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# Using information from LCGM in path models to understand child development

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Associations between risk factors and outcome vary by child characteristics

Moderating variables tend to be categories or snapshots

Developmental aspects of moderating variables may be important

Example:

Peer delinquency predicts adolescent own delinquency but this may be particularly the case for individuals with a specific history of prior behavior problems



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Avon Longitudinal Study of Parents and Children

Outcome: Adolescent-reported Delinquency at 15 (continuous)

Predictors: Peer deviance at 10; Parent-child relationship at 10;  
Mother-reported childhood conduct problems at 6 time points from 4  
to 13



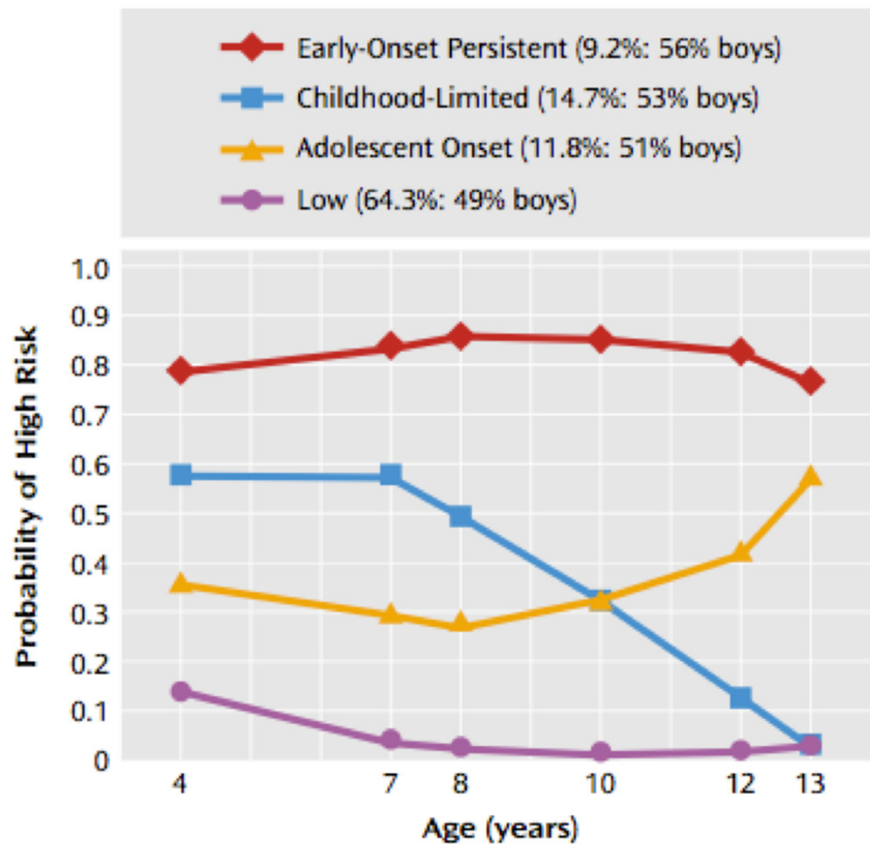
## 1) Multiple regression including interaction terms

<b>Outcome: Delinquency 15</b>	<b>Girls</b>		<b>Boys</b>	
Peer deviance (X1)	.06*	.06*	.08**	.09***
Parent-child relationship (X2)	-.06*	-.05	-.01	-.01
Conduct problems (MOD)	.13***	.13***	.17***	.17***
Peer deviance x Conduct Problems		.00		-.02
Parent-child relationship x Conduct problems		-.02		-.02



## 2) Childhood problem behavior trajectories using mixture models

(Barker & Maughan, 2009, AJP)



ANALYSIS:

TYPE = MIXTURE;

ALGORITHM = INTEGRATION;

STARTS = 100 20;

MODEL: %OVERALL%

i s q|cp1@1 cp2@2 cp3@3 cp4@4 cp5@5 cp6@6;

i@0;

s@0;

q@0;

