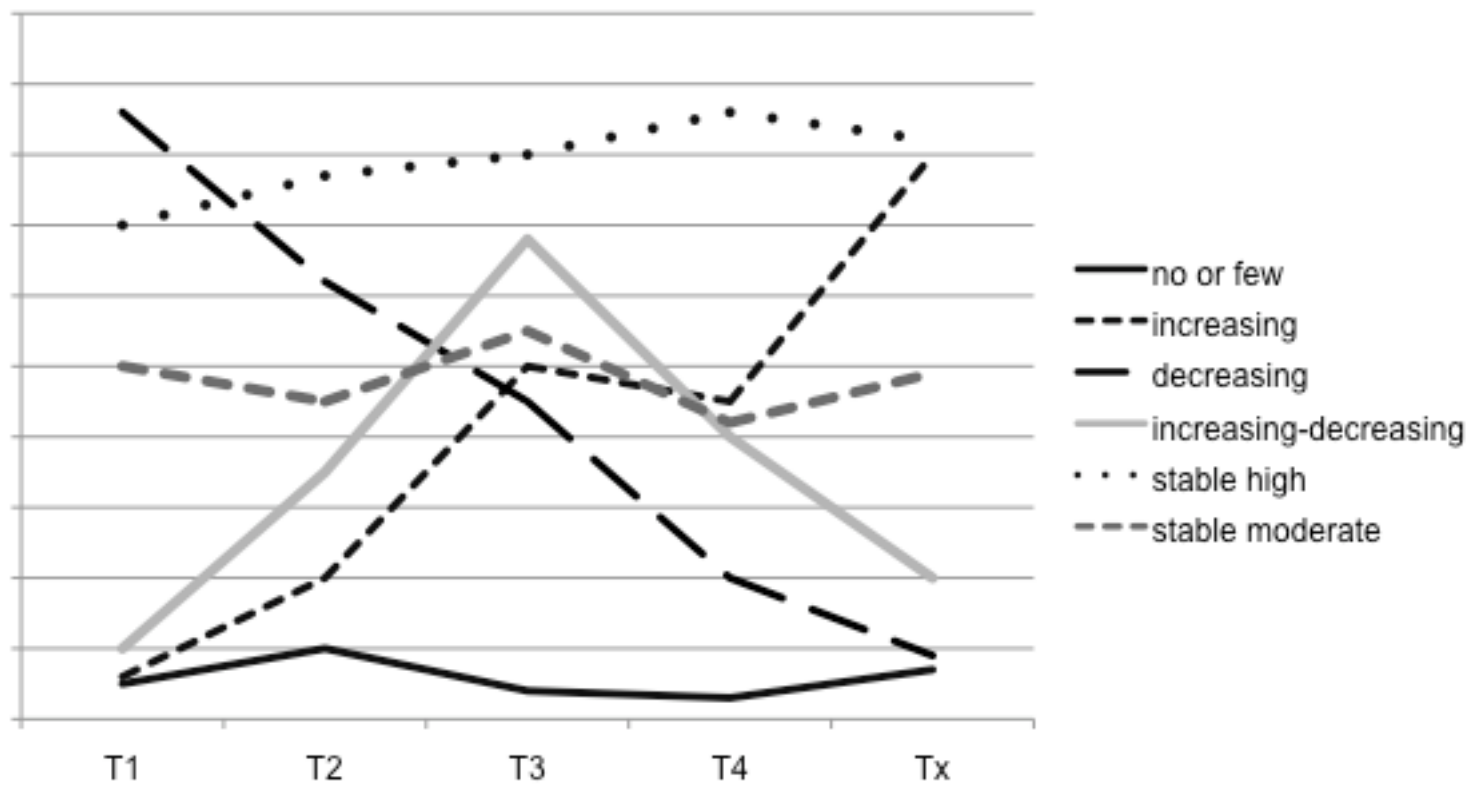
- no or few problems
- increasing problems
- decreasing problems
- increasing-decreasing
- stable (moderate / high) problems
- others / unclassified

long term studies

- abstainers
- adolescence limited
- childhood limited (recoveries)
- adolescence limited
- life course persistent
- others / unclassified



Typical trajectories could look like this:





Trajectories of delinquency / antisocial behaviour

Terrie Moffitt and her collaborators (1993, 1996, 2002) built a theory about the course of delinquency.

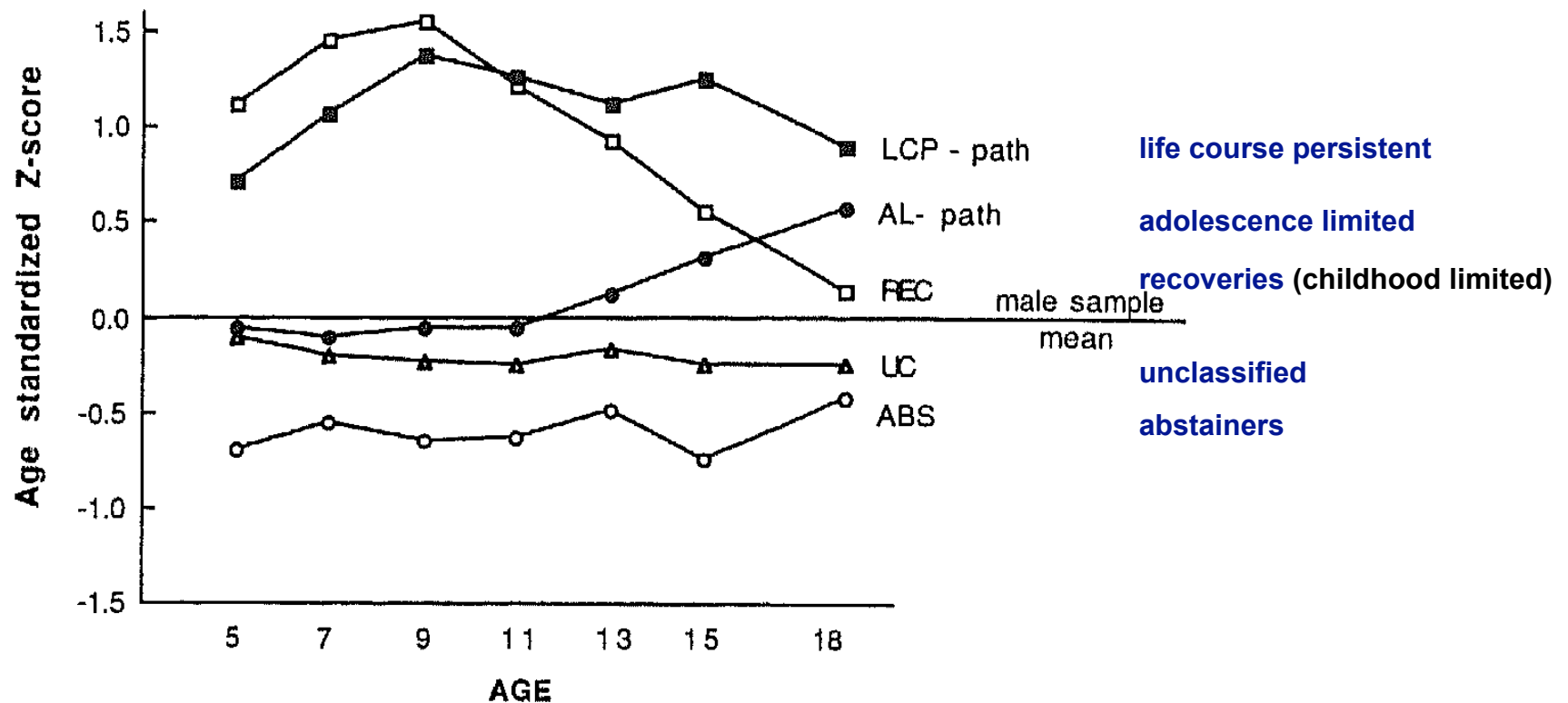
They found five different trajectories:

