

**Emotion-Related Self-
Regulation: Conceptualualization
and Relations to Socioemotional
Functioning**

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Emotion-related self-regulation

processes used to manage and change if, when, and how (e.g., how intensely) one experiences emotions and emotion-related motivational and physiological states, as well as how emotions are expressed behaviorally generally in the service of biological or social adaptation and/or accomplishing goals



Emotion-related self-regulation occurs at several levels:

- *sensory receptors (input regulation):*
control of perceptual & experiential input through processes such as attention shifting/focusing and selection or modification of contexts that the individual encounters (e.g., turn away from frightening movie or a shy person selecting not to attend a social event)

▪ *central level where information is processed and manipulated:*

modifying the meaning and significance of events or experiences in one's mind (e.g., positive cognitive restructuring—when one reinterprets events in a positive light)

■ *response selection (output regulation)*

■ changing or selecting behavioral responses (e.g., facial expressions) that stem from, or are associated with, internal emotion-related psychological or physiological states

(Campos et al., 1994)

Distinction: Control vs. Self-Regulation

- overlapping constructs but not identical
- control = inhibition
- self-regulation includes voluntary self-control as well as other abilities (e.g., activation control)



- **well-regulated people have the ability to respond to the ongoing demands of experience with a range of responses that are socially acceptable and sufficiently flexible to allow for spontaneity as well as for the delay of spontaneous reactions as needed (Cole et al., 1994)**
- **self-regulation usually (not always) is adaptive; control can be adaptive or maladaptive, but high levels of control or undercontrol often are not adaptive**

- **self-regulation is built on what Rothbart has labeled as temperamental *effortful control***
 - **"the efficiency of executive attention, including the ability to inhibit a dominant response and/or to activate a subdominant response, to plan, and to detect errors"** (Rothbart & Bates, 2006)
 - **involves attentional regulation (e.g., executive attention), behavioral regulation, & planning**
 - **effortful, willful, and voluntary, albeit often fairly automatic**

Less Voluntary or Reactive Control

- some aspects of control, or the lack thereof, seem relatively involuntary or so automatic that they are difficult to bring under voluntary control
- called *reactive control*; reflects motivational tendencies (e.g., approach and avoidance) & associated behavior
- the distinction between effortful & reactive control systems is similar to distinctions discussed by Nigg, Carver (impulse vs. constraint), Mischel (hot vs. cold systems), Hofmann (impulse vs. self-control) (also recent work by Zelazo, Blair, Bunge, etc.)

Types of reactive control

- ***reactive undercontrol***: impulsivity, pulled by environmental rewards/cues; approach to appealing objects without much thought
- ***reactive overcontrol***: rigid, constrained behavior, often inflexible, such as behavioral inhibition (Kagan; Note: this is not inhibitory control)
 - e.g., children who are timid, constrained, and lack flexibility in novel situations
- reactive under/overcontrol is not necessarily totally involuntary, but seems to be more difficult to willfully modulate

Neurological correlates of effortful control and more reactive control (or the lack thereof) likely differ

- **effortful control believed to be based in the anterior cingulate gyrus (Posner) and prefrontal cortex (e.g., right ventrolateral prefrontal cortex)**
- **Gray and others have argued that reactive systems are associated especially with subcortical systems**
 - **but also complex involvement of parts of the cortex**

What is measured to assess emotion-related self-regulation and effortful control in children?

- many constructs and methods....
- typically use adults' reports or self-reports on questionnaires or behavioral measures of self-regulation, delay of gratification, and/or aspects of executive functioning (especially executive attention)

Sample items/measures

Executive attentional control – the ability to voluntarily focus and shift attention as needed

“Becomes very absorbed in what s/he is doing, and works for long periods”

“Has an easy time leaving play to come to dinner”

Rothbart's Child Behavior Questionnaire

Behavioral tasks: Stroop or computer tasks involving focusing & shifting attention, ignoring distractors

Inhibitory control – the capacity to suppress inappropriate responses

“Can lower his/her voice when asked to do so”

“Can wait before entering new activities if s/he is asked to” (Rothbart et al., 2001)

Or tasks such as Simon Says; also “don’t look” and delay of gratification tasks, knock/tap (also some attentional tasks are viewed as involving mental inhibitory control)

Activation control – the capacity to perform an action when there is a tendency to avoid it

“When asked to do something, does it right away, even if s/he doesn’t want to”

Behavioral tasks? Tasks that assess persistence on boring task



- **child must put her hands on the mat and wait to take candy under a see-through plastic cup until the adult rings a bell; the trials get longer over time**



- **the child has to move plastic figurines (a child, a rabbit, and a turtle) down the path to “home,” while staying on the path**
- **the child first does this with a same-sex figure of a child, then the fastest rabbit in the world (so the child should move fast) and the slowest turtle in the world (so should move slowly)**
- **how well the child stays on the path & also the difference between the fast rabbit time and the slow turtle time are assessed**



- **child first knocks on the table when the experimenter knocks on the table & taps on the table when the experimenter taps**
- **then the child has to knock on the table when the experimenter taps and tap on the table when the experimenter knocks**
 - **these are the critical trials; this is a common executive functioning task**

Can we differentiate between effortful & reactive control?

- in 3 studies, we have found separate latent constructs for the two constructs for preschoolers and school-aged children (e.g., Eisenberg et al., 2004, *CD*; Valiente et al., 2003, *J. of Personality*)
- at 30 months, cannot differentiate reactive overcontrol from undercontrol, but could at 42 and 54 months (Eisenberg et al., 2013, *DP*)

Development of Effortful Control

- the abilities to regulate attention and behavior improve some in infancy but are still immature at 24 months
- there is a dramatic improvement in these abilities in the 3rd year of life
- these skills are fairly well developed by 4 or 5 years but continue to improve across childhood, in adolescence (with continued prefrontal cortex development), and into adulthood

How might one think about individual differences in emotion-related self-regulation, including various types of effortful control, and their implications for (mal)adjustment?

Heuristic Styles of Control: Highly Inhibited

- high in less voluntary reactive overcontrol (e.g., behavioral inhibition)
- average or slightly low in the ability to effortfully inhibit behavior (i.e., inhibitory control)
- relatively low in effortful attentional control (used to modulate negative emotion)

- **low in the ability to effortfully activate behavior as needed (activational control) and in planful active coping**
- **prone to internalizing problems (e.g., anxiety, depression, social withdrawal), especially if predisposed to negative emotionality (Eisenberg & Morris, 2002)**



Undercontrolled

- low in all types of effortful control (e.g., attentional, inhibitory, activational, planning)
- low in reactive overcontrol & high in reactive approach tendencies (impulsivity)
- relatively low in social competence and prone to externalizing problems



Optimally Regulated

- high in various modes of effortful control
- in regard to reactive control, neither overcontrolled nor undercontrolled
- well adjusted, socially competent, and resilient to stress



Hypothesized Relations of Effortful and Reactive Control To Adjustment

- externalizing problems are linked to *low* effortful control (of all types) and high reactive undercontrol/impulsivity
- internalizing problems associated with *low* attentional and activation effortful control and *high* reactive overcontrol (or low impulsivity) (not behavioral inhibitory control)

Empirical findings

- **effortful control (EC) has been associated with a wide range of positive child outcomes:**
 - **low externalizing & internalizing problems (somewhat mixed findings for the latter)**
 - **higher social competence**
 - **higher conscience, prosocial development, and sympathy**
 - **school performance/engagement**

- **need to look at different components of EC/self-regulation, unique effects of EC and reactive control; mediators; important to use multiple reporters/methods and longitudinal data**

Examples of relevant work from other labs

- Kochanska--observed effortful control & reported child inhibitory control in the early years predict internalized compliance, moral behavior and moral reasoning, lower anger, and better adjustment
- Mischel--ability to delay gratification (often through attentional mechanisms) predicted positive outcomes a decade or two later (e.g., academic & social competence, coping with frustration/stress, drug issues)

Relations with different types of effortful control (Eisenberg et al., 2001, *CD*)

- **4.5- to 7-year-olds with externalizing &/or internalizing problems or nondisordered**
- **mothers', fathers', and teachers' reports of externalizing & internalizing problems**
- **parents' and teachers' report of EC**
- **observed measures of EC (sitting still when hooked to physiological equipment and left alone, facial/behavioral reactions to a disappointing prize, persisting at a difficult task; on the last task)**





Constructed 4 groups of children

- **Externalizing: high in externalizing but not internalizing problems**
- **Internalizing: high in internalizing but not externalizing problems**
- **Co-occurring: high in both externalizing & internalizing problems**
- **Control/nondisordered: below borderline clinical levels in both externalizing & internalizing**

Pure externalizing or co-occurring children compared to non-disordered children (age 5-7 years)

- lower in attention shifting & attention focusing
- lower in inhibitory control
- higher in impulsivity
- less regulated on observed tasks
 - had more difficulty than controls sitting still when asked and in persisting on puzzle task
- strong pattern found across reporters & measures

Internalizing children as compared to non-disordered children.....

- somewhat lower in attention shifting and attention focusing
- much lower in impulsivity
- about the same in reported inhibitory control
- not less regulated on observed tasks

- **EXTs low in attentional *and* inhibitory control and high in impulsivity/reactive undercontrol**
- **INTs low in reactive undercontrol (i.e., low impulsivity) and low in effortful attentional control (but not inhibitory control)**

Externalizing: 2- and 4-year follow-up

- **externalizing problems still clearly linked to low effortful control and high impulsivity**
 - **change in externalizing status related to change in effortful control and impulsivity (in predictable ways)**

Internalizing: 2- and 4-year follow-up

- internalizing no longer associated with problems in attentional regulation (and still not associated with deficits in inhibitory control)
- internalizers still low in impulsivity
 - change in internalizing status linked to change in impulsivity and, 4 years later, attentional control (Eisenberg et al., 2005, 2009, *DP*)

Do we see the same patterns in other countries?

