

# Longitudinal Risk and Promotive Factors for Antisocial Behavior, Substance Use, and School Failure

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# Overview

A meta-analysis of longitudinal research was used to:

- Develop a taxonomy of the risk predictor and outcome constructs found in longitudinal studies with the target outcomes.
- Determine which risk factors show the greatest predictive strength at different ages for later antisocial behavior, substance use, or school success/failure.

# The Meta-analysis

Three overlapping meta-analyses:

- Longitudinal studies reporting risk-outcome relationships for:
  - Antisocial behavior
  - Substance use
  - School success or failure
- Samples from the general population or selected by broad indicators of risk, e.g., SES; no clinical samples
- Risk/promotive factors measured between birth & 18
- Outcomes measured from age 4 through 30
  - Substance use outcomes from age 11
  - Most outcomes between 5-17

# Study Coding

- General study characteristics
  - (e.g., geographic region, sample selection).
- Subject characteristics
  - (e.g., age, gender, racial/ethnic composition, risk, SES).
- Measurement wave and timing characteristics
- Risk and outcome variable characteristics
- Study results— effect size statistics
  - Cross-sectional risk-risk relationships
  - Cross-sectional risk-outcome relationships
  - Longitudinal risk-outcome relationships

# Effect Sizes

Z-transformed product moment correlation coefficient:

$$ES_{Z_r} = .5 \log_e \left[ \frac{1 + ES_r}{1 - ES_r} \right]$$

$$SE_{Z_r} = \frac{1}{\sqrt{n_w - 3}}$$

$$W_{Z_r} = \frac{1}{SE^2} = n_w - 3$$

# Effect Sizes

- All effect sizes were coded so that positive correlations indicated that higher risk was associated with a worse outcome.

For example, positive correlations when:

- Low GPA predicts high alcohol use
- Harsh/negative parenting predicts low achievement test scores
- Low peer school performance predicts high delinquency

# Current Database

- 1,596 independent longitudinal samples from 619 studies
- 56,780 cross sectional correlation coefficients (risk-risk, outcome-outcome, risk-outcome)
- 47,618 longitudinal risk-outcome correlation coefficients
  - 11,664 for antisocial behavior
  - 8,302 for substance use
  - 22,718 for school success or failure

# Analysis

- Fixed effects inverse variance weighting of effect sizes.
- Mainly multiple regression analyses modeling risk-risk, outcome-outcome, or risk-outcome correlations as a function of subject sample and measurement characteristics.
- Multilevel models used with effect sizes nested within waves and waves nested within subject groups (SPSS Mixed Models).
- Results viewed as descriptive; not possible to properly estimate standard errors and statistical significance.



**Constructs and measures:  
Developing a classification  
scheme**

# Problem: Deciding which measures represent the same construct

- Many different operationalizations with different labels and claims or implications for the constructs they measure.
- Difficult to study risk factors systematically because research presents great variability and inconsistency in construct labels and measures.
- For assessing risk, we are primarily interested in the constructs, not how they are measured; valid measures of the same constructs should produce similar results.
- Correlations between measures that might guide identification of those indexing the same or different constructs are often modest and are heavily influenced by the characteristics of the samples on which they are measured and the nature of the measurement operationalizations.
- No existing framework for classifying constructs and measures of the target outcomes of interest or the risk factors for those outcomes.

# Development of a classification scheme: The Conceptual Part

- Inductively sorted measures and variables into a hierarchical scheme of macro and micro constructs based on conceptual similarity.

<b>Macro Constructs</b>	<b>Micro Constructs</b>
Parenting Behaviors	Parenting practices/skill, harsh parenting, parental expectations and educational supports, exposure to print, parent-child attachment, parental warmth, parent supervision
Drug Exposure & Attitudes	Availability of drugs, offered drugs , media exposure to drugs, drug attitudes, intention to use drugs, family drug use
Peer Behaviors & Influences	Peer antisocial behavior, normlessness; peer substance use orientation, peer school performance & attitudes
School Motivation & Attitudes	Achievement motivation, educational goal setting, beliefs about education, school effort, academic anxiety, school bonding

# Development of a classification scheme: The Empirical Part

- Used MR to examine measurement and sample characteristics among cross-sectional correlations in the same macro category;
- Then, adjusted the correlations within a category for a standard profile of sample and measurement characteristics.
- Reclassified any construct that showed notably low mean adjusted correlations with the other constructs in each category.

# Example of mean standardized correlations across micro risk constructs

	Mean cross-construct correlation		Mean cross-construct correlation
<b><i>Harsh, Negative Parenting</i></b>		<b><i>Family Educational Supports</i></b>	
Maltreatment	.45	Home environment	.24
Harsh/negative parenting	.48	Parental expectations	.34
		Exposure to print	.28
<b><i>Family Cohesion</i></b>		Scaffolding	.33
Attachment to parent	.35	Involvement in education	.32
Attachment to child	.40	<b><i>Social Competence/Activities</i></b>	
Parent-child relations	.37	Social activities	.31
Parent warmth	.38	Social skills/competence	.39

# Example of mean standardized correlations across micro risk constructs

	Mean cross-construct correlation		Mean cross-construct correlation
<b><i>Peer ASB/Normlessness</i></b>		<b><i>Parenting Skills</i></b>	
Antisocial peers	.51	Appropriate discipline	.38
Peer normlessness	.60	Parental practices	.36
		Inconsistent/ineffective discipline	.31
<b><i>Peer SU Orientation</i></b>		Parent supervision	.29
Peer substance use	.44	Family structure, regimen	.35
Peer drug attitude	.43		
Peer pressure	.45		

# Example of mean standardized correlations across micro risk constructs

	Mean cross-construct correlation		Mean cross-construct correlation
<i>Internalizing Behavior</i>		<i>Attention/Hyperactivity</i>	
Dependency	.23	Attention, self-regulation	.22
Internalizing behavior	.34	Attention & activity	.26
Anxiety, anxious	.41	Impulsive/self-control	.26
Depression, depressed	.29	Activity level	.16
Shy, withdrawn	.34	Sensation seeking	.31
Psychological distress	.30		