- childhood limited (recoveries)
- adolescence limited
- life course persistent
- abstainers
- unclassified



Trajectories of delinquency look like this:

Parent Ratings of Antisocial Behavior



source: Moffitt, T.E., Caspi, A., Dickson, N., Silva, P. & Stanton, W. (1996). Childhood onset versus adolescent onset antisocial conduct problems in males: Natural history from ages 3 to 18 years. *Development and Psychopathology*, 8, 399-424.



What have we done?

- a **Latent Class Growth Analysis** MPlus 4.2.1 (Muthen et al., 1998-2006) with a maximum likelihood estimator and missing data imputation. The slopes were modelled linear and quadric. The time lapses were fixed with the average time differences between the measurement points (T1 = 0; T2 = 0.6; T3 = 2; T4 = 4.4 years) The number of trajectories were determined with the Bayesian Information Criteria (BIC) and the Lo-Mendell-Rubin Likelihood-Ratio-Test (Lo et al., 2001) .
- some **Structural Equation Modelling** with AMOS 6 with internalizing, externalizing problems, and substance use with paths
 - from the intercepts to the slopes
 - from T1 variables to the intercepts and the slopes and with five moderators



Variables

scale / item	items	range	type	α	authors
depression (CES-D)	15	0-45	Σ	.89	Hautzinger et al. (1993)
anxiety (STAI; trait)	20	20-80	Σ	.90	Laux et al. (1981)
delinquency	11	0-11	Σ	.81	Loeber et al. (1989); adapted
tobacco use	1	1-6			e.g. Arènes et al. (1998)
alcohol use	5	1-6	Σ	.85	e.g. Arènes et al. (1998)
cannabis use	1	1-5			e.g. Arènes et al. (1998)



T1 variables

scale	items	range	type	α	authors
relationship with parents					
emotional	5	1-4	Ø	.85	Armsden et al. (1987)
cohesion	3	1-4	Ø	.63	Armsden et al. (1987)
conflict	3	1-4	Ø	.77	Armsden et al. (1987); Moos et al. (1986)
problematic peers					
substance using peers	11	1-5	Ø	.89	Hibell et al. (1997)
delinquent peers	3	1-5	Ø	.76	Friedmann et al. (1989)
self-concept					
self-esteem	7	1-4	Ø	.83	Harter (1982)
self-efficacy	10	1-4	Ø	.84	Jerusalem et al. (1992)



Moderators and T1 variables

item / scale

gender	1 = male ; 2 = female
age	1 = 11-15; 2 = 16-20/25
intervention	1 = intervention group (<i>supra-f</i>); 2 = comparison group
language -> culture	1 = german; 2 = french
sociodemographic Background	1 = high; 2 = moderate; 3=low

social background: 10 items concerning living, parents and school / apprenticeship



