Children’s Effortful Self-regulation: Conceptualization and Relations to Adjustment and Maladjustment

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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 inhibitory 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 is sometimes adaptive, often not: very high levels of control 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 (executive attention), behavioral regulation, & planning

- effortful, willful, and voluntary (although can be in a semi-automatic mode at times)

- partially overlaps with executive functioning
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), 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, typically 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
- Effortful and reactive control systems are clearly interconnected
What is measured to assess emotion-related self-regulation and effortful control in children?

- many constructs and methods....
- typically use others’ reports (e.g., parents, teachers) or self-reports on questionnaires
- or behavioral measures of self-regulation, delay of gratification, and/or aspects of executive functioning (especially executive attention)
- cannot use amount of emotion displayed because that could be due to either degree of emotion or amount of regulation
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 effortfully 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, and some executive functioning tasks (e.g., knock/tap task)
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
Can we differentiate between effortful & reactive control?

- In 3 studies, we have found separate latent constructs for the two constructs for preschoolers or school-aged children (e.g., Eisenberg et al., 2004, CD, 2013, DP; 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)
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 (which is 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 such as reactive aggression
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 activational effortful control and high reactive overcontrol (or low impulsivity)
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 of the relation of EC→outcome
- Interactions of EC and reactive control
- relations of EC with co-occurring externalizing/internalizing versus pure externalizing or pure internalizing
- also important to use multiple reporters/methods and longitudinal data
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 problems
Pure externalizing or co-occurring children (compared to non-disordered children) at 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

- pure 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)
6-year follow-up (early adolescence)

- Computed bifactor models (which provide unique, continuous factors for pure and co-occurring internalizing and externalizing problems)

- Both pure externalizing & co-occurring problems predicted by low EC and high impulsivity in childhood and adolescence (controlling initial symptoms)

- Pure internalizing related to low childhood & early-adolescent impulsivity (but not EC)
Lower early effortful control predicted changes in externalizing (pure and co-occurring) over six years, but only when parental positive expressivity was low (Wang, Eisenberg, et al., in press, *D & P*)
in a high-risk adolescent sample (including children of alcoholics & a bi-factor model), assessed 5- to 10-year-olds’ EC & impulsivity and, 5–6 years later, their aggressive-antisocial behavior (AAB) and depressive symptoms (DEP)

■ low EC → pure AAB
■ low EC & low impulsivity → pure DEP & co-occurring AAB/DEP
■ for older adolescents, lower EC predicted pure AAB & co-occurring AAB-DEP only at average and high impulsivity (Wang, Chassin, Eisenberg, et al., 2015, CD)
so perhaps low EC is related to pure internalizing problems in mid adolescence, or is related to only certain kinds of internalizing problems (e.g., depression)
...there are some findings similar to those reported in other US labs and in Europe (e.g., Oldehinkel’s and Muris’ research)

EC related to low aggression/externalizing in Indonesia (Eisenberg et al., 2001, CD, 2004, DP; French et al., in process)

- 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*)
Time 1

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

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 (Valiente, Eisenberg, et al., 2003, *J. of Personality*)
Similar findings for social competence?

- pattern found at each age (5-7, 9-11) and across 2 years in elementary school

EC $\rightarrow$ resiliency $\rightarrow$ popularity

- impulsivity was uniquely associated with less popularity over time (Spinrad, Eisenberg, et al., 2006, *Emotion*)

- in preschool years
  - EC $\rightarrow$ committed compliance (Spinrad, Eisenberg, et al., 2012, *DP*)
  - EC $\rightarrow$ sympathy (Taylor, Eisenberg, et al., 2015, *DP*)
EC → resiliency → preschoolers’ agreeableness (Cumberland-Li et al., 2004, SD)

however, across kindergarten, peer acceptance predicted EC rather than vice versa (Hernández, Eisenberg et al., in press, IJBD)

relations are likely bi-directional
In other countries?

- Chinese children high in EC perceived as socially skilled & leaders at school (Zhou et al., 2004, *DP*)

in an Italian longitudinal sample, teacher-reported EC at age 13 predicted higher prosocial behavior at age 13 and 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, Kanacri, Eisenberg, et al., *PSPB*, 2014)
Relations with school functioning?

- EC related to greater school liking, better behavior at school, and higher academic performance/GPA (e.g., Diaz et al., in press, *IJBD*; Eisenberg et al., 2010, *EE&D*; Kopystynska et al., 2016, *DP*; Valiente et al., 2013, *EE&D*)

- the relation of regulation with these outcomes sometimes was mediated
In preschool years:
EC $\rightarrow$ better relationships $\rightarrow$ school liking with preschool teachers (Silva et al., 2011)

In elementary school:
EC $\rightarrow$ social competence/ $\rightarrow$ better grades low externalizing (e.g., Valiente et al., 2011)
Do self-regulation & emotionality interact when predicting developmental outcomes?

In several studies, interactions of EC with negative or general emotional intensity or anger when predicting social competence or externalizing problems:

- EC → outcomes: stronger for children high in negative emotion
- OR emotion → outcomes stronger for children low in EC
- Intense and/or negative emotion was not a problem for regulated children

- in more recent studies, evidence of EC X emotion interactions when predicting outcomes at school

(Diaz, Eisenberg et al., in press, JRP)

301 kindergartners are being followed for 3 years, with multiple measures of school outcomes in spring:
- teachers’ reports of student-teacher conflict
- teachers’ reports of problem behavior at school
- observed engagement in class
- observed real-life positive and negative emotional expressivity at school in autumn for 9-12 weeks
- measured EC in the autumn
  - parents, teachers, & observers rated children's EC (CBQ; Rothbart et al., 2001)
    - attention focusing, inhibitory control, attention shifting
  - a computer-based continuous performance task (CPT; adapted from NICHD, 2003)
- Direct effects: EC predicted better school outcomes whereas negative emotionality (but not positive emotionality) predicted worse school outcomes.
- Multiple EC X emotion interactions when predicting school outcomes, especially for negative emotion.
Children high in EC tended to be low in conflict with teacher and problem behaviors & high in school engagement regardless of their level of negative expressivity.

For children with low and/or average EC, observed negative emotion predicted student-teacher conflict, problem behaviors at school, and low engagement.
The negative relation between negative expressivity and academic engagement was significant at low and moderate levels of EC, $p_s < .01$.

Children high in EC were high in engagement regardless of their level of negative emotion.
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) might be 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 is modestly negatively related to resiliency

but 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*)
Conclusions

- Individual differences in effortful regulation and less voluntary types of control are predictors of (mal)adjustment, social competence, and academic outcomes and sometimes provide unique additive (and interactive) prediction.
- EC becomes the stronger unique predictor (vs. impulsivity) of externalizing with age.
- Personality resiliency and quality of relationships may be important mediators of relations of EC to child outcomes.
EC & impulsivity or negative emotionality sometimes interact when predicting many outcomes for children
Other directions

- Parental behavior often predicts EC, which in turn predicts maladjustment & other developmental outcomes.
- But EC sometimes also predicts parenting behavior.
- Evidence of bidirectional relations between parenting & EC.
- These relations vary somewhat depending on age of child, type of parenting examined, & developmental outcome.
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