# Example of mean standardized correlations across micro risk constructs

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	Mean cross-construct correlation		Mean cross-construct correlation
<i><b>Drug Attitudes</b></i>		<i><b>Intention to Use Drugs</b></i>	
Drug attitudes, general	.60	Intention to use tobacco	.64
Drug attitudes, health	.54	Intention to use alcohol	.64
Drug attitudes, social desirability	.54		
Drug attitudes, mental experience	.57		

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# Predictive Risk Factors for School Failure/Success

# Data available from the meta-analysis

- 416 studies reporting 20,768 longitudinal correlations between a risk variable and a school success/failure variable measured later
- Sample characteristics
  - 53% primarily white, 17% primarily minority
  - 28% primarily low/working class, 22% primarily middle class
  - Mean proportion male = .51
  - Mean age at first wave = 7.17
  - Mean interval between waves = 28 mos.
- Major sources for the risk and outcome measures
  - Child reports: 47% of the risk measures and 42% of the outcome measures
  - School-administered instruments: 22% of the risk measures and 39% of the outcome measures

# Identifying the construct categories for school performance outcomes

- School performance measures inductively sorted into categories based on conceptual similarity.
- MR models used to standardize cross-sectional correlations between different performance measures for a consistent profile of sample and measurement characteristics:
  - Age, gender, SES, ethnicity, risk
  - Informant (child, parent, etc.), scaling (binary, continuous)
- Mean cross-sectional correlations across constructs examined to ensure that inclusion in the same construct category was empirically justified.

# School performance outcome constructs

Constructs & construct categories	Mean cross-construct correlation	Constructs & construct categories	Mean cross-construct correlation
<i>Achievement Tests</i>		<i>School Readiness</i>	
Total achievement	.81	Readiness: Oral communication	.64
Reading achievement	.71	Readiness: Draw-a-Person	.70
Math achievement	.66	Individual readiness tasks	.73
Other subject achievement	.65	Visual, perceptual skills	.65
Vocabulary	.68	Readiness Test: Total	.73
Comprehension	.56	Readiness: Early Literacy	.70
Language mechanics	.62	Readiness: Math, spatial	.61
Writing achievement	.66		
General knowledge	.53		

# School performance outcome constructs

Constructs & construct categories	Mean cross-construct correlation	Constructs & construct categories	Mean cross-construct correlation
<i>Decoding Skill</i>		<i>GPA/Grades</i>	
Phonemic awareness	.76	Math grades	.71
Phonics	.79	English grades	.73
Fluency achievement	.77	Other grades	.74
Spelling achievement	.78	GPA, grades	.80
Print concepts, print awareness	.77		

# Method for Longitudinal Correlations

- As with the cross-sectional correlations, we performed a series of multi-level regression models to adjust the longitudinal correlations for differences associated with measurement characteristics.
  - Informant (child, parent, etc.), scaling (binary, continuous), and form of data collection (standardized test, survey).
- We then examined the influence of age, time interval,  $\text{age}^2$ , and  $\text{age} \times \text{interval}$  on the risk-outcome correlations.
- Risk-outcome correlations for given Time 1 and Time 2 ages estimated from the second stage models.

# Achievement Test Outcomes: Mean Longitudinal Correlations with Prior Performance

Predictor	4-7	5-8	9-13	Nes (Nss)
<b>Prior Academic Performance</b>				
School readiness tests	.42	.43	.42	2738 (263)
Decoding skills	.42	.43	.42	1030 (130)
Grades, GPA	.30	.31	.30	83 (25)
Achievement test scores	.43	.44	.43	2580 (318)
Grade retention	.55	.55	.55	17 (6)
<b>Cognitive Abilities, IQ</b>	.45	.43	.37	1556 (76)

# What are the strongest predictors of Achievement Test Scores?

Predictor	4-7	5-8	Nes (Nss)
Self-efficacy, Goal Setting	.50	.47	52 (19)
Achievement Motivation	.48	.44	227 (51)
Academic Goal Setting	.56	.53	27 (10)
Social Competence	.46	.43	131 (41)
Peer Acceptance, Rejection	.47	.43	34 (14)
Parenting Skills	.45	.43	58 (17)
Family Educational Supports	.44	.42	493 (67)
Harsh Parenting	.44	.42	19 (14)
Family Socioeconomic Status	.50	.49	364 (67)



# What are the weakest predictors of Achievement Test Scores?

Predictor	4-7	5-8	Nes (Nss)
Teacher Instructional Quality	.36	.36	123 (20)
Motor Skills, Coordination	.37	.37	161 (38)
Self-esteem*	.37	.37	176 (33)
Problem Behavior, School Conduct	.38	.39	264 (70)
Internalizing Problems*	.37	.37	147 (37)

\* Also the weakest predictors with sufficient N for Grades/GPA

# Grades, GPA Outcomes: Mean Longitudinal Correlations with Prior Performance

Predictor	4-7	5-8	9-13	Nes (Nss)
<b>Prior Academic Performance</b>				
School readiness tests	.49	.49	.39	50 (13)
Decoding skills	.47	.48	.37	16 (3)
Grades, GPA	.51	.52	.42	232 (78)
Achievement test scores	.48	.48	.38	321 (47)
<b>Cognitive Abilities, IQ</b>	.51	.48	.38	136 (32)

# What are the strongest predictors of Grades and GPA?

Predictor	4-7	5-8	9-13	Nes (Nss)
Achievement Motivation	.63	.60	.52	126 (23)
School Self-concept	.69	.67	.60	197 (18)
Self-efficacy, Goal Setting	.68	.65	.58	22 (12)
Social Competence	.55	.43	.46	53 (14)
Peer Acceptance, Rejection	.54	.52	.45	53 (19)
Family Educational Supports	.54	.52	.42	210 (25)
Harsh Parenting	.56	.54	.45	23 (11)
Parenting Skills	.54	.52	.42	43 (16)
Family Socioeconomic Status	.57	.57	.52	95 (33)