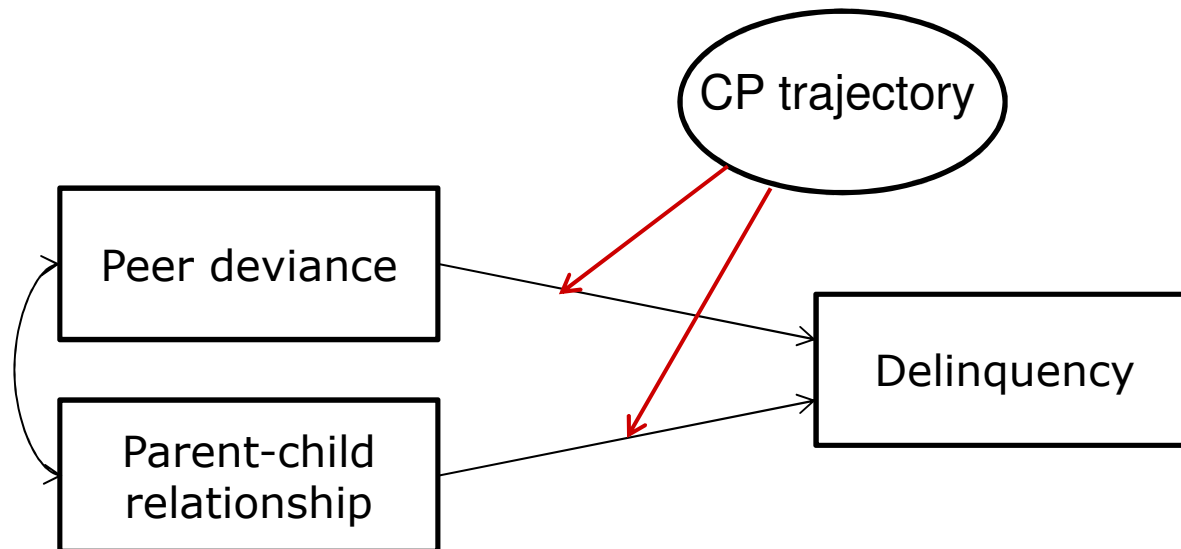
i WITH s@0;

i WITH q@0;

s WITH q@0;

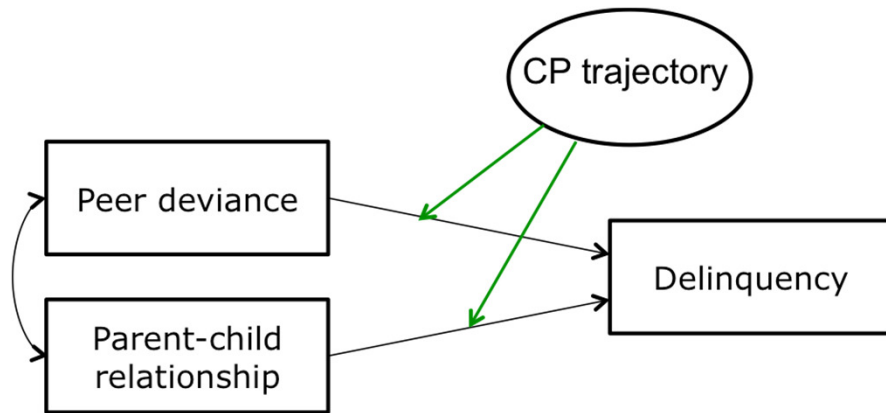


## 2) Multiple group approach in path model





### a) Unconstrained model



```
weight is prob;
classes are cp(4);
knownclass is cp(traj=1 traj=2 traj=3 traj=4);
```

**Analysis:**

Type = mixture ;

**Model:**

```
%overall%
  asb15  ON      pcrel
  asb15  ON      peerdev;
  pcrel  WITH    peerdev;

%cp#1%
  asb15  ON      pcrel
  asb15  ON      peerdev;
  pcrel  WITH    peerdev;

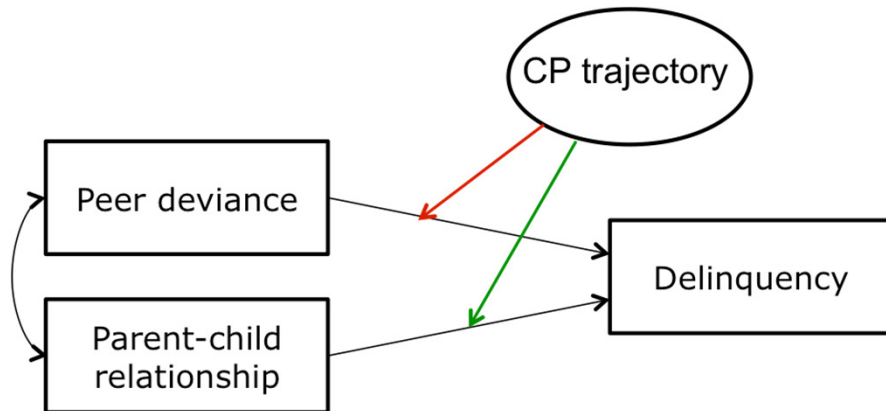
%cp#2%
  asb15  ON      pcrel
  asb15  ON      peerdev;
  pcrel  WITH    peerdev;

%cp#3%
  asb15  ON      pcrel
  asb15  ON      peerdev;
  pcrel  WITH    peerdev;

%cp#4%
  asb15  ON      pcrel
  asb15  ON      peerdev;
  pcrel  WITH    peerdev;
```