Sample

N=835	mean age (years)	15.6	
<hr/>			
gender:	- female	32%	
<hr/>			
language:	- french	54%	
	- german	46%	
<hr/>			
sociodemographic background:	- high	45%	
	- moderate	33%	
	- low	22%	
<hr/>			
school, apprenticeship, work:	- integration	76%	
<hr/>			
problems:	- internal	32%	over norm
	- external	37%	over norm
problematic substance use:	- tobacco	38%	more than 5 cigarettes a day
	- alcohol	15%	repeated weekly use
	- cannabis	28%	more than 2 times a week
<hr/>			
general risk:	- no risk	54.3%	
	- moderate risk	22.7%	
	- high risk	23.0%	
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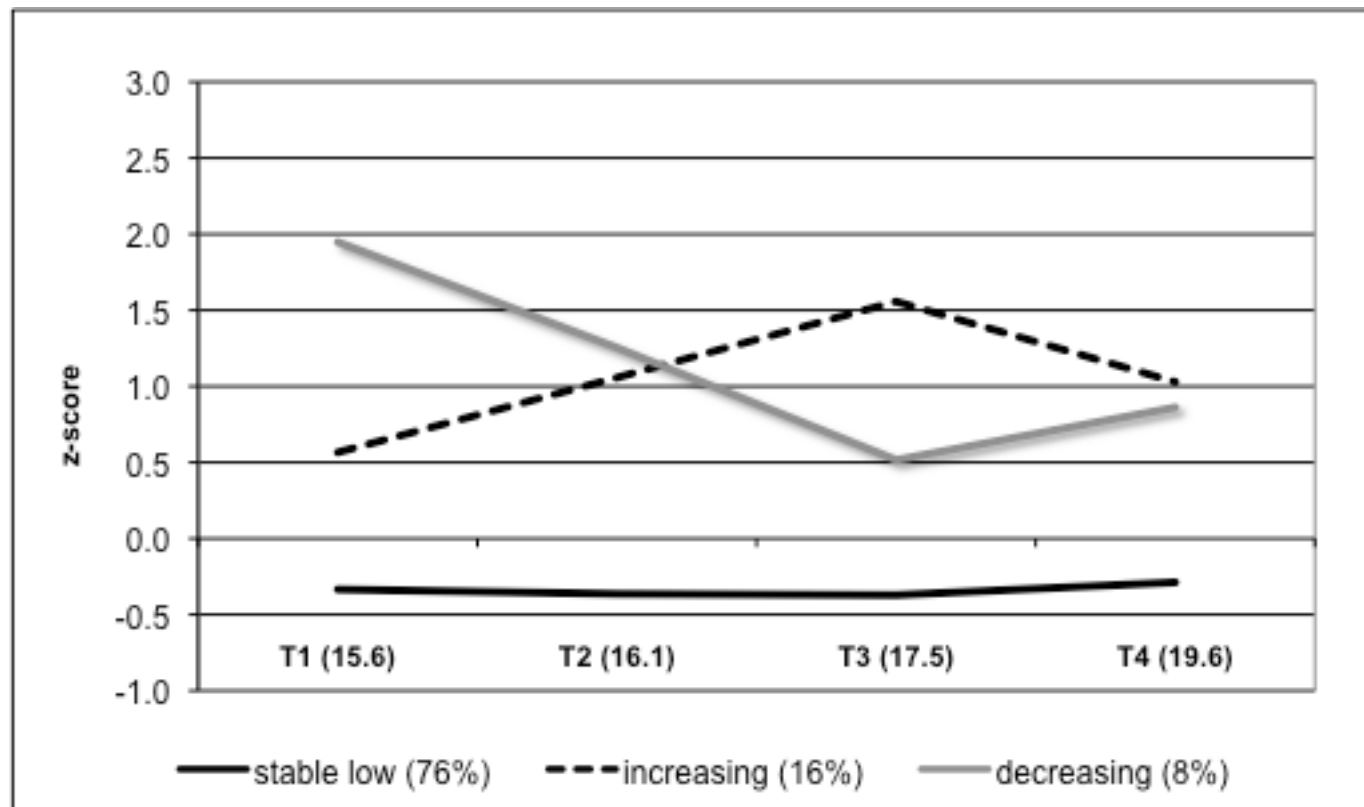


Results

The trajectories

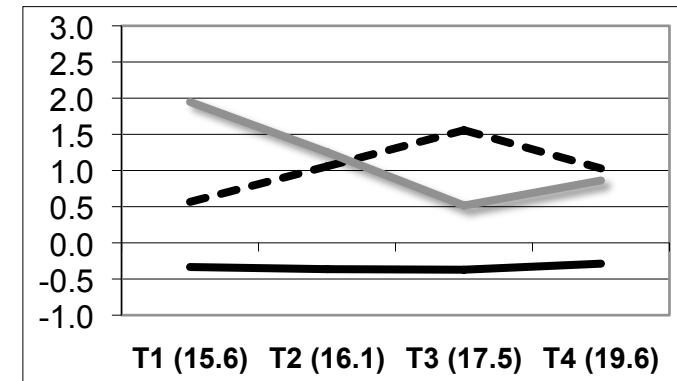


Results: trajectories of internalizing problems (depression, anxiety)





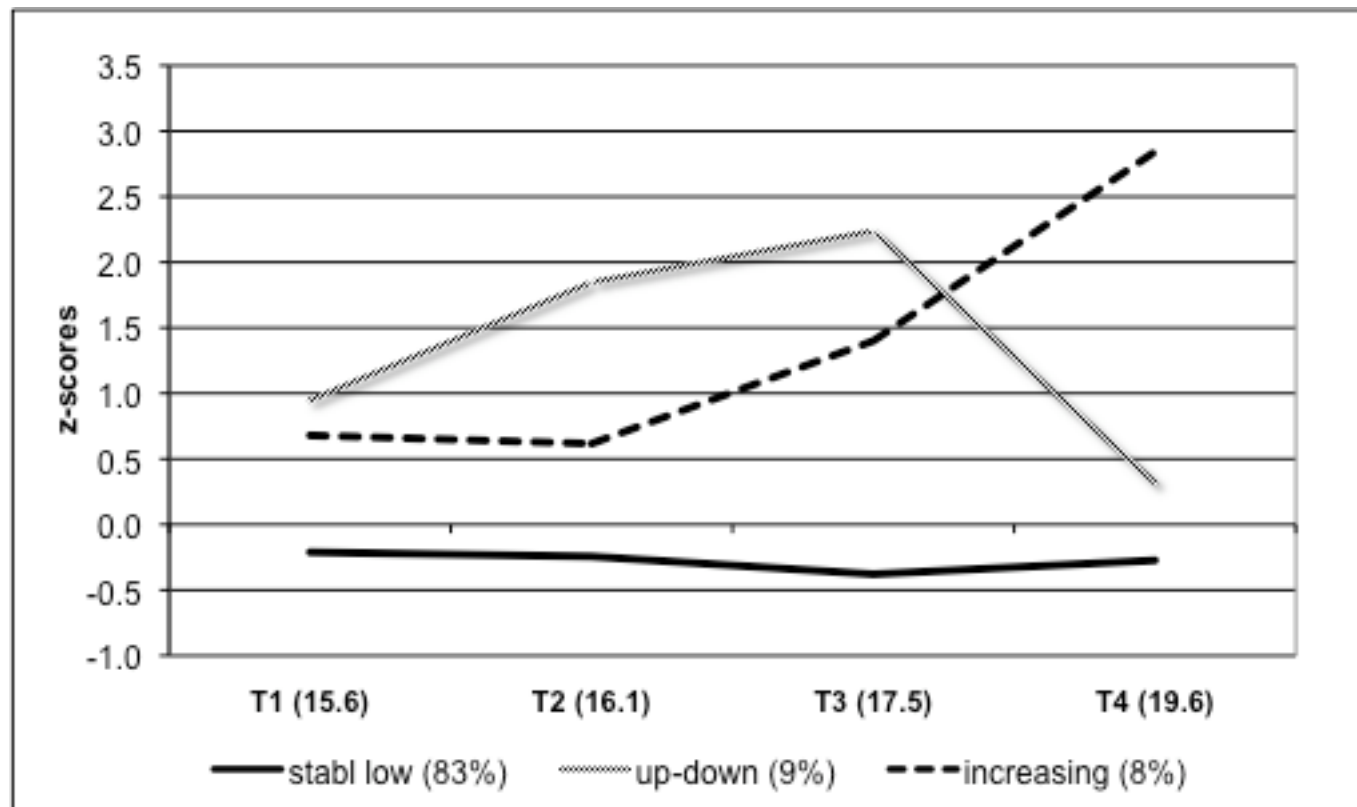
Results: trajectories of internalizing problems (depression, anxiety)