# School Readiness and Decoding Skills: Mean Longitudinal Correlations with Prior Performance

<b>Predictor at Age 4</b>	<b>Readiness at 6</b>	<b>Nes (Nss)</b>	<b>Decoding at 6</b>	<b>Nes (Nss)</b>
<b>Prior Academic Performance</b>				
School readiness tests	.53	404 (65)	.41	671 (84)
Decoding skills	.54	56 (18)	.44	1225 (91)
<b>Cognitive Abilities, IQ</b>	.45	72 (22)	.40	289 (59)

# What are the strongest predictors of School Readiness & Decoding Skill other than prior performance?

<b>Predictor at Age 4</b>	Readiness at 7	Nes (Nss)	Decoding at 7	Nes (Nss)
Family Socioeconomic Status	.47	57 (12)	.47	86 (19)
Attention, Hyperactivity Problems	.47	23 (7)	.47	74 (18)
Problem Behavior	.40	48 (20)	.44	68 (12)
Family Educational Supports	.38	68 (10)	.42	96 (19)

# Does ASB Predict School Performance?

## Outcomes at Age 13

<b>Predictors at Age 9</b>	Achievement		Grades	
		Nes (Nss)		Nes (Nss)
Delinquent behavior	-	-	.38	30 (7)
Problem behavior/school conduct	.38	264 (70)	.39	142 (32)
Violent behavior	.34	11 (5)	-	-

# Do Attention Problems Predict School Performance?

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	Age 4-7	Age 5-8	Age 9-13	Nes (Nss)
Attention/hyperactivity → School Readiness Tests	.47	.45	-	23 (7)
Attention/hyperactivity → Decoding Skills	.47	.42	-	74 (18)
Attention/hyperactivity → Achievement Tests	.41	.42	.42	369 (71)
Attention/hyperactivity → Grades, GPA	.52	.49	.38	74 (15)

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# School Performance: Conclusions

- Many predictors had moderate to strong correlations with later school performance.
  - Grades were generally better predicted than achievement tests, decoding, and readiness.
- Prior performance and socioeconomic status were consistently strong predictors of all school performance outcomes.
- Attitudes and motivations appeared to play an important role in predicting later achievement test scores and grades.
- Antisocial behavior was among the weaker predictors.
- Attention difficulties and related problems were moderately predictive of later school outcomes.



# Predictive Risk Factors for Substance Use

# Data available from the meta-analysis

- 119 studies reporting 7,962 longitudinal correlations between a risk variable and a substance use variable measured later
- Sample characteristics
  - 69% primarily white; 26% primarily minority
  - 36% primarily low/working class; 25% primarily middle class
  - Mean proportion male = .51
  - Mean age at first wave = 14.5
  - Mean interval between waves = 38 mos.
- Major sources for the risk and outcomes measures
  - Child reports: 88% of the risk measures and 99% of the outcome measures
  - Teacher or peer reports: 6% of the risk measures

# Identifying the construct categories for substance use outcomes

- Substance use (SU) measures inductively sorted into four categories based on conceptual similarity
  - Tobacco use
  - alcohol use
  - marijuana use
  - other mixed substance use
- MR models used to standardize cross-sectional correlations between different SU measures for a consistent profile of sample and measurement characteristics
  - Age, gender, SES, ethnicity, risk
  - Source (child, parent, etc.), scaling (binary, continuous)
- Mean cross-sectional correlations across constructs examined to ensure that inclusion in the mixed SU construct category was empirically justified

# Substance use outcome constructs

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Constructs & construct categories	Mean cross-construct correlation
<i>Tobacco Use</i>	.58
<i>Alcohol Use</i>	.67
<i>Marijuana Use</i>	.82
<i>Mixed Substance Use</i>	
Other substance use	.59
Mixed minor substance use	.57
Mixed major substance use	.62

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# Number of Longitudinal Correlations in Major Risk Categories Predicting Substance Use Outcomes

Risk Variable Category	Substance Use Outcome			
	Tobacco Use	Alcohol Use	Marijuana Use	Mixed Substance Use
Prior substance use	446	738	478	332
Antisocial behavior	60	187	152	206
School motivation & attitudes	168	231	227	128
Drug exposure & attitudes	232	374	130	192
Peer behaviors & influences	158	282	198	192
Parenting behaviors	75	195	155	232

# Adjustments to the longitudinal correlation coefficients

- Step 1: MR models used to produce standardized longitudinal correlation coefficients for a consistent profile of measurement characteristics:
  - Scaling (e.g., dichotomous, continuous)
  - Reporting source (e.g., self vs. parent)
  - Form of data collection (e.g., standardized test, observation)
- Step 2: Second stage MR models used to predict the standardized correlation coefficients from age, age<sup>2</sup>, interval between waves, and age x interval for each combination of risk-outcome categories
- Risk-outcome correlations for given Time 1 and Time 2 ages estimated from the second stage models

# Mean correlations for major risk categories at age 16 and SU outcomes at age 20

Risk Construct Category	Substance Use Outcome			
	Tobacco Use	Alcohol Use	Marijuana Use	Mixed Substance Use
Prior substance use	.18	.38	.41	.29
Antisocial behavior	.29	.28	.30	.26
School motivation & attitudes	.31	.20	.22	.40
Drug exposure & attitudes	.44	.18	.26	.13
Peer behaviors & influences	.40	.32	.29	.23
Parenting behaviors	.16	.18	.17	.22

<sup>a</sup> Estimated from weighted regression models that included age at Time 1, age<sup>2</sup>, Time 1-Time 2 interval, and age\*interval; means calculated from the models for age= 16 and interval= 4 (age 20).