### b1) Testing moderation of peer deviance by trajectory – Constrained model



```
weight is prob;
classes are cp(4);
knownclass is cp(traj=1 traj=2 traj=3 traj=4);
```

**Analysis:**

Type = mixture ;

**Model:**

```
%overall%
  asb15  ON      peerdev ;
  asb15  ON      pcrel ;
  pcrel  WITH    peerdev;

%cp#1%
  asb15  ON      peerdev (1);
  asb15  ON      pcrel ;
  pcrel  WITH    peerdev;

%cp#2%
  asb15  ON      peerdev (1);
  asb15  ON      pcrel ;
  pcrel  WITH    peerdev;

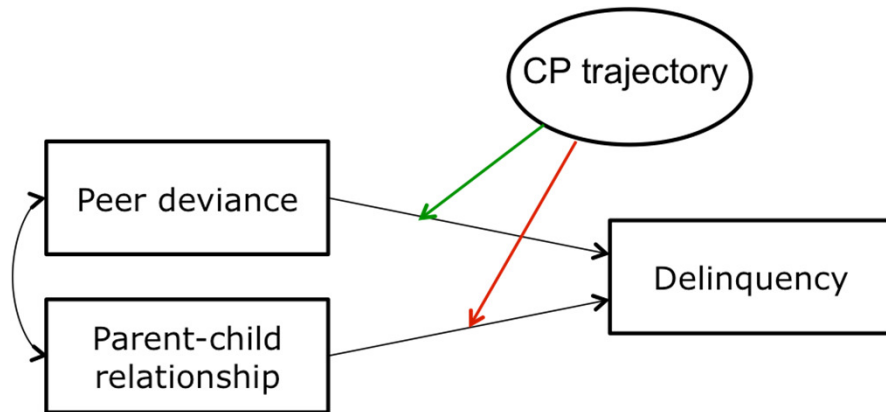
%cp#3%
  asb15  ON      peerdev (1);
  asb15  ON      pcrel ;
  pcrel  WITH    peerdev;

%cp#4%
  asb15  ON      peerdev (1);
  asb15  ON      pcrel ;
  pcrel  WITH    peerdev;
```





## b2) Testing moderation of parent-child relationship quality by trajectory – Constrained model



```
weight is prob;
classes are cp(4);
knownclass is cp(traj=1 traj=2 traj=3 traj=4);
```

### Analysis:

```
Type = mixture ;
```

### Model:

```
%overall%
  asb15  ON      peerdev;
  asb15  ON      pcrel ;
  pcrel  WITH    peerdev;

%cp#1%
  asb15  ON      peerdev;
  asb15  ON      pcrel (2);
  pcrel  WITH    peerdev;

%cp#2%
  asb15  ON      peerdev;
  asb15  ON      pcrel (2);
  pcrel  WITH    peerdev;

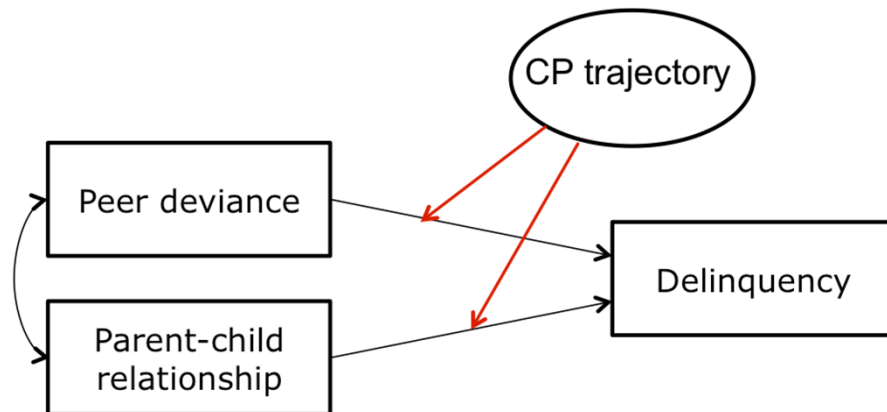
%cp#3%
  asb15  ON      peerdev;
  asb15  ON      pcrel (2);
  pcrel  WITH    peerdev;

%cp#4%
  asb15  ON      peerdev;
  asb15  ON      pcrel (2);
  pcrel  WITH    peerdev;
```