	9 studies	<i>supra-f</i>
	N=20314	N=835
stable low	54%	76%
stable moderate	8%	0%
increasing	11%	16%
decreasing	22%	8%
stable high	6%	0%
	100%	100%

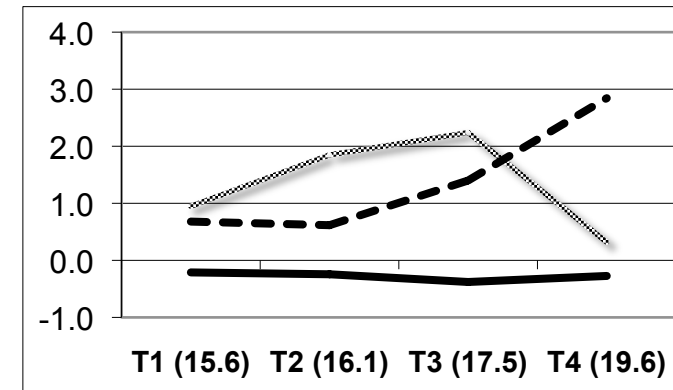


Results: trajectories of externalizing problems (delinquency)





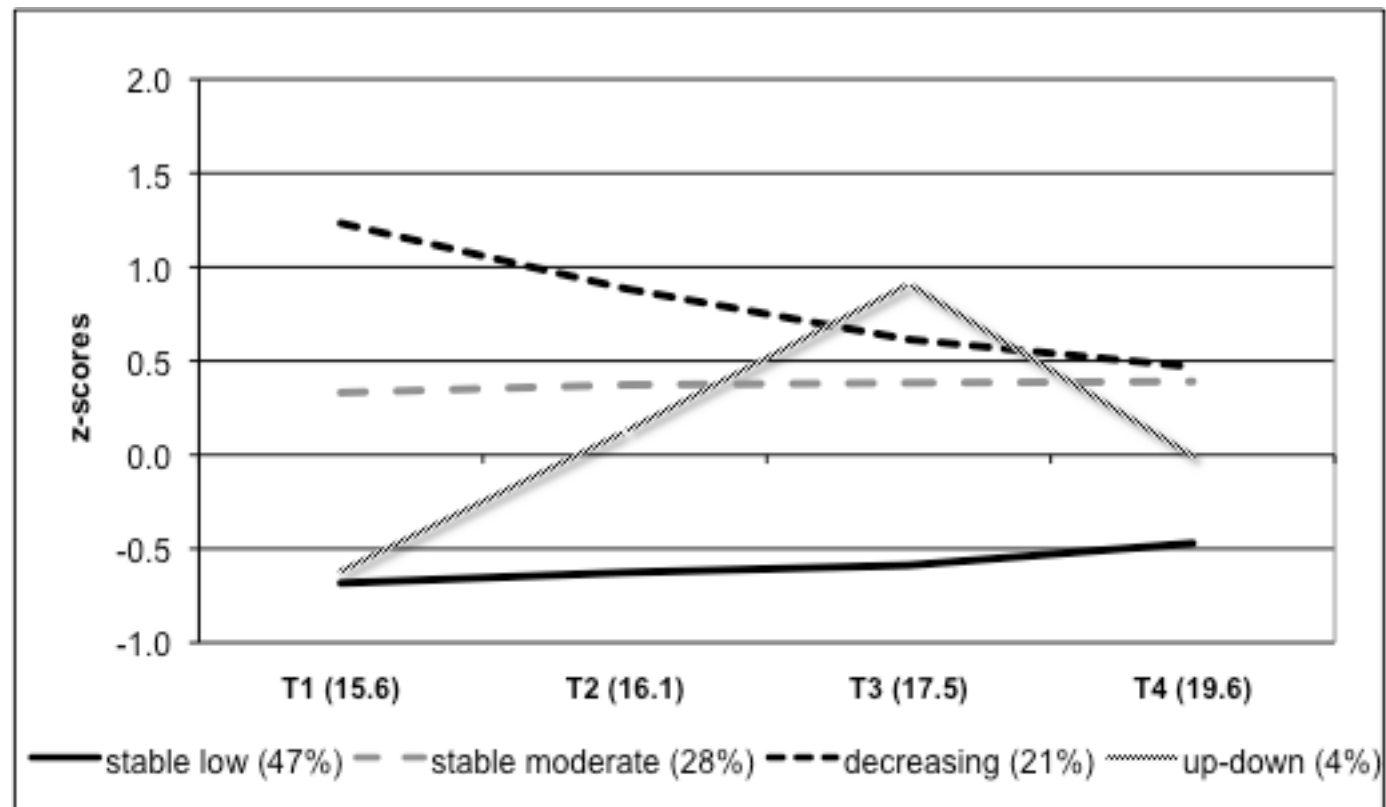
Results: trajectories of externalizing problems (delinquency)



	male 9 studies N=4670	female 7 studies N=3339	<i>supra-f</i> N=835
no or few	53%	71%	83%
increase	8%	7%	8%
increase - decrease	7%	5%	9%
decrease	12%	9%	0%
stable moderate	10%	3%	0%
stable high	10%	5%	0%
	100%	100%	100%