**Within a risk construct category, micro constructs have about the same risk-outcome correlations: E.g., Prior SU and antisocial behavior as predictors of alcohol use**

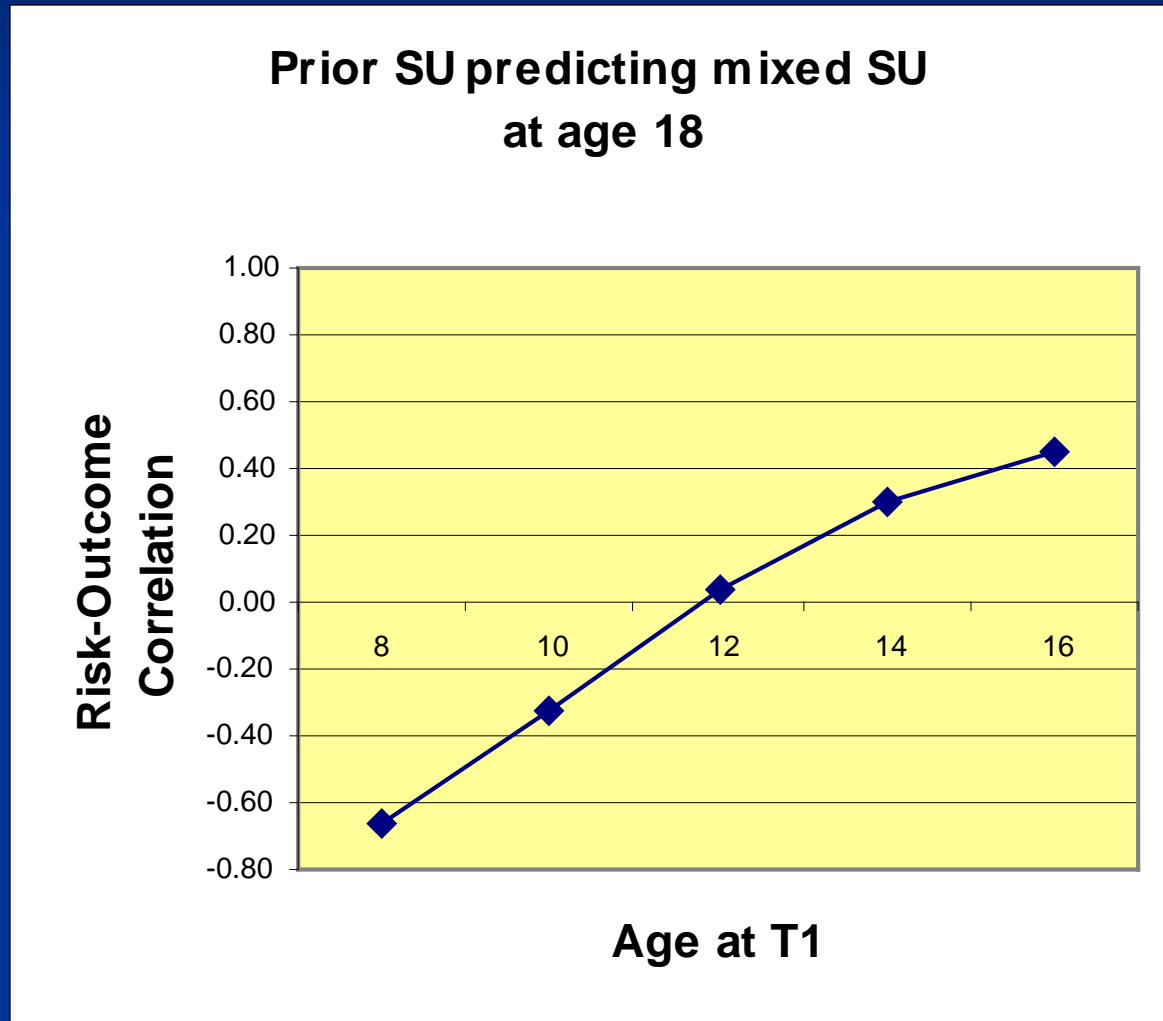
<b>Risk Constructs &amp; Categories</b>	<b>T1=14 T2=16</b>	<b>T1=16 T2=20</b>	<b>Nes (Nss)</b>
<b><i>Prior Substance Use</i></b>			
Tobacco use	.21	.33	106 <sup>(25)</sup>
Alcohol use	.32	.43	425 <sup>(101)</sup>
Marijuana use	.23	.35	152 <sup>(39)</sup>
Mixed substance use	.15	.28	55 <sup>(20)</sup>
<b><i>Antisocial Behavior</i></b>			
Delinquent/illegal behavior	.34	.29	82 <sup>(18)</sup>
Violence/aggression	.31	.26	17 <sup>(4)</sup>
Low level problem behavior	.34	.28	47 <sup>(18)</sup>



**Within a risk category, micro constructs have about the same risk-outcome correlations: E.g., drug exposure and peer influences as predictors of alcohol use**