...there are some findings similar to those reported in other US labs and in Europe (e.g., Oldehinkel's and Muris' research)

involved in 2 studies in Beijing with 1st & 2nd graders; 3.5 year follow-up in one study

In China: both internalizing & externalizing symptoms related to low attention focusing & low inhibitory control (Eisenberg et al., 2007, *D & P*; Zhou et al, 2004, *DP*; Zhou et al., 2008, *CD*)

- **internalizing group lower than controls & externalizers in impulsivity (Eisenberg, Chang, et al., 2007, *D & P*)**

Additive & mediated relations

Hypothesized and found:

- **at some ages, prediction of socioemotional outcomes is greater when both effortful and reactive control are predictors (unique effects)**
- **personality resiliency--the ability to cope with and rebound from stress--mediates some relations between effortful control and socioemotional functioning**

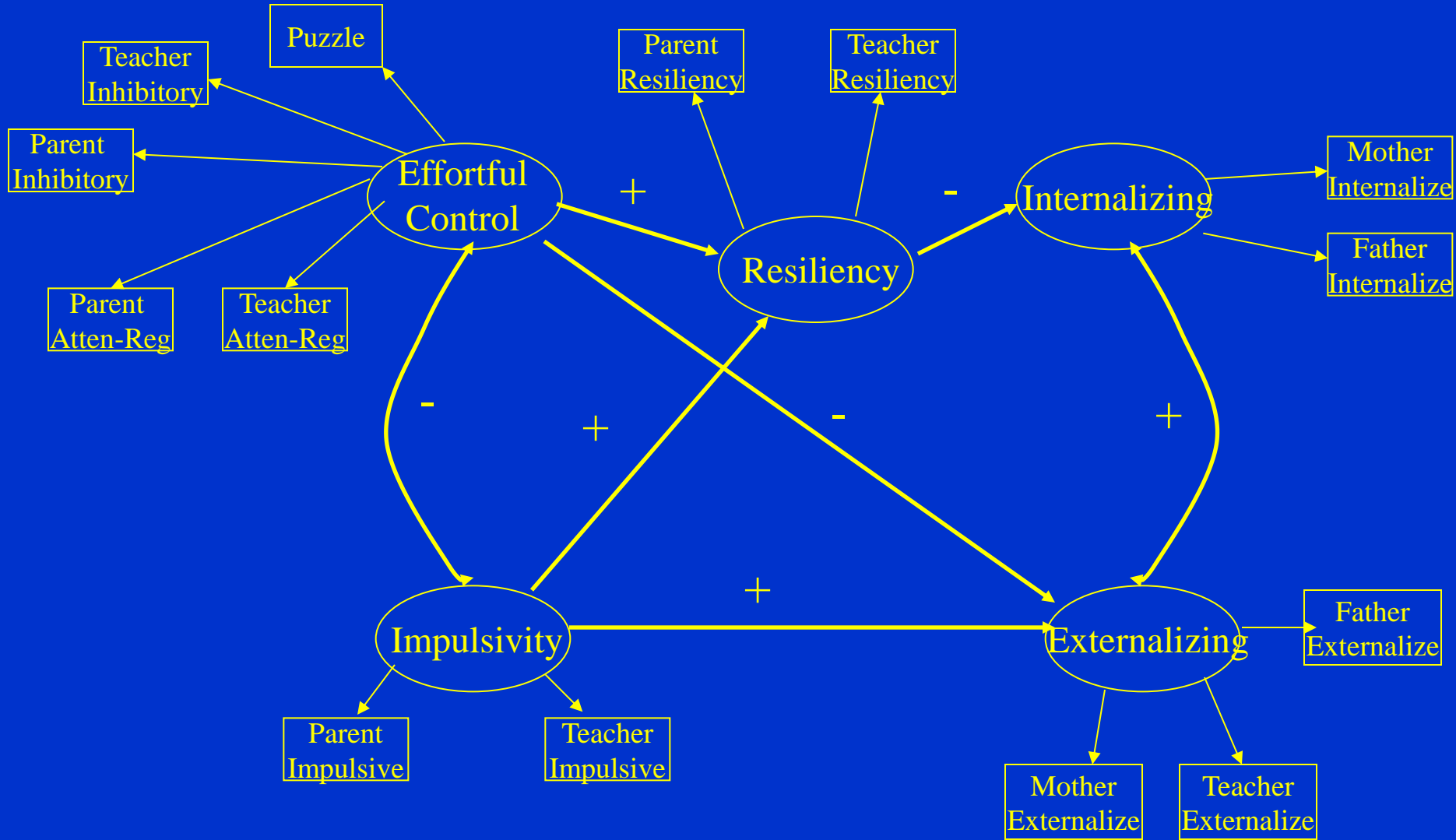
Prediction of maladjustment from EC and reactive control

- in structural equation models (SEMs) predicting maladjustment, resiliency was treated as a mediator between impulsivity or effortful control and internalizing (or externalizing) problems

(Eisenberg, Spinrad et al., 2004, *Child Development*)

- at Time 1 (T1; about age 5-7), EC predicted higher resiliency, which in turn predicted lower internalizing
- EC predicted fewer externalizing problems
- impulsivity predicted more externalizing problems
- impulsivity predicted more resiliency, which predicted fewer internalizing problems

Time 1

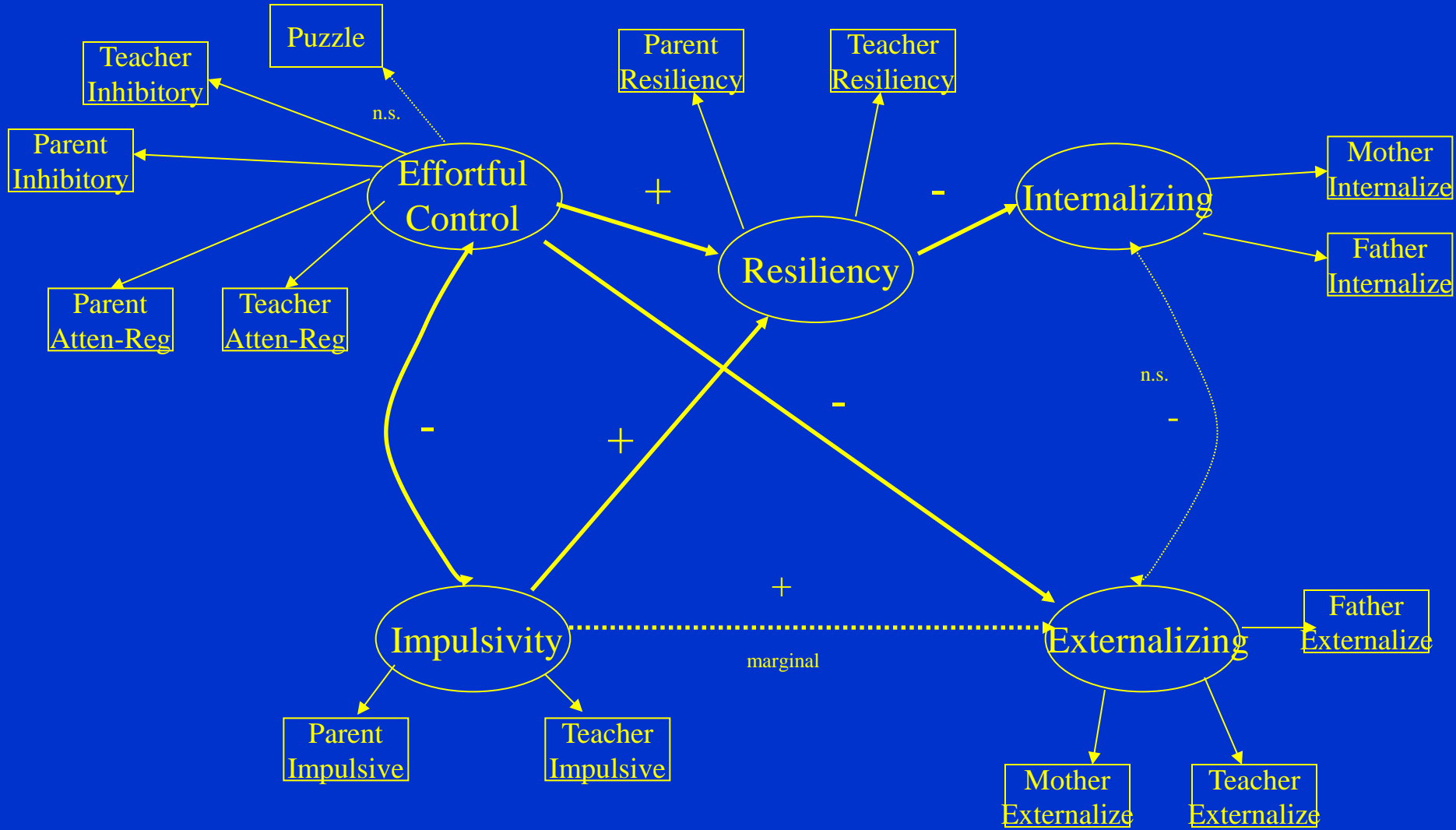


Chisq (52, N=214)=60.017, $p > .208$, CFI= .994;
RMSEA=.027; Eisenberg et al., 2004, *CD*

2 years later at Time 2 (T2)

- same pattern except the relation between impulsivity and externalizing became near significant (although there was a significant zero-order correlation between the two)