## Comparison of model fit constrained and unconstrained – BOYS

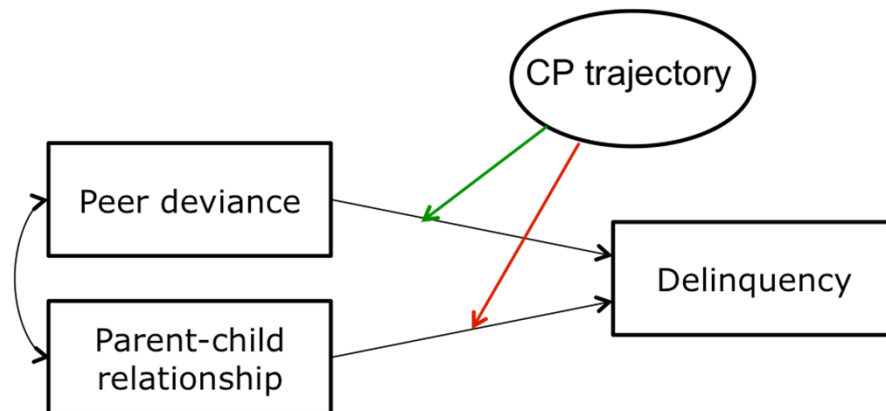
	Log likelihood	Scaling correction	Free parameters	TRd
Unconstrained	-59847,689	3,785	30	
Parent-child relationship constrained	-59848,693	3,916	27	0,77
Peer deviance constrained	-59850,417	3,887	27	1,90





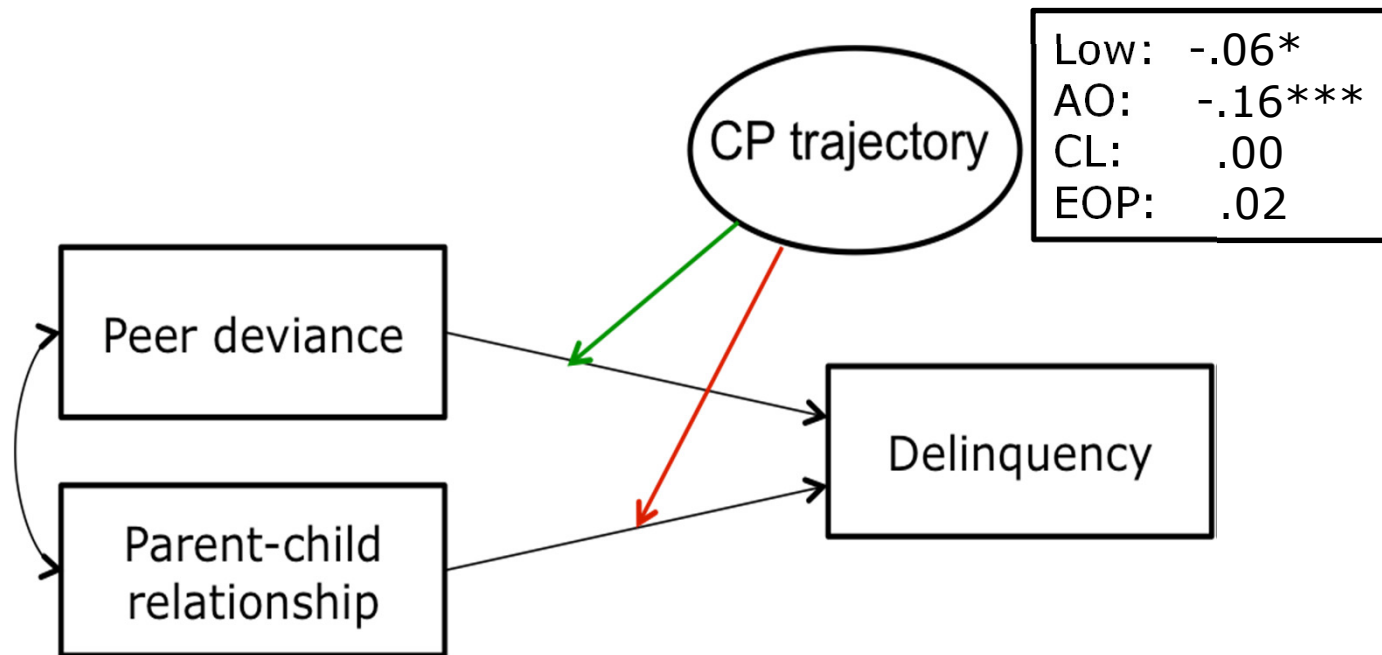
## Comparison of model fit constrained and unconstrained – GIRLS