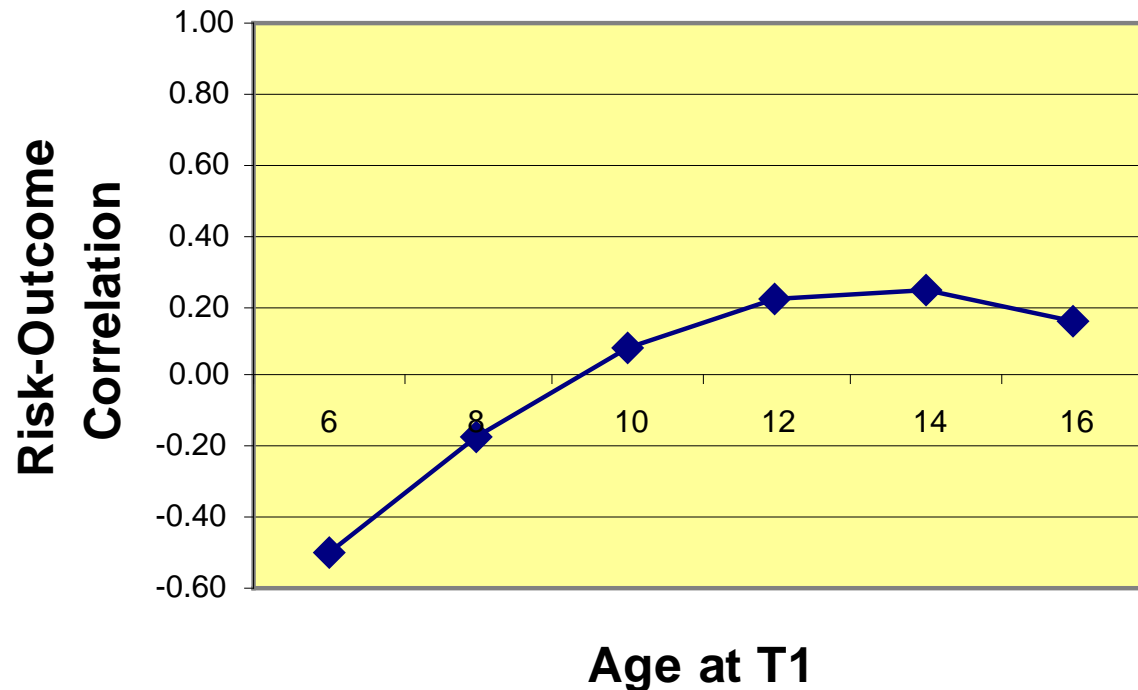
<b>Risk Constructs &amp; Categories</b>	<b>T1=14 T2=16</b>	<b>T1=16 T2=20</b>	<b>Nes (Nss)</b>
<b><i>Drug Exposure &amp; Attitudes</i></b>			
Availability of drugs	.25	.21	9 <sup>(3)</sup>
Drug attitudes	.22	.17	214 <sup>(44)</sup>
Intention to use drugs	.34	.30	14 <sup>(4)</sup>
Family antisocial behavior/su	.22	.18	125 <sup>(30)</sup>
<b><i>Peer Behaviors &amp; Influences</i></b>			
Peer school performance	.29	.33	23 <sup>(8)</sup>
Peer antisocial behavior/su	.32	.36	62 <sup>(17)</sup>
Peer substance use orientation	.28	.32	174 <sup>(50)</sup>

# Risk age differences: For prior SU, risk at later ages is stronger predictor of mixed SU



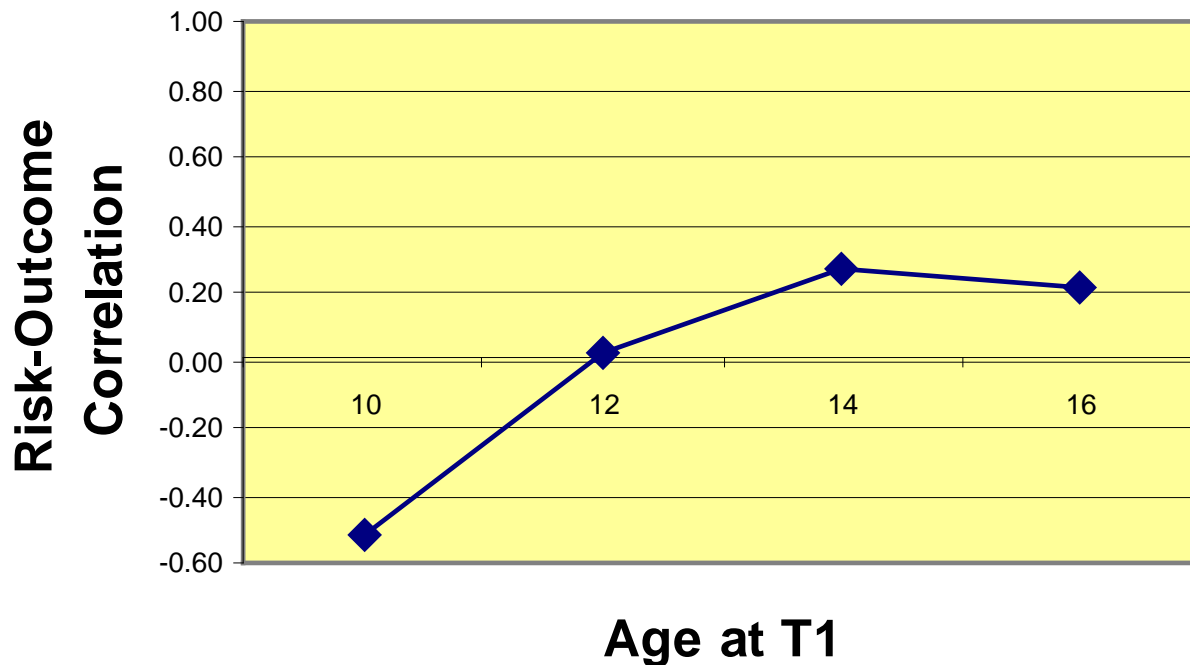
# Drug exposure risk at later ages is a stronger predictor of mixed SU