Time 2

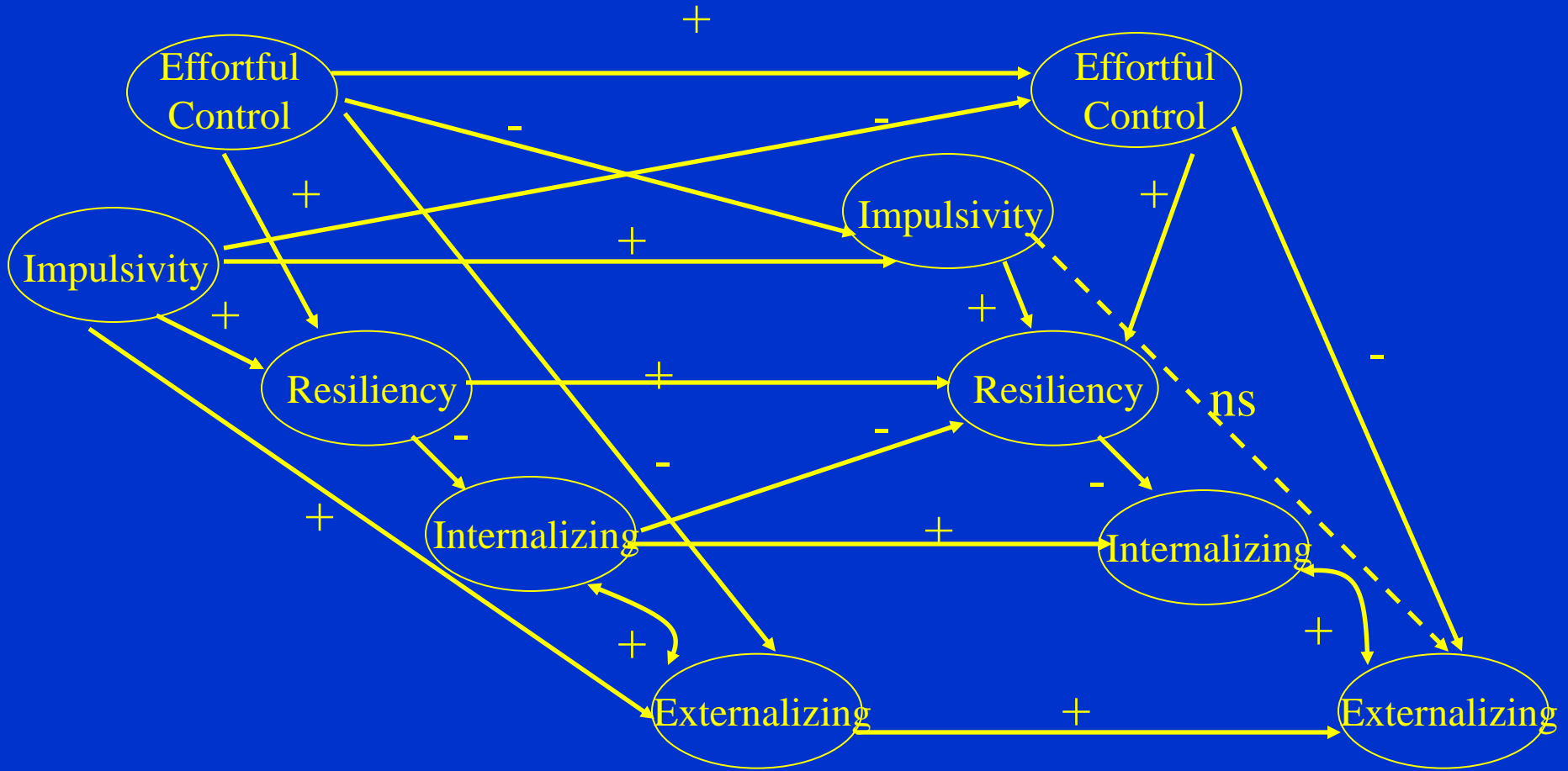


Chisq (55, N=193)=86.846, p>.004, CFI= .974, RMSEA=.055

Longitudinal Model

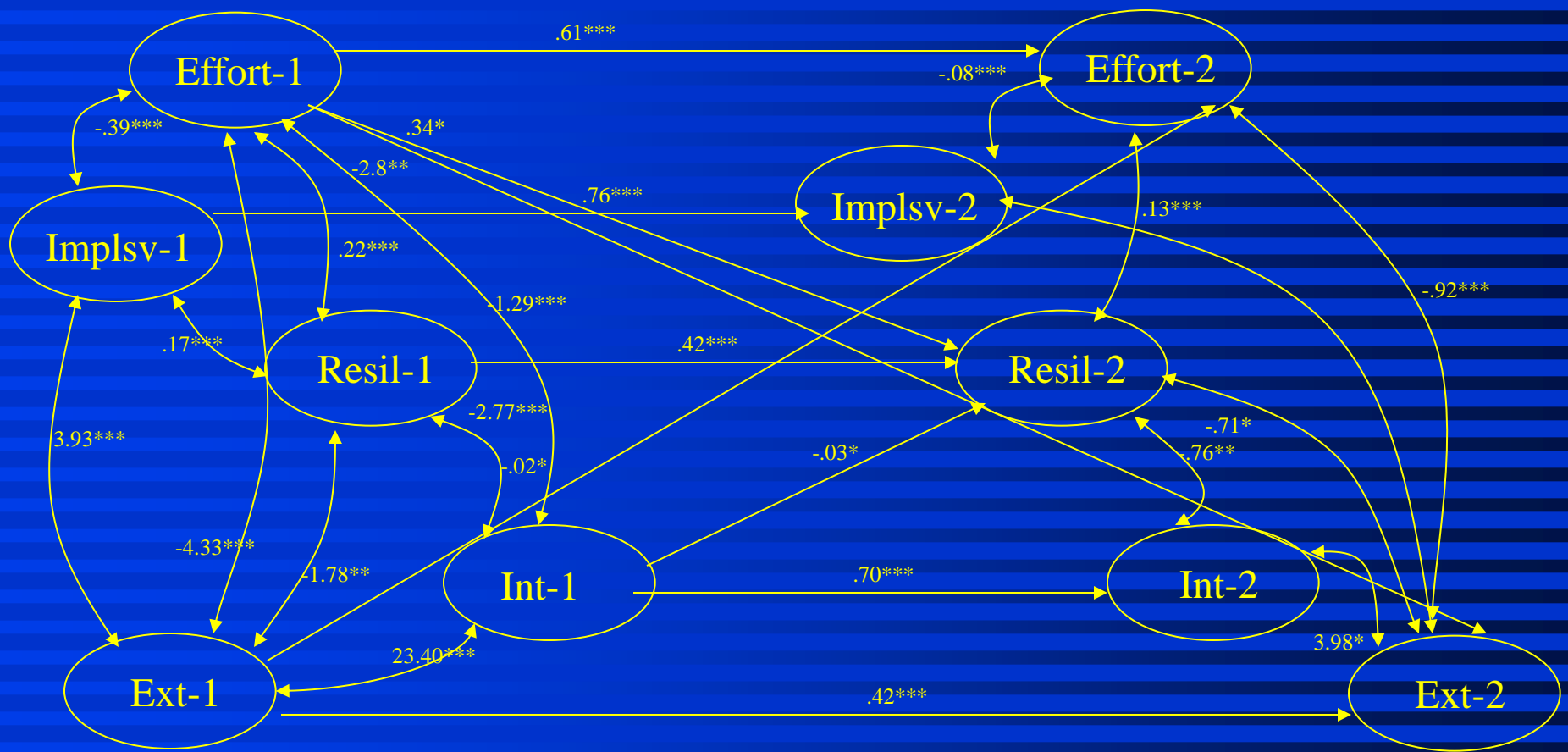
Time 1

Time 2



Chisq (24, n=214)=23.70. $p < .48$; CFI= .1.0; RMSEA = .00.

- **predicted relations held at T2 even when controlling for levels of the various constructs at T1 except the path from impulsivity to externalizing became nonsignificant**
 - **so EC may increasingly modulate the expression of reactivity tendencies**
- **most relations at T2 not due merely to the consistency of relations and variables over time**
- **replicated this pattern for externalizing**



Chisq (9, n=214)=10.59. $p < .30$; CFI= .999; RMSEA = .03.

Evidence of bi-directionality in relations

Similar findings for social competence?

- pattern found at each age (5-7, 9-11) and across 2 years in elementary school
- EC → resiliency → popularity
 - impulsivity was uniquely associated with less popularity over time (Spinrad, Eisenberg, et al., 2006, *Emotion*)
- in preschool years
 - EC → committed compliance (Spinrad, Eisenberg, et al., 2012, *DP*)

- Chinese children high in EC perceived as socially skilled & leaders at school (Zhou et al., 2004, *DP*)
- Indonesia: EC related to low externalizing/high social competence (Eisenberg et al., 2001, *CD*, 2004, *DP*)

■ in an Italian longitudinal sample, teacher-reported EC at age 13 predicted higher prosocial behavior at age 13 and EC predicted a later normative decline in prosocial behavior

- (Kanacri, Pastorelli, Eisenberg, et al. 2013, *Journal of Personality*)

■ and from 16 to 26 years, the relation of EC to prosocial behavior was mediated by ego-resiliency (Alessandri et al., submitted)

Relations with school functioning?

- EC related to greater school liking, better behavior at school, and higher academic performance (e.g., Eisenberg et al., 2010; Valiente et al., 2013)
- the relation of regulation with these outcomes is mediated by relationships with peers and teachers at school and with children's social skills & low levels of externalizing problems

In preschool years:

**regulation → better relationships → school liking
with teachers (Silva et al., 2011)**

In elementary school:

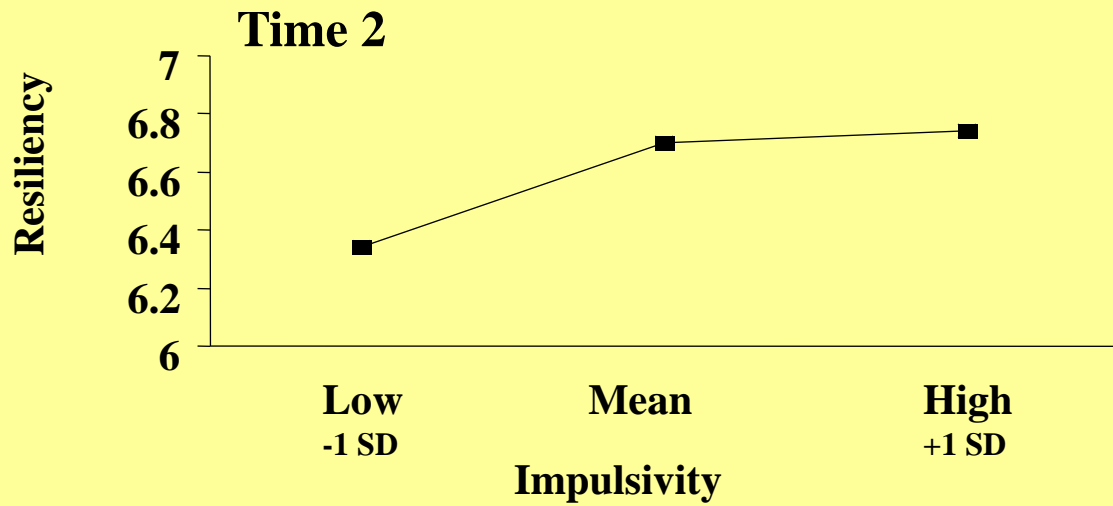
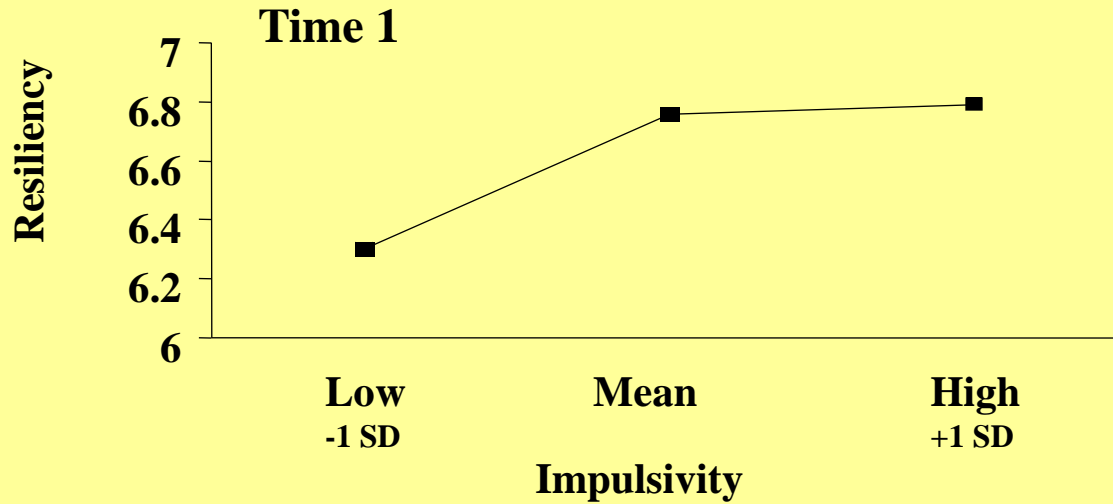
**regulation → social competence/ → better grades
low externalizing
(e.g., Valiente et al., 2011)**

Why is resiliency related to high impulsivity?