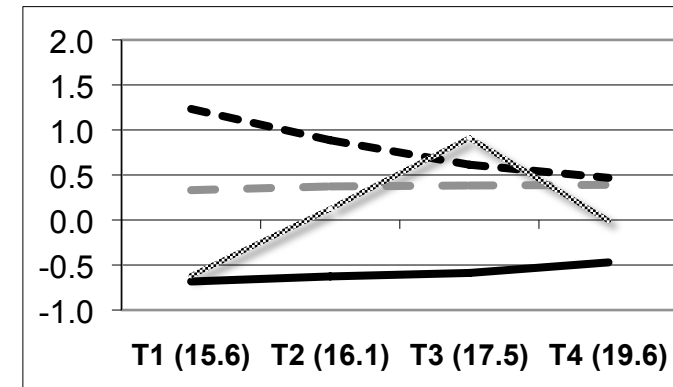


Results: trajectories of substance use (tobacco, alcohol, cannabis)





Results: trajectories of substance use (tobacco, alcohol, cannabis)



	estim. mean N=37991	<i>supra-f</i> N=835
no/low use	56%	47%
experim./unstable	10%	0%
stable moderate	3%	28%
stable high	6%	0%
increasing	17%	0%
decreasing	7%	21%
in- / decreasing	1%	4%
	100%	100%

	tobacco N=16746	alcohol N=7176	cannabis N=14069
	62%	31%	62%
	7%	0%	19%
	0%	14%	0%
	10%	7%	1%
	16%	33%	11%
	5%	15%	4%
	0%	0%	2%
	100%	100%	100%



Some Critics on Latent Class Growth Analysis

- **sample dependence:**
 - depending on sample characteristics there results an other number and an other structure of trajectories
 - a stable high by youth at-risk has not the same significance as a stable high in a normal population
- rare and specially extremely **rare trajectories** can not be found



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Results

The model



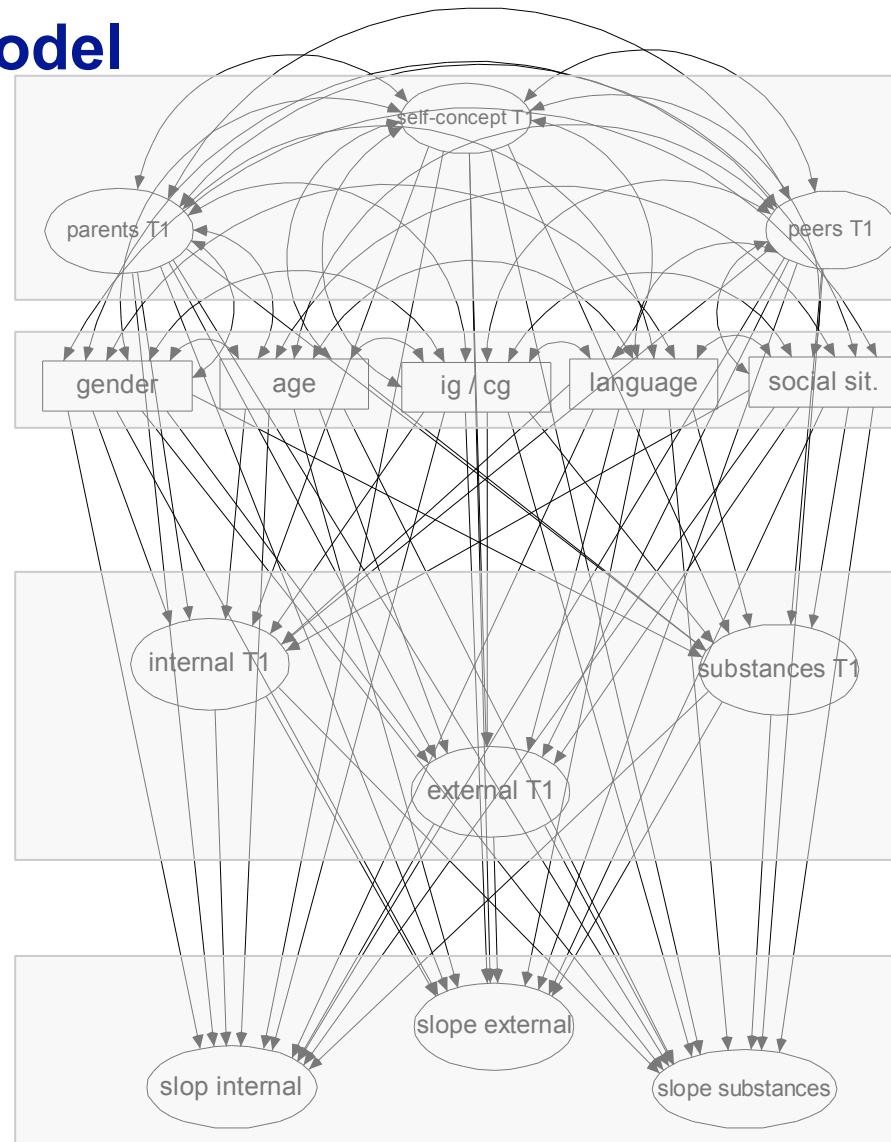
Method: the model

influences

influences /
moderators

intercepts

slopes



- Relationship with parents
- Problematic peers
- Self-concept

- Gender
- Age
- Intervention – comparison
- Language
- Social background

- Internalizing problems
 - depression
 - anxiety
- Externalizing problems
 - delinquency
- Substance use
 - tobacco
 - alcohol
 - cannabis



Results: Fit-indices

	the model	limits
CMIN / DF:	4.10	2 - 5
RMSEA:	.061 (.057-.065)	<.05 / <.08
P CLOSE:	.000	>.050
NFI:	.83	>.90
CFI:	.87	>.95
FMIN:	1.33	
FO:	1.00 (0.88-1.13)	
MECVI:	1.73	
ECVI:	1.72 (1.60-1.85)	

The fit is not too good; depending on the index acceptable



Results: Influences - intercepts on slopes

intercepts		slopes		
internal	->	internal	.26	.000
external	->	internal	.11	.136
substances	->	internal	-.18	.315
<hr/>				
internal	->	external	.18	.080
external	->	external	.29	.024
substances	->	external	-.13	.675
<hr/>				
internal	->	substances	.26	.007
external	->	substances	-.04	.639
substances	->	substances	1.16	.001