Drug exposure/attitudes predicting mixed SU at age 18

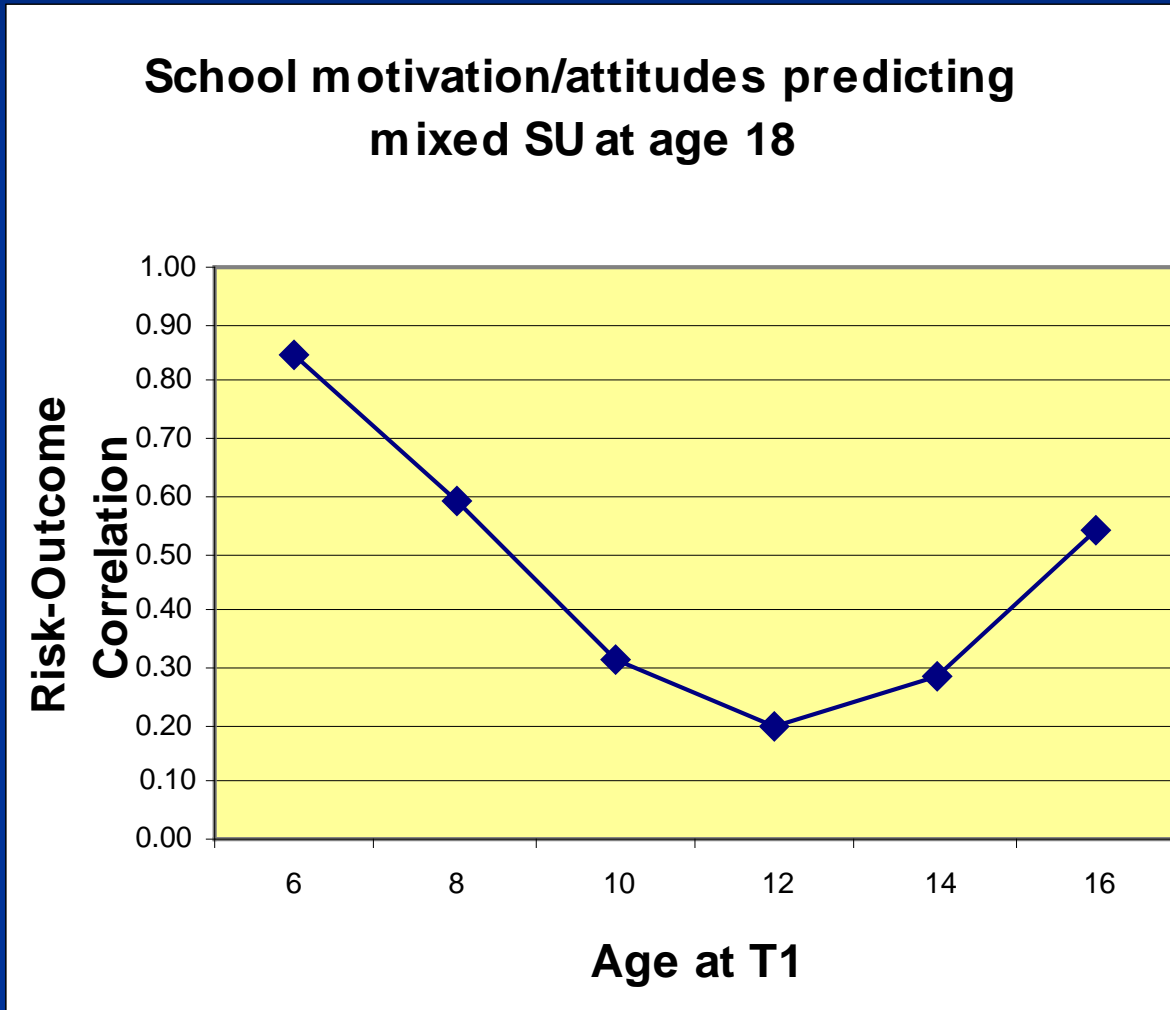


# Peer influence at later ages is a stronger predictor of mixed SU

Peer behavior/influences predicting mixed SU at age 18



# School motivation at earlier ages is a stronger predictor of mixed SU



# **Predictive Risk Factors for Antisocial Behavior**

# Data available from the meta-analysis

- 225 studies reporting 11,388 longitudinal correlations between a risk variable and an antisocial behavior variable measured later
- Sample characteristics
  - 67% primarily white, 18% primarily minority
  - 47% primarily low/working class, 24% primarily middle class
  - Mean proportion male = .57
  - Mean age at first wave = 10.1
  - Mean interval between waves = 32 mos.
- Major sources for the risk and outcome measures
  - Child reports: 43% of the risk measures and 38% of the outcome measures
  - Teacher reports: 11% of the risk measures and 24% of the outcome measures

# Identifying the construct categories for antisocial behavior outcomes

- Antisocial behavior (ASB) measures inductively sorted into categories based on conceptual similarity
- MR models used to standardize cross-sectional correlations between different ASB measures for a consistent profile of sample and measurement characteristics
  - Age, gender, SES, ethnicity, risk
  - Source (child, parent, etc.), scaling (binary, continuous)
- Mean cross-sectional correlations across constructs examined to ensure that inclusion in the same construct category is empirically justified



# Antisocial behavior outcome constructs

Constructs & construct categories	Mean cross-construct correlation	Constructs & construct categories	Mean cross-construct correlation
<i>Delinquency/Illegal Behavior</i>	.30	<i>Problem Behavior</i>	
		Aggression & disruption	.33
<i>Violence/Aggression</i>		Disruptive behavior	.34
Violence	.41	School adjustment	.33
Aggressive behavior	.32	Anger, hostility	.35
		CBCL delinquency	.29

# Number of Longitudinal Correlations in Major Risk Categories Predicting Antisocial Behavior Outcomes

Risk Variable Category	Antisocial Behavior Outcome		
	Delinquency/ Illegal Behavior	Violence/ Aggression	Problem Behavior
Prior antisocial behavior	793	559	1974
Substance use	154	62	28
Drug exposure & attitudes	185	49	28
School motivation & attitudes	320	84	386
Peer behavior & influences	343	90	35
Parenting behaviors	647	207	1264

# Adjustments to the longitudinal correlation coefficients

- Step 1: MR models used to produce standardized longitudinal correlation coefficients for a consistent profile of measurement characteristics:
  - Scaling (e.g., dichotomous, continuous)
  - Reporting source (e.g., self vs. parent)
  - Form of data collection (e.g., standardized test, observation)
- Step 2: Second stage MR models used to predict the standardized correlation coefficients from age, age<sup>2</sup>, interval between waves, and age\*interval for each combination of risk-outcome categories
- Risk-outcome correlations for given Time 1 and Time 2 ages estimated from the second stage models

# Mean correlations between major risk categories at age 11 and ASB outcomes at 16

Risk Construct Category	Antisocial Behavior Outcome		
	Delinquency/ Illegal Behavior	Violence/ Aggression	Problem Behavior
Prior antisocial behavior	.32	.73	.19
Substance use	.54	.48	.27
Drug exposure & attitudes	.17	.12	.19
School motivation & attitudes	.33	.33	.34
Peer behaviors & influences	.18	.35	.37
Parenting behaviors	.18	.22	.40

<sup>a</sup> Estimated from weighted regression models that included age at Time 1, age<sup>2</sup>, Time 1-Time 2 interval, and age\*interval; means calculated from the models for age= 11 and interval= 5 (age 16).