Block & Kremen (1996) noted,
"the human goal is to be as undercontrolled as possible and as overcontrolled as necessary. When one is more undercontrolled than is adaptively effective or more overcontrolled than is adaptively required, one is not resilient."

- **effortful control would be expected to relate positively to resiliency (and has been)**
- **high reactive control (overcontrol) expected to predict rigidity & low resiliency**
- **moderate reactive undercontrol (i.e., a bit impulsive & spontaneous) expected to relate positively to resiliency, especially for young children**

- **positive linear relations between reactive undercontrol and resiliency in several samples of young children and quadratic relations in 2 samples (Eisenberg et al., *Self & Identity*, 2002; Cumberland et al., 2004, *Social Development*; Taylor, Eisenberg, et al., 2013)**
- **children low in impulsivity are especially low in resiliency**



- **by mid- to late-elementary school, only the quadratic relation between impulsivity and resiliency remains**
- **by early adolescence, impulsivity modestly negatively related to resiliency**
 - **if the overlapping variance in resiliency predicted by effortful control is controlled, and then the relation becomes positive (Valiente, Eisenberg, et al., 2003, *Journal of Personality*)**

Main findings thus far

- **individual differences in effortful regulation and less voluntary types of control are important predictors of (mal)adjustment and sometimes provide some unique additive prediction**
- **effortful control becomes the stronger unique predictor of externalizing with age**
- **personality resiliency and quality of relationships may be important mediators of relations of EC to child outcomes**

Origins of Self-Regulation

- **strong genetic component to effortful control**
- **however, despite the role of heredity in self-regulation, socialization seems to be important**

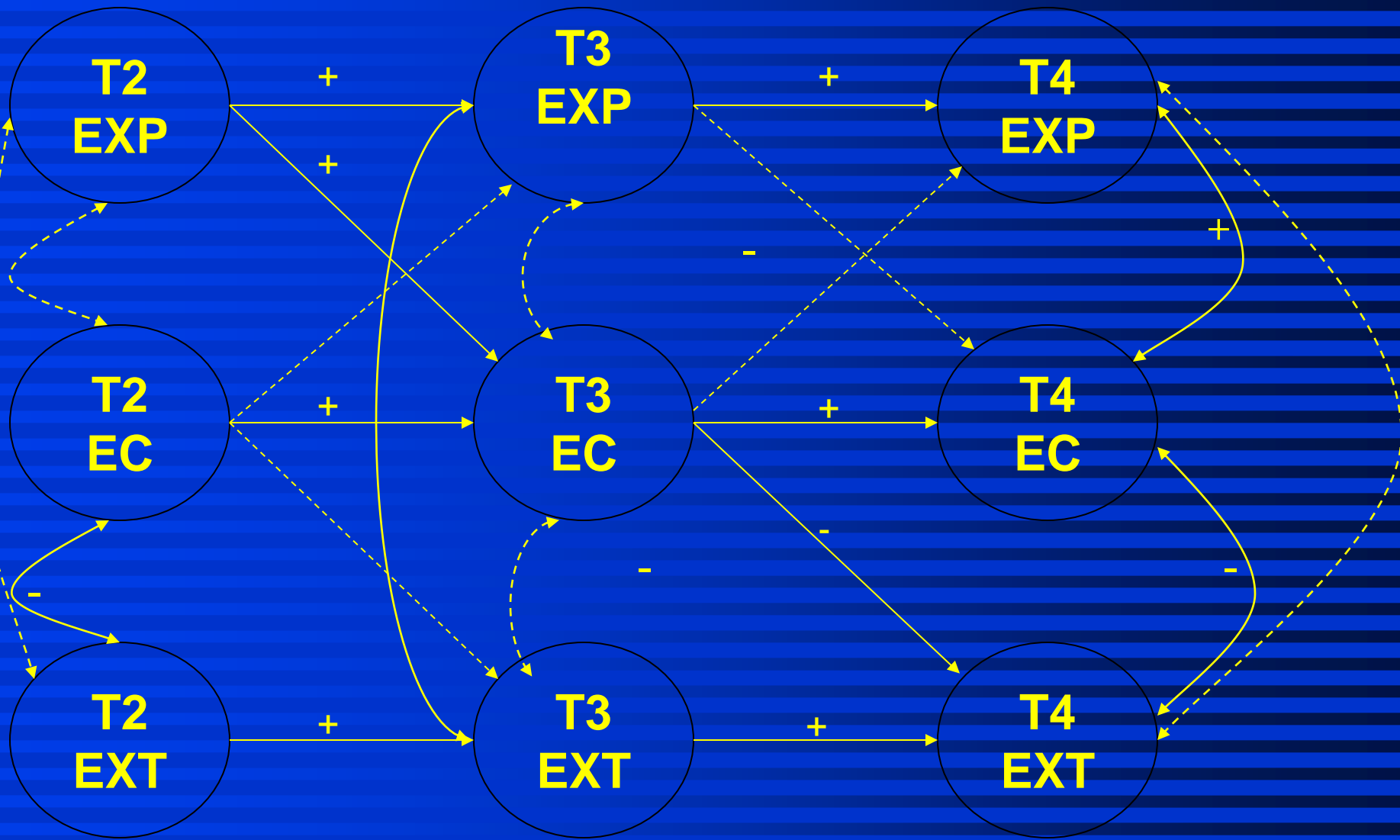
Hypothesized

Optimal socialization → regulation →
adjustment

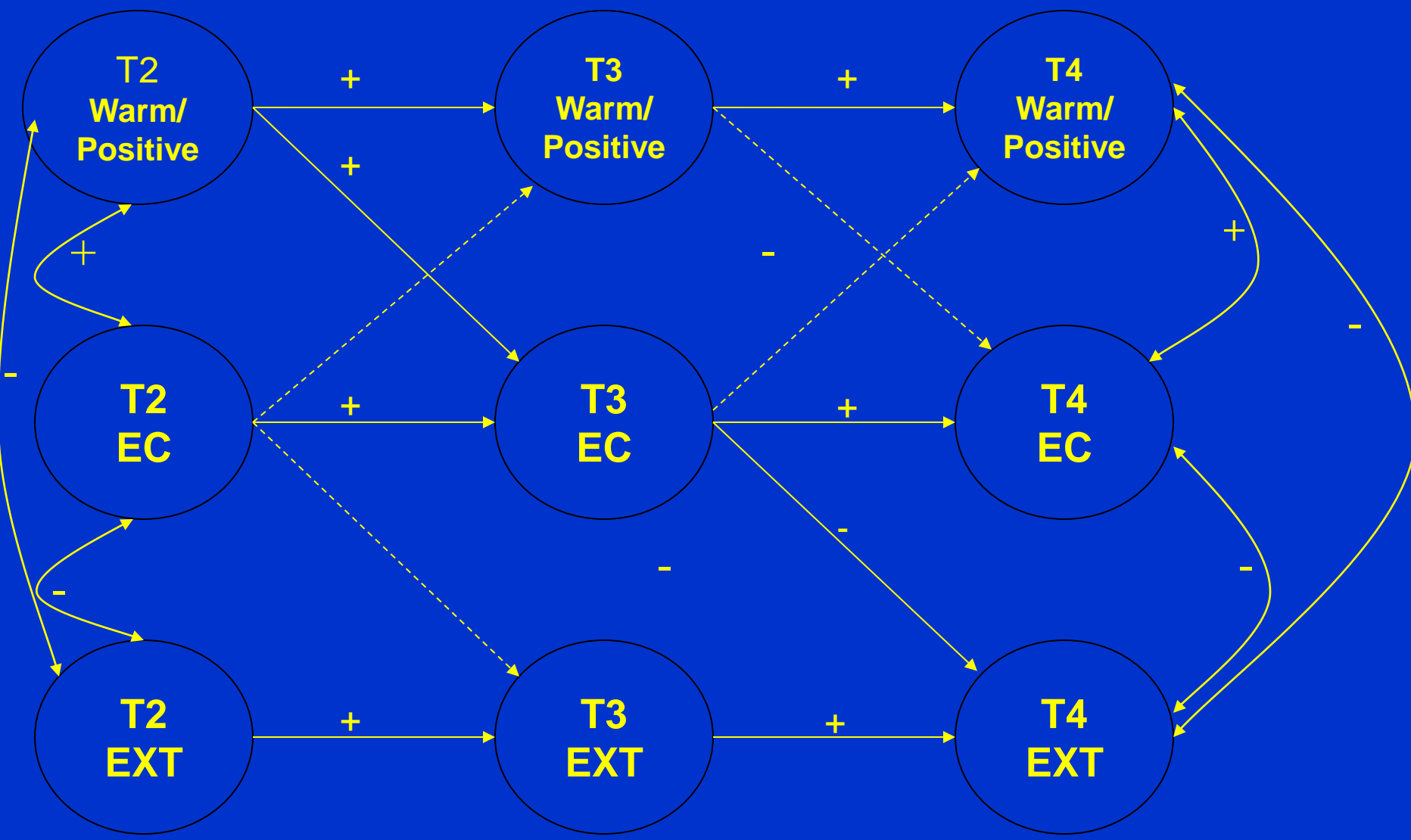
Longitudinal model

- tested mediation using 3 times (2 years apart; starting at 7-9 years)
- high parental positive vs. negative expressivity at T2 predicted high EC at T3, which predicted low externalizing at T4
- EC did not predict parenting across time (Valiente et al., 2006, *Emotion*)





EXT = externalizing; EXP = parent expressivity; EC = effortful control.
 Obtained similar findings for parent-rated internalizing problems