Results: Influences on intercepts and slopes

	intercepts					
	internal		external		substances	
gender	.11	.001	-.32	.000	-.10	.002
age	.04	.258	-.18	.000	.10	.003
ig-cg	.03	.310	-.01	.845	.01	.981
language	.00	.981	.08	.021	-.07	.035
soc BG	.00	.973	.05	.132	.07	.037
rel. parents	-.24	.000	-.31	.000	-.21	.000
del/con peers	.13	.001	.55	.000	.75	.000
self-concept	-.38	.000	.16	.000	.06	.136

	slopes					
	internal		external		substances	
gender	-.06	.246	-.02	.858	.32	.000
age	-.04	.483	.14	.088	.03	.675
ig-cg	-.06	.153	.02	.748	.04	.592
language	-.08	.087	-.07	.389	.18	.017
soc BG	-.02	.595	.10	.215	-.15	.051
rel. parents	-.11	.186	-.10	.503	.35	.017
del/con peers	-.08	.655	-.23	.423	-.77	.017
self-concept	.07	.255	.06	.601	.06	.593



Results: Influences on intercepts and slopes

- All intercepts have an influence on their respective slopes
- The **internalizing problems** intercept influences the slopes of substance use and by trend the externalizing problems slope

Influences on the intercepts

- Gender on internalizing, externalizing, substance use
- Age and language on externalizing, substance use
- Social BG on substance use
- Parents, peers, self on internalizing, externalizing, substance use
(except self on substance use)

Influences **only on the substance use slope** by:
gender, language, parents, and peers



Results: Fit-indices in the moderator models

Model:	main	gend.	age	ig/cg	lang.	socBG	limits
CMIN / DF:	4.10	2.76	2.66	3.16	2.55	2.45	2 - 5
RMSEA:	.061	.046	.045	.051	.043	.042	<.05 / <.08
P CLOSE:	.000	.991	.999	.278	>.999	>.999	>.050
NFI:	.83	.79	.80	.76	.81	.74	>.90
CFI:	.87	.85	.86	.82	.87	.82	>.95
FMIN:	1.33	1.71	1.65	1.96	1.59	2.33	
FO:	1.00	1.09	1.03	1.34	.97	1.38	
MECVI:	1.73	2.47	2.40	2.73	2.34	3.55	
ECVI:	1.72	2.41	2.35	2.67	2.29	3.41	

The fits are - depending on the index - acceptable



Results with moderators: Influences - intercepts on slopes

		moderator											
model		main	gender		age		ig/cg		language		soc BackGr		
interc.	slope		m	f	-15	16-	ig	cg	G	F	h	m	l
internal	→ int	.26	.23	.26	.34	.17	.34	-.15	.28	.26	.01	.30	.42
external	→ int	.11	.28	-.09	.10	.14	.10	.02	.62	-.01	.12	-.11	.38
substan.	→ int	-.18	.53	-.35	1.94	-.03	-.35	.23	.25	-.45	-.20	-.27	.08
internal	→ ext	.18	.12	.07	.10	.10	.09	.08	.14	.11	.10	.27	.14
external	→ ext	.29	.16	.20	.07	.20	.38	.11	.05	.01	.31	.11	.12
substan.	→ ext	-.13	2.37	-.33	7.48	-.14	.05	.13	-.20	.15	.09	-.12	.75
internal	→ sub	.26	.22	.06	.25	.03	.29	.30	.21	.25	.36	.47	.06
external	→ sub	-.04	.09	-.01	.02	-.04	-.07	.00	-.27	.11	.14	-.24	-.37
substan.	→ sub	1.16	1.07	1.78	1.46	1.01	1.03	1.32	1.58	.80	.89	.78	.37



Results with moderators: Influences - intercepts on slopes

- **Gender** bigger and more positive effects for **males**
- **Age** bigger and more positive effects for **younger age** (11-15)
- **Language** bigger and more positive effects for **German** speaking
- **Social BG** the **lower** the **soc BG**, the bigger the effects on internalizing problems
the **higher** the **soc BG**, the bigger the effects on externalizing problems and substance use
- **Intervention** few moderator effects (only int -> int)



Results with moderators: Influences on intercepts and slopes

internalizing problems

intercepts

Model	intercepts			age		ig/cg		language		soc BackGr		
	main	gender		-15	16-	ig	cg	G	F	h	m	l
		m	f									
gender	.11			.08	.13	.13	.03	.13	.07	.13	.08	.08
age	.04	.04	.01			.04	.04	.08	.03	.02	.10	.06
ig-cg	.03	.01	.08	.01	.05			-.02	.07	-.01	.05	.11
language	.00	.05	-.10	.03	-.03	.03	-.07			-.01	.00	.10
soc BG	.00	.01	-.03	-.01	.07	.05	-.09	-.05	.05			
rel. parents	-.24	-.18	-.26	-.23	-.21	-.23	-.28	-.38	-.05	-.19	-.33	-.29
del/con peers	.13	.18	.13	.20	.05	.14	.08	.14	.17	.14	.11	.02
self-concept	-.38	-.37	-.46	-.33	-.47	-.37	-.42	-.30	-.49	-.39	-.34	-.21

slopes

Model	slopes			age		ig/cg		language		soc BackGr		
	main	gender		-15	16-	ig	cg	G	F	h	m	l
		m	f									
gender	-.06			.09	.00	-.10	-.06	.31	-.17	-.03	-.08	.03
age	-.04	-.06	-.09			-.04	-.01	.15	-.03	.01	-.05	-.06
ig-cg	-.06	-.07	-.07	-.01	-.09			-.04	-.01	-.13	.07	-.13
language	-.08	-.03	-.04	.11	-.11	-.04	-.12			-.06	-.07	-.09
soc BG	-.02	-.02	-.05	-.08	-.19	.01	-.09	-.07	.03			
rel. parents	-.11	.27	-.34	.35	-.06	-.17	-.04	.42	-.24	-.20	-.03	-.03
del/con peers	-.08	-.80	.34	-1.98	-.14	.02	-.16	-.74	.24	-.07	.14	-.44
self-concept	.07	-.12	-.17	-.18	.10	.13	-.14	-.06	.09	-.05	.17	-.06