	Log likelihood	Scaling correction	Free parameters	TRd
Unconstrained	-54377,125	4,207	30	
Parent-child relationship constrained	<b>-54391,421</b>	<b>4,306</b>	<b>27</b>	<b>8,62</b>
Peer deviance constrained	-54378,994	4,292	27	1,09





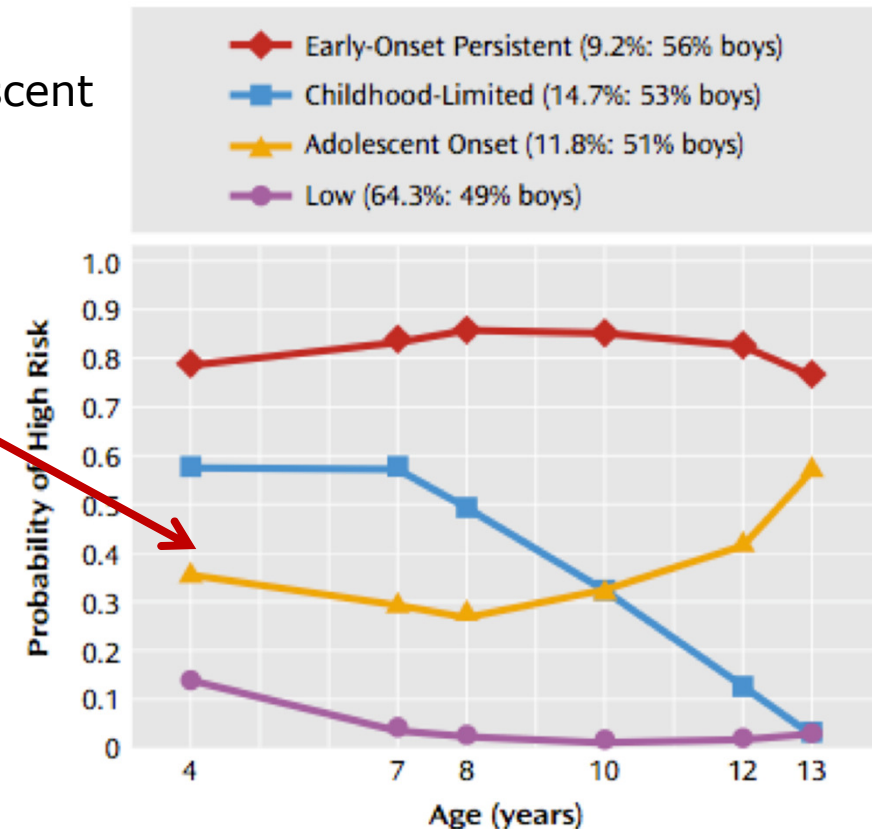
## Trajectory moderates association between parent-child negativity and delinquency in girls





## Trajectory moderates association between parent-child negativity and delinquency in girls

Girls with adolescent-onset conduct problems particularly at risk for adolescent delinquency if experiencing negative relationship with parents





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## Advantages of model approach to regression

More detailed consideration of child effects/individual propensity

Acknowledges that behaviors are not stable

Allows a closer look at risk factors that may be detrimental only for small group of individuals (and targeted intervention)



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Thoughts/Discussion

Results in comparison to 3-step approach

Research questions to be examined using a mixture/path model combination

Dealing with more complex path models/SEM



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Edward D. Barker (Birkbeck University, UK)

### **For questions/ suggestions:**

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