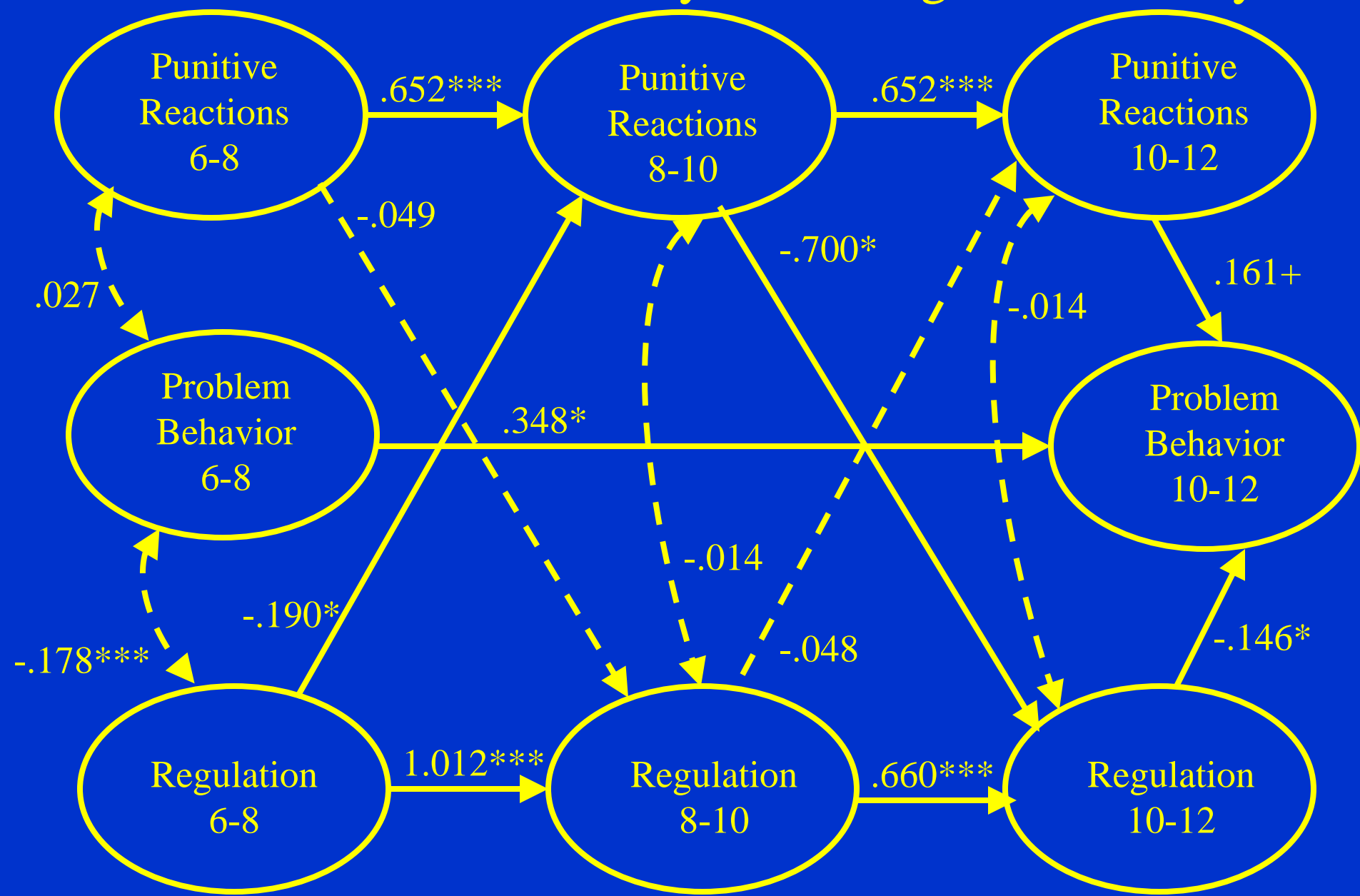


Similar model with unselected school sample and observed parental warmth & positive expressivity (Eisenberg et al., 2005, *CD*)

In a third longitudinal study,

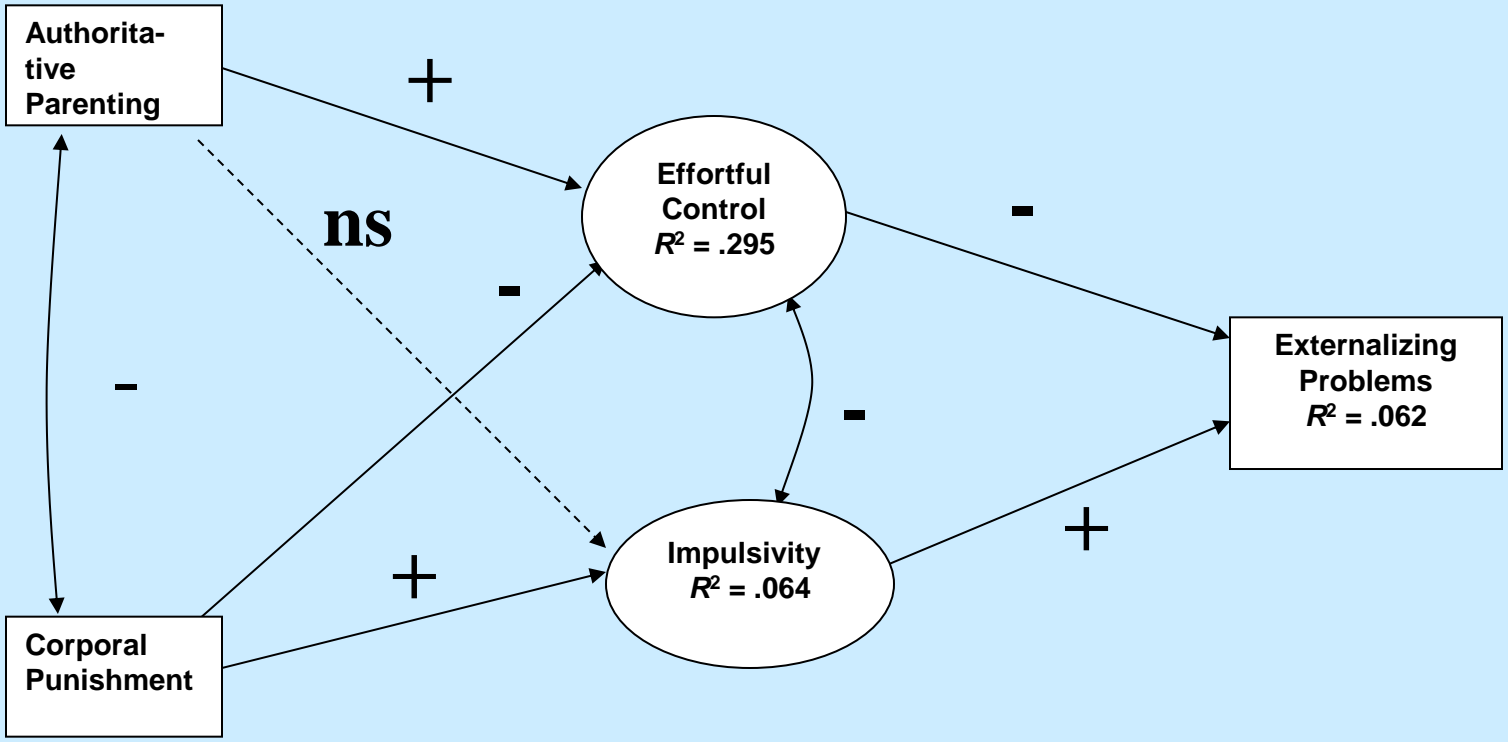
- **found evidence of bidirectional relations between mothers' punitive reactions to children's emotions and children's EC**
 - **and both at least marginally predicted externalizing problems**

Bidirectional Relations: Early U.S. Longitudinal Study



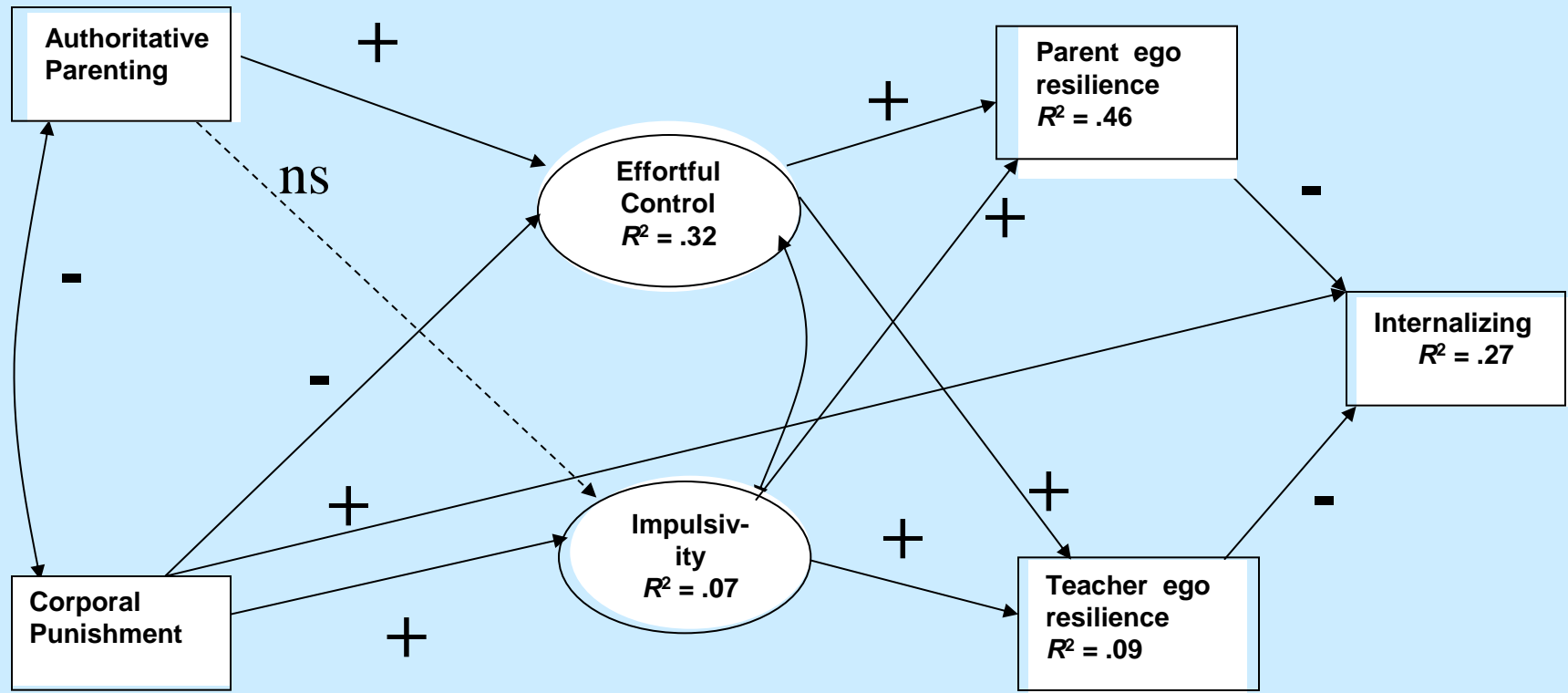
- findings from China for school-aged children consistent with findings in Western countries
- in first study,
 - authoritative parenting (supportive but with reasoned control) and low authoritarian parenting (cold, overly controlling) related to high EC, which in turn predicted low aggression/high socially appropriate behavior (Zhou, Eisenberg, et al., 2004)

- **in a different Chinese sample:**
 - **authoritative parenting and low corporal parenting predicted children's high EC, which in turn predicted low externalizing problems**
 - **corporal punishment predicted impulsivity, which in turn predicted externalizing problems**



Eisenberg, Chang, et al., 2009

Chi-Square = 11.364 ($df=6$), $p=0.0778$, SRMR for within = .005, SRMR for between=0.027, RMSEA=0.038, CFI = 0.993, TLI = 0.974.