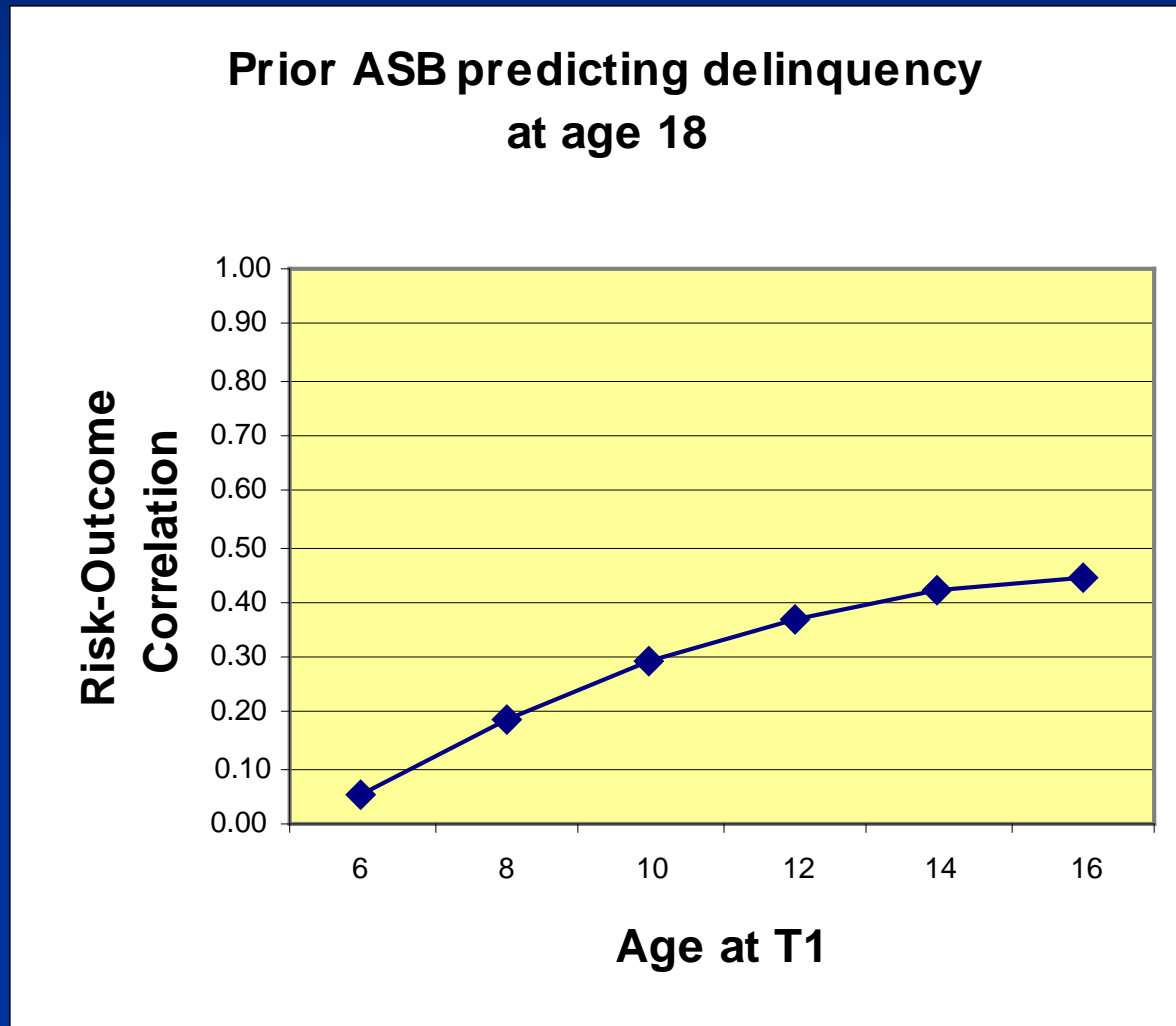
# Within a risk category, micro constructs have about the same risk-outcome correlations: E.g., Prior ASB and SU as predictors of Delinquency/Illegal Behavior