Results: moderators on internalizing problems

- | moderator | effects on intercept |
|------------------|---|
| - Age | females risk for older youth (16-20/25)
con/del peers risk for younger youth (11-15) |
| - Intervention | female and con/del peers risk for intervention group |
| - Language | rel. parents protector for German speaking |
| - Social BG | female risk for high social BG |
| moderator | effects on slope |
| - Gender | rel. parents risk for boys / protector for girls
del/con peers protector for boys / (risk for girls) |
| - Language | rel. parents (risk for German) / protector for French
del/con peers protector for German/ (risk for French)
male risk for French / protector for German speaking |



Results with moderators: Influences on intercepts and slopes

externalizing problems

intercepts

Model	main	gender		age		ig/cg		language		soc BackGr		
		m	f	-15	16-	ig	cg	G	F	h	m	l
gender	-.32			-.26	-.32	-.30	-.47	-.46	-.25	-.26	-.27	-.48
age	-.18	.04	.01			.04	.04	.08	.03	.02	.10	.06
ig-cg	-.01	-.02	.00	.06	-.04			-.13	.07	.11	.06	.18
language	.08	.06	.10	.05	.07	.13	-.12			-.01	.15	.17
soc BG	.05	.06	.02	.06	.05	.04	.13	.01	.14			
rel. parents	-.31	-.33	-.27	-.20	-.30	-.32	-.31	-.59	-.07	-.46	-.29	-.09
del/con peers	.55	.57	.56	.60	.42	.56	.55	.56	.65	.44	.43	.34
self-concept	.16	.17	.15	.12	.14	.20	.03	.21	.06	.26	.23	-.21

slopes

Model	main	gender		age		ig/cg		language		soc BackGr		
		m	f	-15	16-	ig	cg	G	F	h	m	l
gender	-.02			.59	-.09	-.05	-.04	.08	-.10	-.03	.47	.08
age	.14	-.15	.03			.03	-.02	.17	.02	.12	-.10	-.31
ig-cg	.02	-.02	.05	-.03	.10			.10	-.02	.02	-.09	-.71
language	-.07	.10	-.06	.57	-.08	-.04	.01			.10	-.07	.10
soc BG	.10	-.05	-.26	-.12	-.23	-.18	-.05	.01	-.29			
rel. parents	-.10	.55	-.17	1.55	.10	-.08	.05	.09	-.12	.11	-.25	-2.76
del/con peers	-.23	-2.16	.16	-6.61	-.06	-.12	-.09	-.27	-.12	-.45	.08	-.49
self-concept	.06	-.32	.01	-.71	-.12	.04	.04	.07	-.05	-.06	.21	2.86



Results: moderators on externalizing problems

moderator	effects on intercept
- Intervention	German / good self-concept risk for intervention group (French speaking protector for comparison group)
- Language	intervention group protector for German speaking low social BG risk for French speaking rel. parents protection for German speaking good self-concept risk for German speaking
- Social BG	French speaking risk for moderate/ (low) social BG rel. parents protection for high / moderate social BG good self-concept risk for high / moderate social BG (good self-concept protector for low social BG)
moderator	effects on slope
- Gender	del/con peers protector for boys / (del/con peers risk for girls) good self-concept protector for boys (rel. parents pattern like internalizing problems; not significant)
- Language	high social BG protector for French speaking



Results with moderators: Influences on intercepts and slopes

substance use

intercepts

Model	main	gender		age		ig/cg		language		soc BackGr		
		m	f	-15	16-	ig	cg	G	F	h	m	l
gender	-.10	.11	.07	-.09	-.14	-.11	-.08	-.15	-.06	-.03	-.14	-.19
age	.10	.11	.07			.12	.05	.02	.13	.14	.14	.12
ig-cg	.01	.02	-.01	.00	.03			.04	-.01	.01	.03	.13
language	-.07	-.06	-.03	-.08	-.04	-.06	-.04			-.06	-.09	-.05
soc BG	.07	.09	.01	.11	.05	.07	.07	.08	.06			
rel. parents	-.21	-.23	-.16	-.23	-.14	-.22	-.21	-.28	-.07	-.33	-.26	.02
del/con peers	.75	.79	.82	.86	.77	.75	.74	.76	.83	.66	.64	.77
self-concept	.06	.13	.00	.11	-.02	.08	.04	.08	.01	.16	.09	-.24

slopes

Model	main	gender		age		ig/cg		language		soc BackGr		
		m	f	-15	16-	ig	cg	G	F	h	m	l
gender	.32			.38	.27	.29	.31	.27	.32	.26	.10	.11
age	.03	-.08	.06			.02	.14	.07	.06	.01	.05	-.26
ig-cg	.04	.02	.06	.10	-.08			-.11	.07	.07	-.14	-.42
language	.18	.15	.15	.18	.12	.16	.06			.28	.08	-.19
soc BG	-.15	-.05	-.26	-.12	-.23	-.18	-.05	.01	-.29			
rel. parents	.35	.50	.05	.46	.08	.32	.31	.36	.14	.47	.41	-1.72
del/con peers	-.77	-.83	-1.66	-1.22	-.93	-.54	-1.14	-.89	-.74	-.60	-.24	.26
self-concept	.06	-.10	.19	-.01	.02	.10	.04	.02	.15	.09	.10	1.60



Results: moderators on substance use

moderator	effects on intercept
- Gender	age, low social BG, good self-concept protectors for males
- Age	low social BG, good self-concept risks for younger age (11-15) French speaking, rel. parents protectors for younger age (11-15)
- Intervention	female, younger age (11-15) protectors for intervention group
- Language	female, rel. parents protectors for German speaking younger age (11-15) protector for French speaking
- Social BG	female protector for moderate / (low) social BG rel. parents protector for high / moderate social BG good self-concept risk for high social BG / (protector for low sBG)
moderator	effects on slope
- Gender	rel. parents protector for males
- Language	lower social BG protector for French speaking
- Social BG	female, French speaking risks for high social BG rel. parents risk for high / (moderate) social BG / (prot. for low) del/con peers protector for high / (moderate) social BG / (risk for low)



Summary

Influences on intercepts: no surprise

- **Males** have less internalizing, more externalizing problems, and substance use.
- **Older** adolescents (16-20) have more substance use.
- Youths with a **low social background** have more internalizing problems.
- the relationship with **parents** is generally a protector
- the relationship with **delinquent/consuming peers** is generally a risk
- a good **self-concept** is a protector for internalizing, but a risk for externalizing problems

Influences on slopes:

- Gender, language, the relationship with parents and with delinquent/consuming peers have an influence **on substance use** (the ones with lower values catching up !)