$\chi^2(13) = 22.336, p = 0.0504, CFI = 0.992, TLI = 0.976, RMSEA = 0.034, SRMR \text{ for within} = 0.028, SRMR \text{ for between} = 0.002$

Study with 18- & 30-month olds

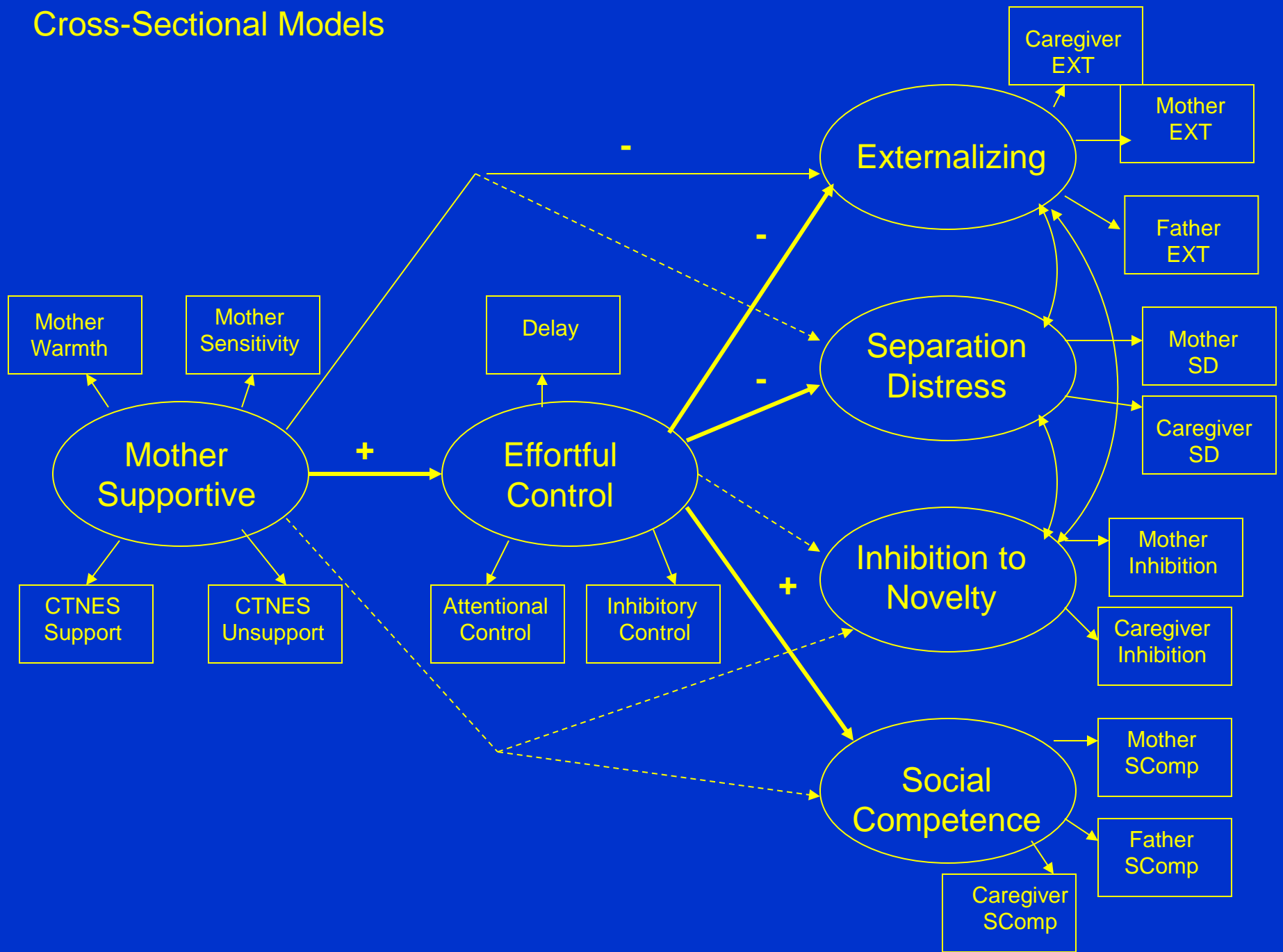
- **parenting: mothers' reports of supportive and unsupportive reactions to their children's negative emotions & observed maternal sensitivity and/or warmth during free-play and teaching interactions**
- **EC: mothers' & caregivers' reports & children's snack delay behavior**
- **adjustment & social competence: mothers', fathers', and caregivers' reports**

- in both 18- and 30-month within-time models,

supportive → EC → low externalizing, low parenting separation distress, & high social competence

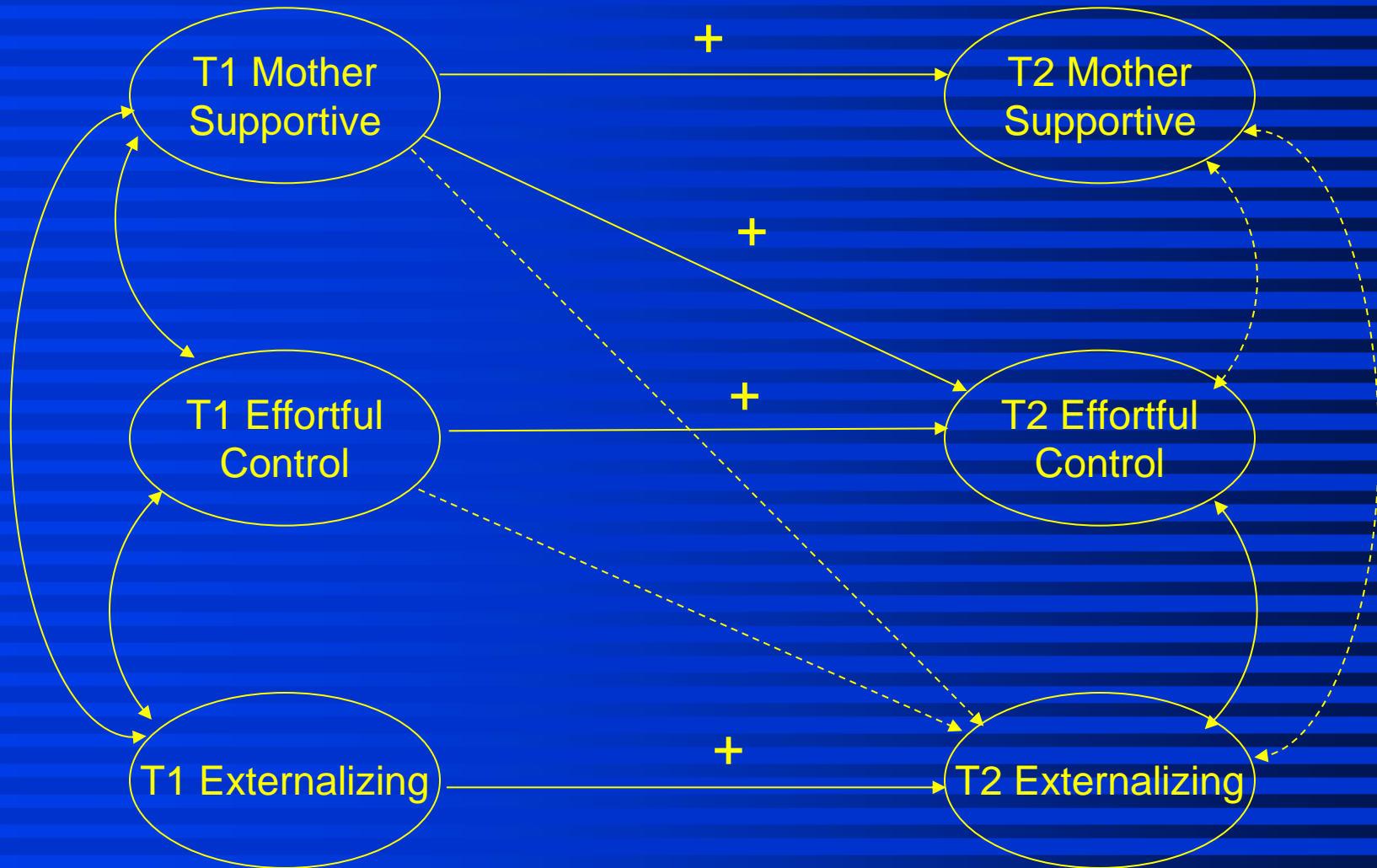
(Spinrad, Eisenberg et al., 2007, *Developmental Psychology*)