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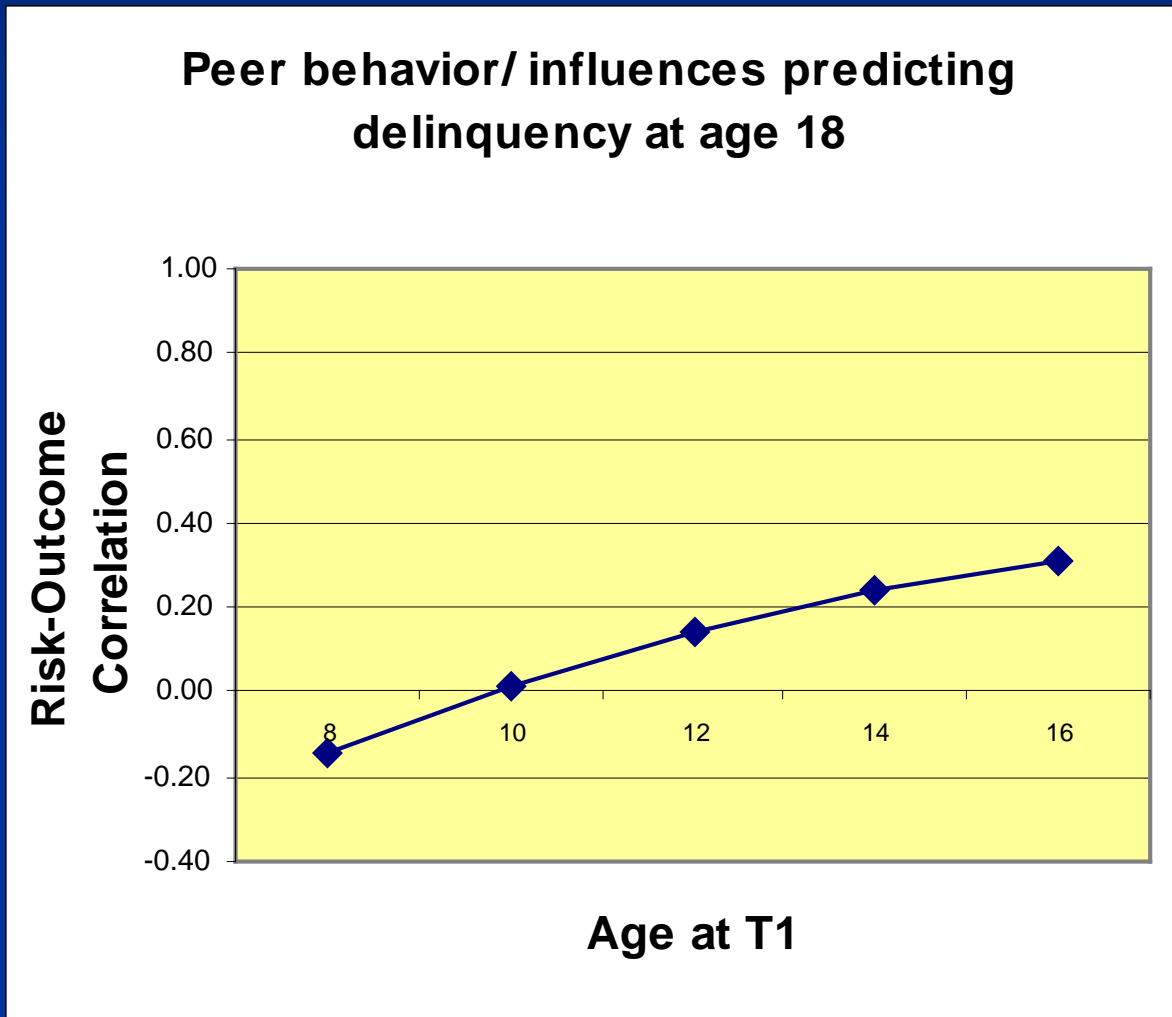
<b>Risk Constructs &amp; Categories</b>	T1=11 T2=16	T1=16 T2=20	Nes (Nss)
<b>Prior Antisocial Behavior</b>			
Delinquency/illegal behavior	.33	.31	479 (106)
Violence/aggression	.30	.29	62 (15)
Low level problem behavior	.30	.29	188 (48)
<b>Substance Use</b>			
Alcohol use	.56	.28	51 (12)
Marijuana use	.55	.27	41 (6)
Mixed substance use	.51	.22	60 (14)

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# Risk age differences: For prior ASB, risk at later age is stronger predictor of delinquency

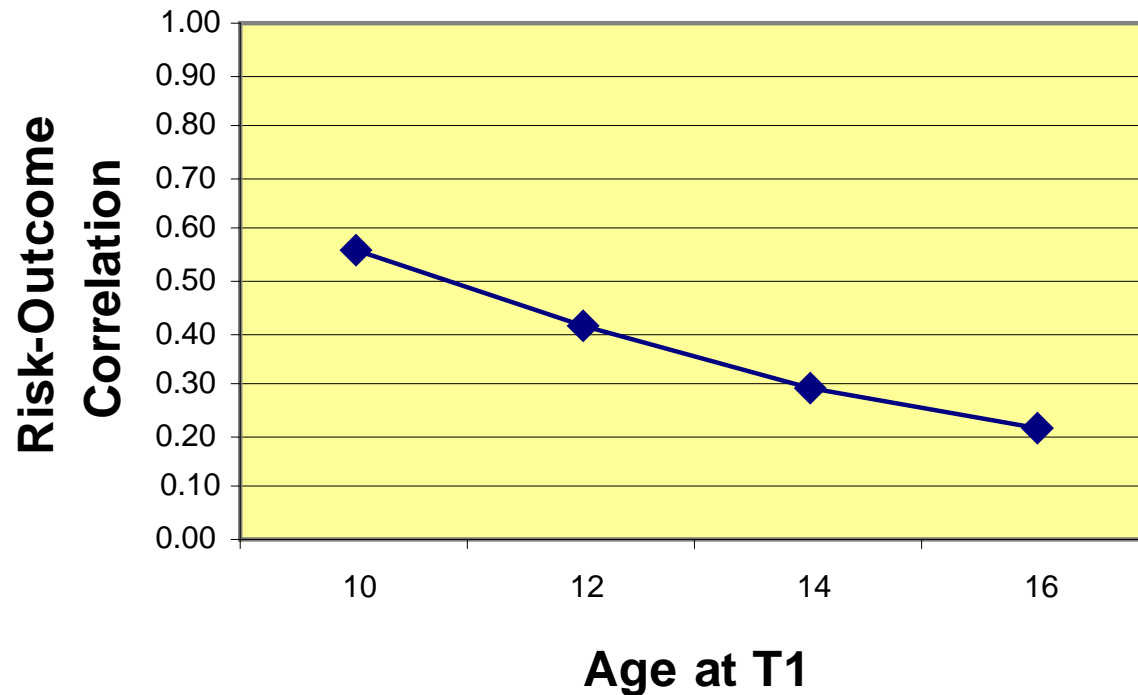


# Peer influence at later ages is a stronger predictor of delinquency



# Substance use at earlier ages is a stronger predictor of delinquency

Substance use predicting delinquency at age 18





# Parenting at earlier ages is a stronger predictor of delinquency

Parenting practices predicting delinquency at age 18