Summary

Moderators:

Influences on internalizing, externalizing problems are moderated by:

- gender (effects often stronger on males)
- age (effects often stronger on younger adolescents; 11-15)
- social background (effects often stronger for the ones with a good social background)
- language (effects often stronger on German speaking youths)

The **relationship with parents** and **with delinquent/consuming peers** is for the further development partly protective and partly a risk, depending on group membership (e.g. male, female; German, French)



Conclusions

Depending on the situation at a point of time, internalizing problems, externalizing problems, and substance use take different courses.

To know which variables influence the development of a trajectory can help to develop (preventive) interventions to change the course of problem behaviour in youth (at risk).



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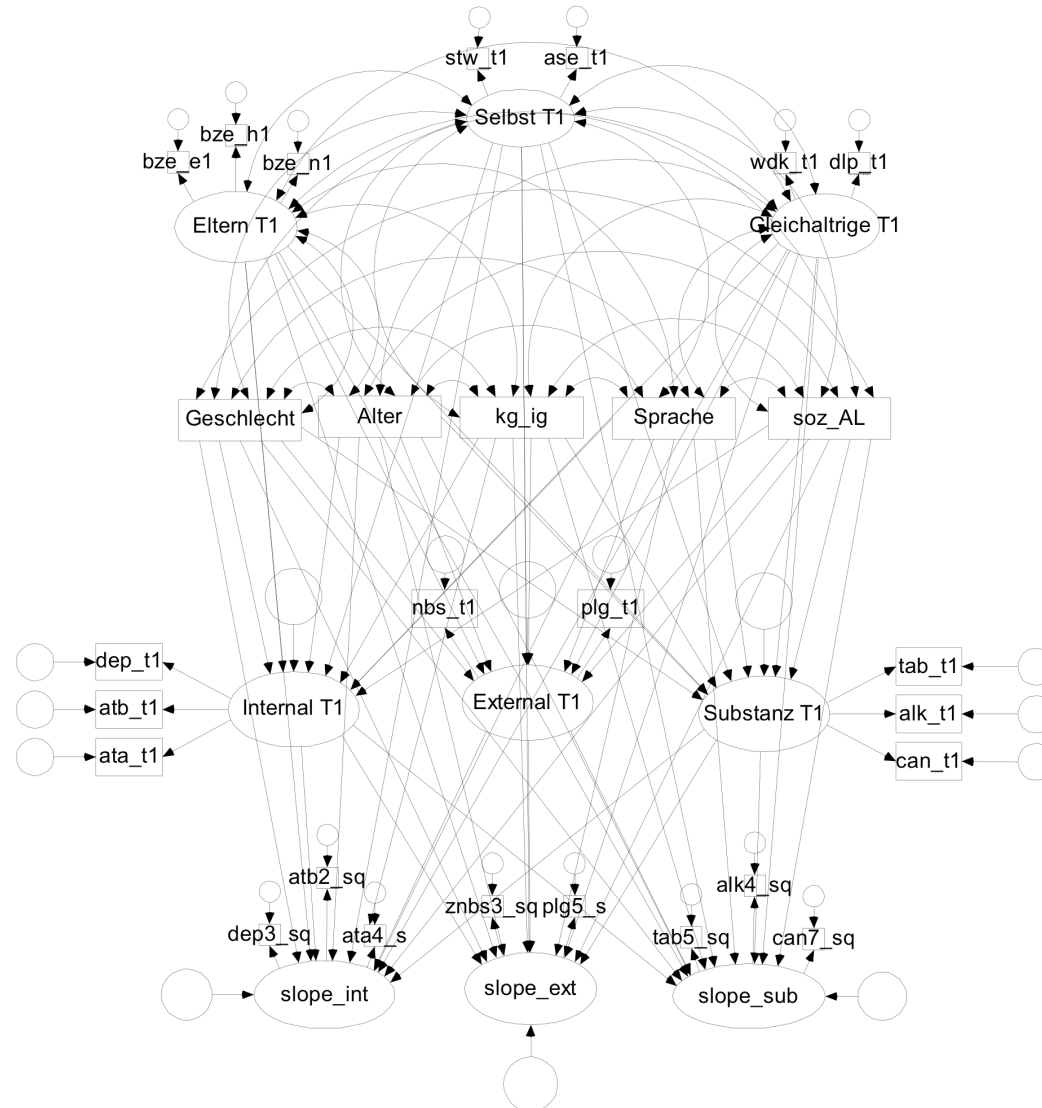


Thank you for the attention !



Sample

	N	mean	(sd)	
depression	815	11.63	(8.75)	0 - 45
anxiety (trait; STAI)	826	39.30	(11.24)	20 - 80
anxiety (state; SCL-90R)	824	16.91	(7.40)	10 - 50
delinquency	826	2.04	(2.43)	0 - 11
bullying	817	1.44	(0.69)	1 - 4
tobacco use	803	2.80	(1.87)	1 - 6
alcohol use	827	2.75	(1.53)	1 - 6
cannabis use	812	2.00	(1.47)	1 - 5





Trajectories of delinquency

childhood limited - recoveries:

The small group with childhood limited delinquency showed **in adulthood again some delinquency** and had first of all **internalizing problems** and elevated **emotionality** (neuroticism).

adolescence limited:

Youth from low risk environments are **seeking adult privileges** that are forbidden for them. They are influenced by **dissocial peers**. The **maturation gap** reinforces the adolescence limited dissocial behavior (or makes it possible). **Positive consequences** also reinforce this behavior. Earlier, these youth **learned alternative behavior**, so they can give up delinquency in transition phases of life. A certain amount of delinquency in adolescence seems to be part of a **normal development**.

life course persistent:

Youth and young adults that were early (beginning in childhood) delinquent **didn't** have the possibility to **learn alternative (social) behavior**. Often they had a **difficult temperament** and showed **externalizing behavior** that partially was tolerated or even encouraged by the environment. Probably, a cause of chronic delinquency are **neurological deficits**.

abstainers:

Moffitt wrote 1993 that youth without dissocial behavior have pathological characteristics (e.g. shy, withdrawn). But in adulthood, they are the **most successful** in social life and profession (Moffitt et al. 2002).