Cross-Sectional Models

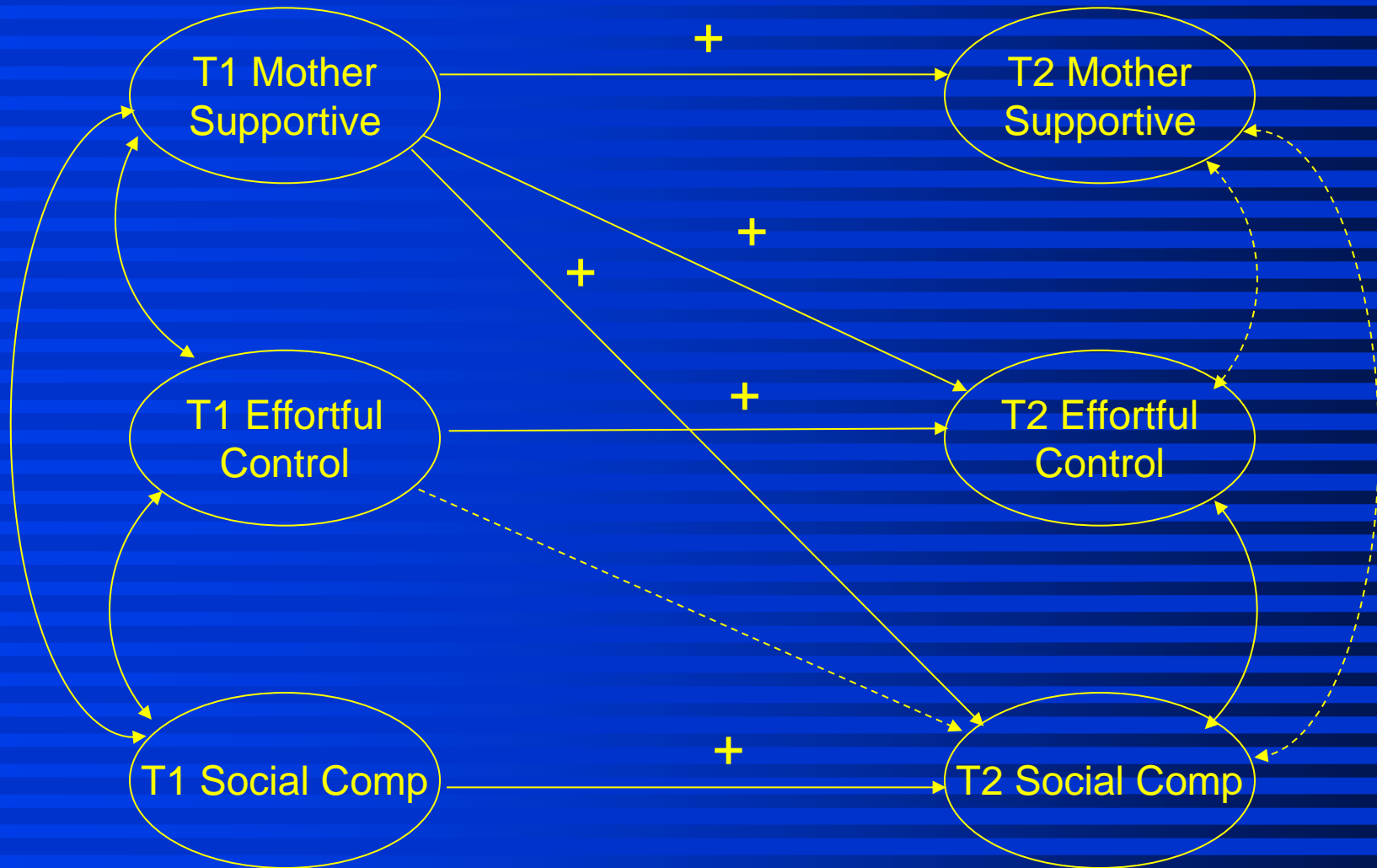


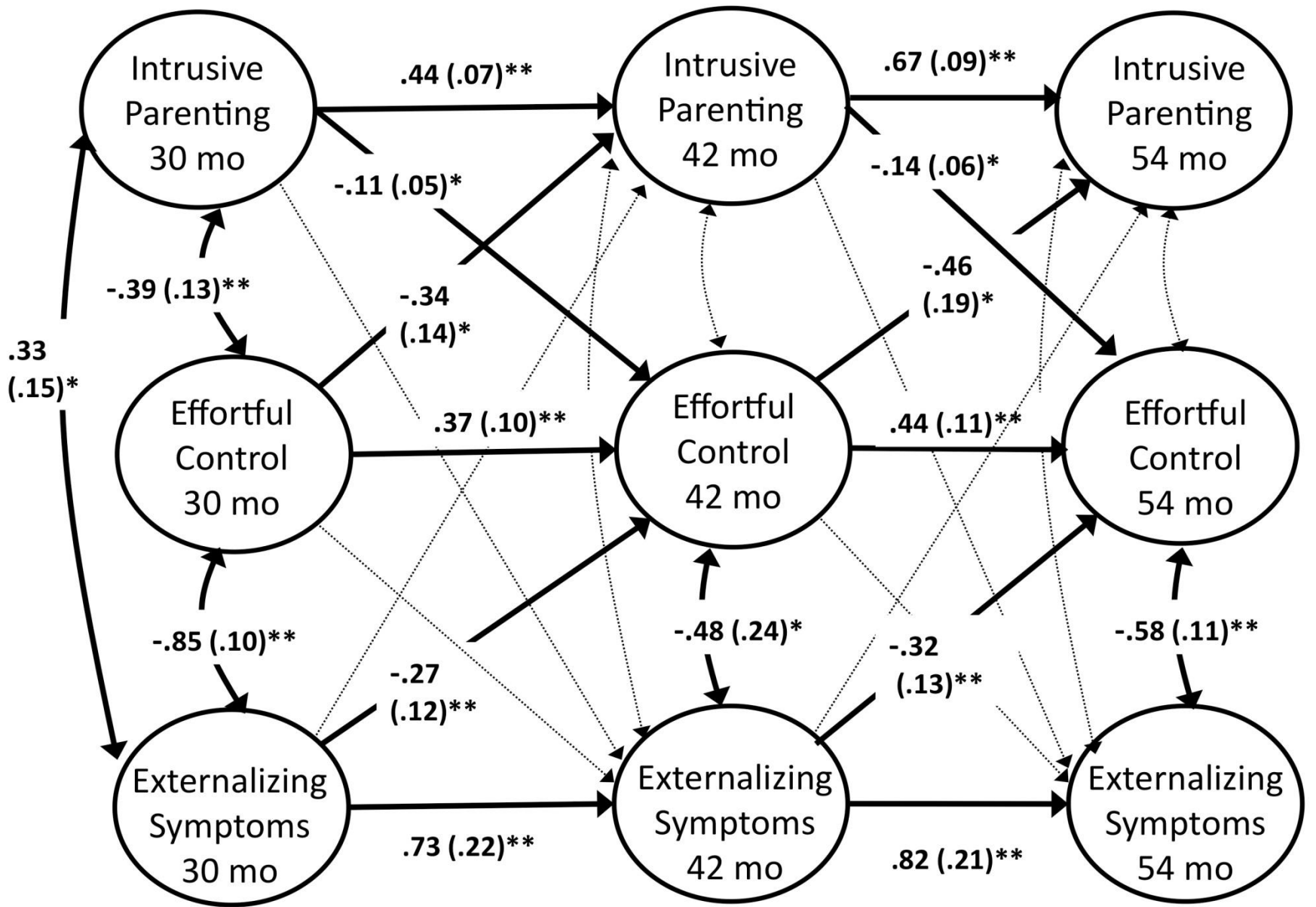
- across one year, supportive parenting predicted high EC when controlling stability and earlier EC
- but EC did not predict maladjustment a year later when controlling for initial levels of the variables at 18 months; the relation was there early and was stable across time (Spinrad, Eisenberg, et al., 2007, *DP*)
- and there were no additional effects of supportive parenting on EC from 30 to 42 months (Eisenberg et al., 2010, *D & P*)

Longitudinal Model for Externalizing Problems: 18 & 30 Months

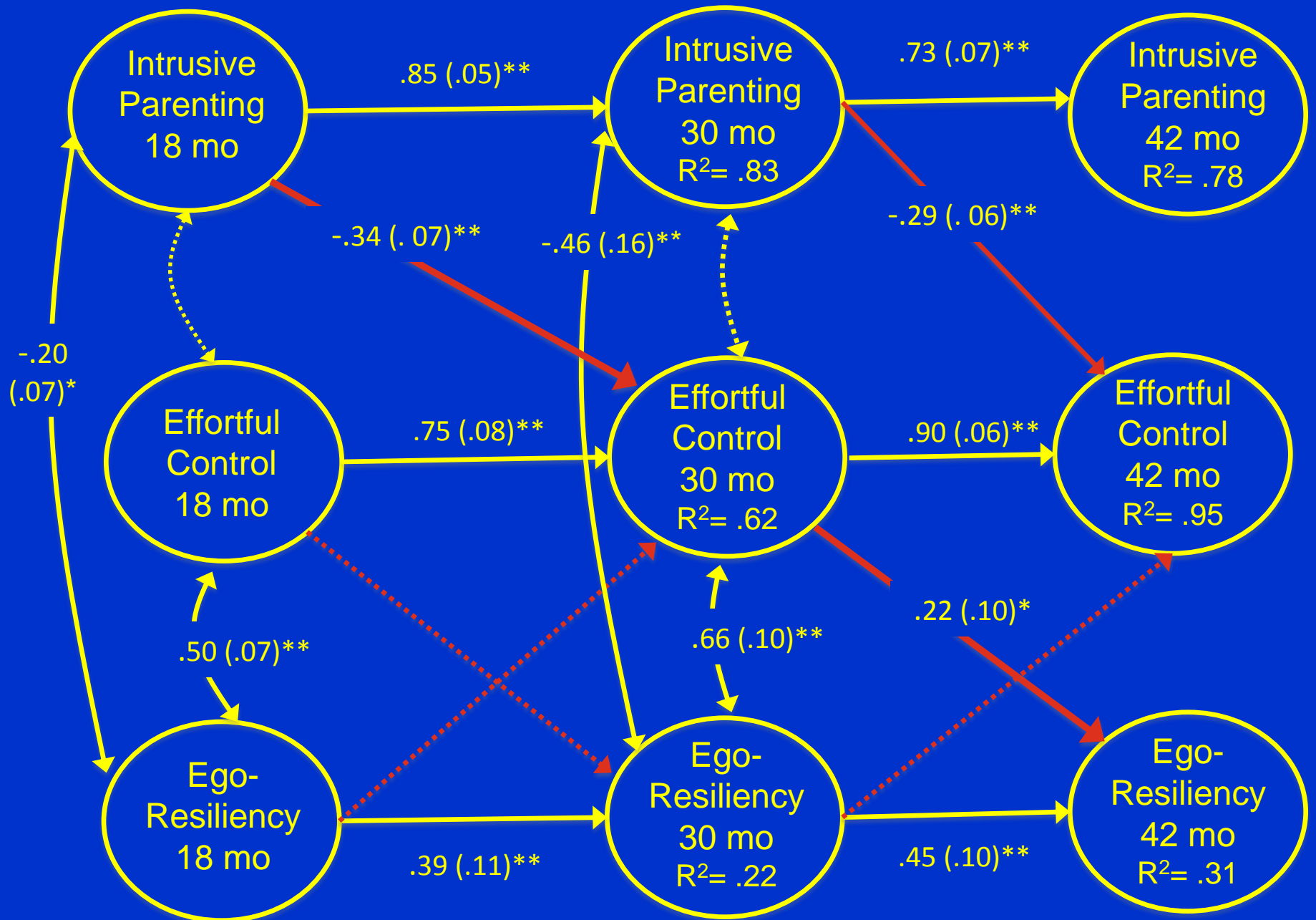


Longitudinal Model for Social Competence



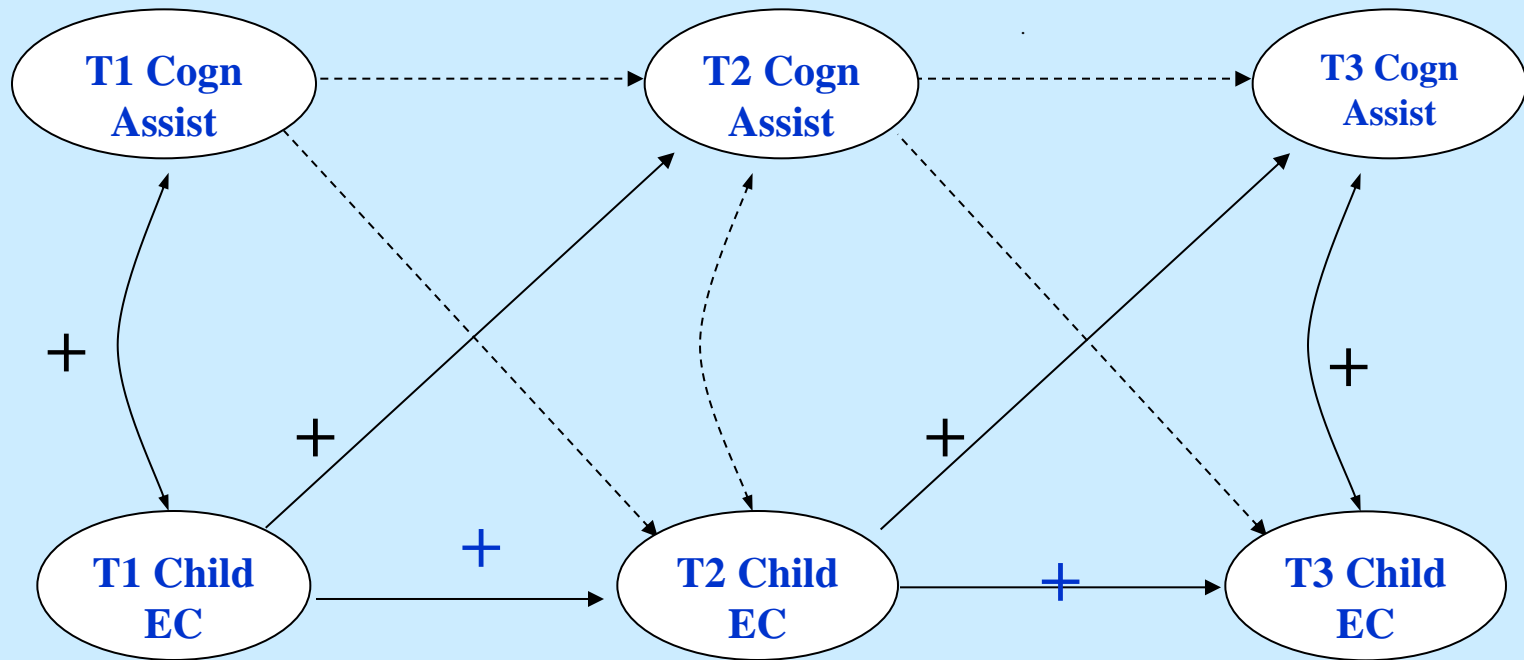


- however, 18-month nonsupportive (intrusive) parenting was predictive of lower EC at 30 months and again from 30 to 42 months
- and EC predicted ego resiliency across time) (Taylor, Eisenberg, et al., 2013, *CD*)



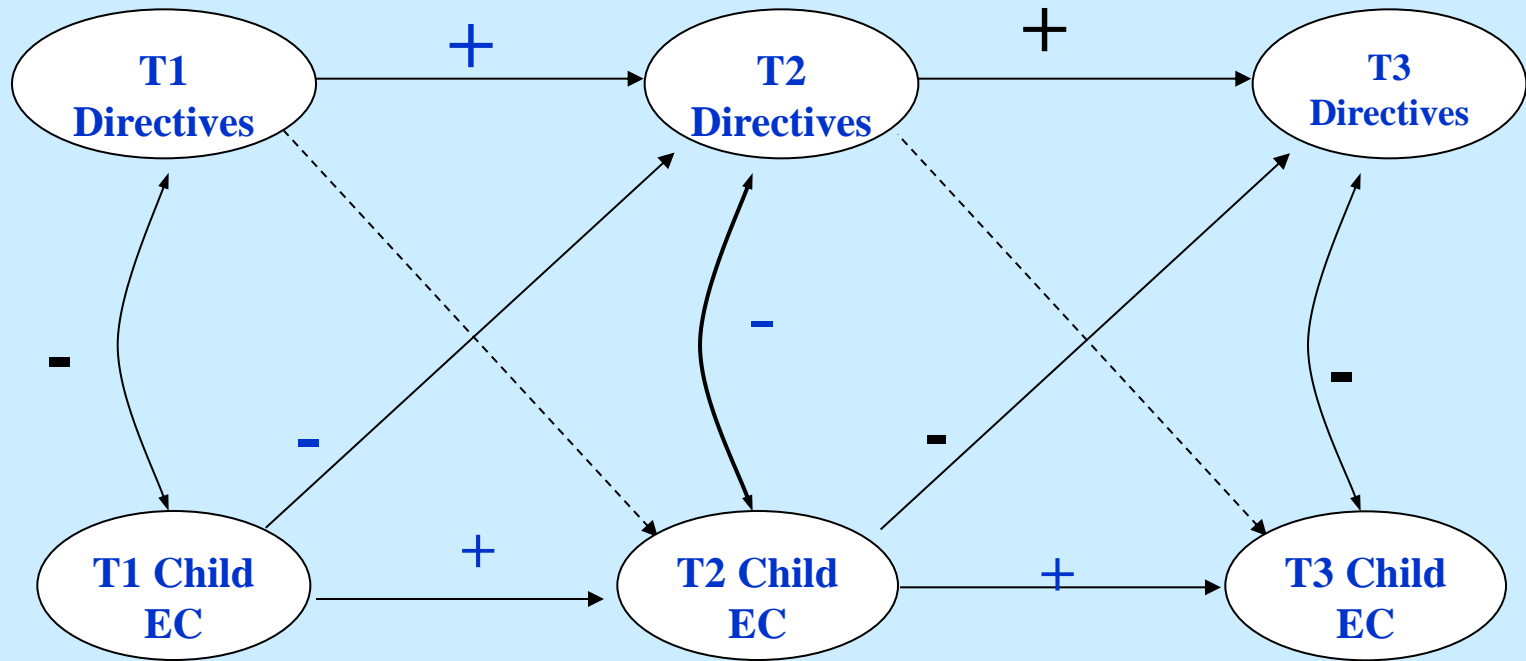
Child effects

- during a teaching interaction at ages 18, 30, and 42 months, coded observed maternal teaching strategies (cognitive assistance, being directive, using questions)
- mothers', nonparental caregivers', and observers' reports of child EC, performance on a delay task
- when controlling for the stability of constructs over time, SES, & child expressive language, child EC predicted higher-quality maternal teaching strategies at 30 months and/or 42 months (Eisenberg et al., 2010, *DP*)

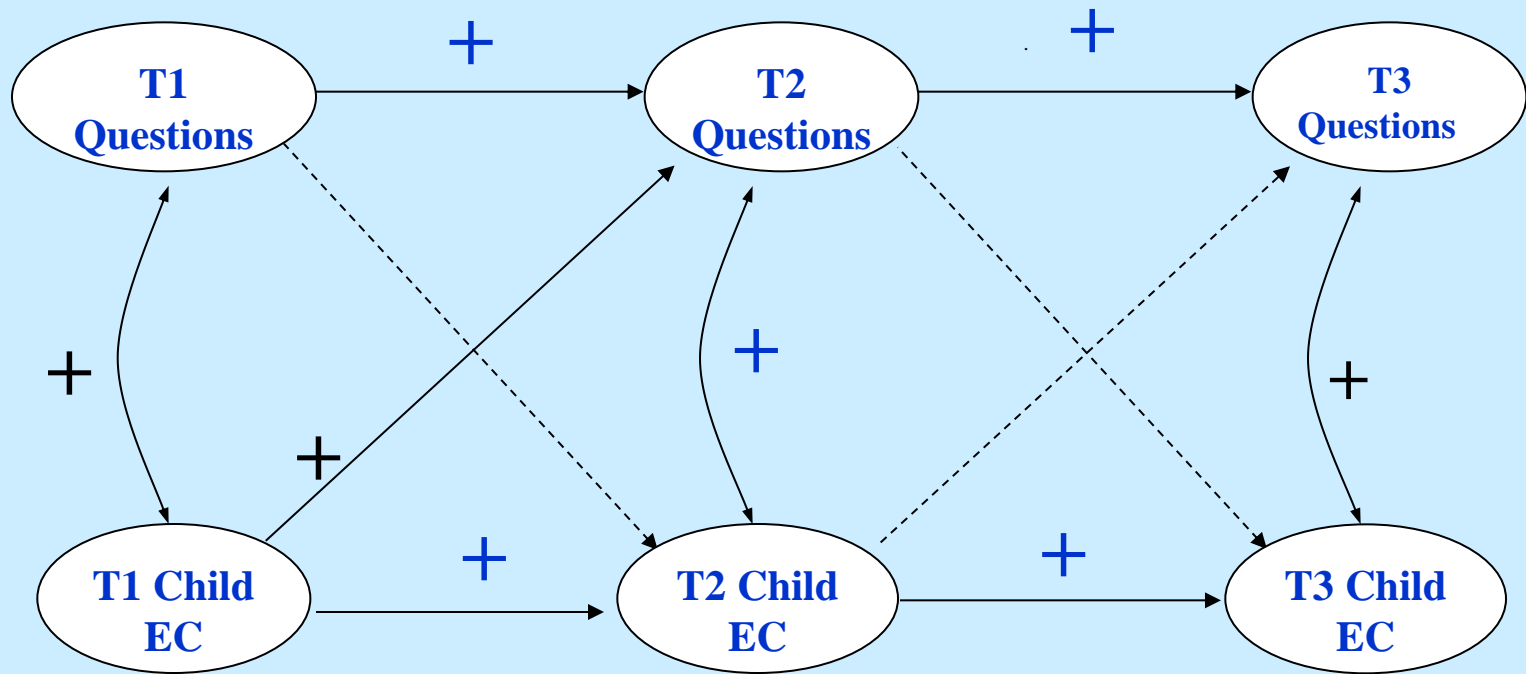


Simplified model for cognitive assistance

Eisenberg et al., 2010, *Developmental Psychology*



Simplified model for mothers' directives



Simplified model for maternal use of questions

Socialization Summary

- the quality of parenting is related to EC at many ages and seems to predict EC over time, at least for some types of parenting
- sometimes children's EC may affect the quality of parenting; may depend on the measures of parenting and EC
- there seems to be considerable stability across time in the early relation between parenting quality and children's regulation

New Directions

- interventions, e.g., work of Diamond, Greenberg, Bierman, Izard, Domitrovich & others (including using meditation; e.g., Tang)
- which genes relate to effortful control & adjustment (Posner, Rothbart, Fossella)?
- gene X environment interactions
 - Kochanska (2009) found that among children with a short 5-HTTLPR allele (but not those with long alleles), insecurely attached children developed poor effortful control whereas those who were securely attached did not differ

Collaborators

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