



Measurement of self-regulation in three-year-old children

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Background

- **Self-regulation:** ability to control or direct one's attention, thoughts, emotions and actions optimally in pursuing personal goals (Baumeister & Vohs, 2007; Carver & Scheier, 2011; Hofmann, Schmeichel, & Baddeley, 2012; McClelland & Cameron, 2012; McClelland, Ponitz, Messersmith, & Tominey, 2010).
- **Executive functions:** working memory, inhibitory control, and cognitive flexibility (Blair & Ursache, 2004; Blair, Zelazo, & Greenberg, 2005; Miyake et al., 2000).



Cognitive and emotional self-regulation

- Cognitive self-regulation (Bodrova & Leong, 2006; Pintrich, 2002; Whitebread et al., 2009):
 - Metacognitive knowledge about thinking and learning processes
 - Metacognitive strategies to regulate task behavior, such as planning, monitoring, and control
 - Motivation-related factors, such as persistence and sustained attention
- Emotional self-regulation (Bodrova & Leong, 2006; Denham, Bassett, Thayer, Minicic, Sirotkin, & Zinsser, 2012):
 - Knowledge about emotions
 - Strategies to control and modulate expression of emotions
 - Meet social expectations of the situation, get along with peers and resolve peer conflicts



Self-regulation and play

- **Pretend play:** imaginary situation with social rules in which children set own goals. Children coordinate their behavior according to these goals and rules (Verba, 1993; Vygotsky, 1978). This intentional goal-directed behavior contributes to developing self-regulation (Bodrova, 2008). Pretend play predictive of self-regulation in preschoolers (Elias & Berk, 2002; Vieillevoeye & Nader-Grosbois, 2007).
- **Tools of the Mind:** focus on verbally planning pretend play (Bodrova & Leong, 2007) -> improvement in EF, language (Barnett et al., 2008; Diamond et al., 2007).



Research questions

- To what extent do children display cognitive and emotional self-regulation during play and how are these interrelated?
- To what extent is children's self-regulation in play related to cool and hot executive functioning skills, as assessed with neuropsychological tests?
 - Hypotheses:
 - Cool EF related to cognitive self-regulation
 - Hot EF related to emotional self-regulation



Observational child measures

- Rating scales on self-regulation with scores ranging from Low (1) to High (5).
- Setting: play in small groups (4-10 children, M=6) with kitchen play materials
- 15 minutes



Observed self-regulation

- Cognitive self-regulation:
 - Metacognitive knowledge (Pintrich, 2002; Whitebread et al., 2009)
 - Metacognitive regulation (Whitebread et al., 2009)
 - Persistence (Egeland et al., 1990)
- Emotional self-regulation:
 - Knowledge of emotions (Whitebread et al., 2009)
 - Emotion regulation (Eisenberg & Spinrad, 2004; Eisenberg & Sulik, 2012)
 - Resolving conflicts (de Haan & Singer, 2003; Singer & de Haan, 2004; CLASS, 2011)
 - Behavioral self-control (Kopp, 1982)



Scoring

- Scoring:
 - Low: behavior does not occur during play
 - Mid: behavior occurs sometimes or behavior occurs when guided by teacher
 - High: behavior occurs frequently, without guidance by the teacher
- Inter-observer reliability: $ICC = .81/.76$

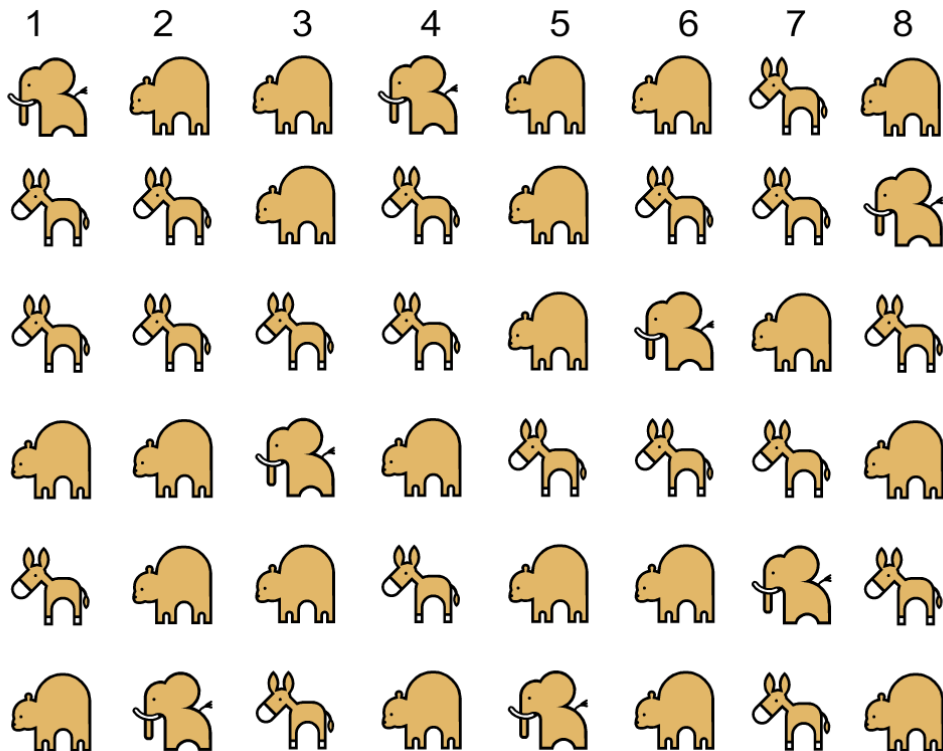


Executive functions and children's background measures

- Cool EF
 - Selective attention
 - Visuospatial short-term memory
 - Visuospatial working memory
- Hot EF
 - Snack delay of gratification
 - Gift delay of gratification
- Control measures:
 - Receptive vocabulary PPVT
 - Age
 - Home language
 - Gender
 - Time between test and observation



Example: Selective attention task



‘Can you try to to find all the elephants as quickly as possible?’

8 elephants per item
3 items of 40 sec each



Exmple: Visuospatial working memory task



(After hiding toys):

‘Can you find one?’

- 6 search attempts
- Short delay in between search attempts



Example: Delay of gratification



‘Try not to touch the present’

- Delay time: 1 minute
- Scoring: pass/fail



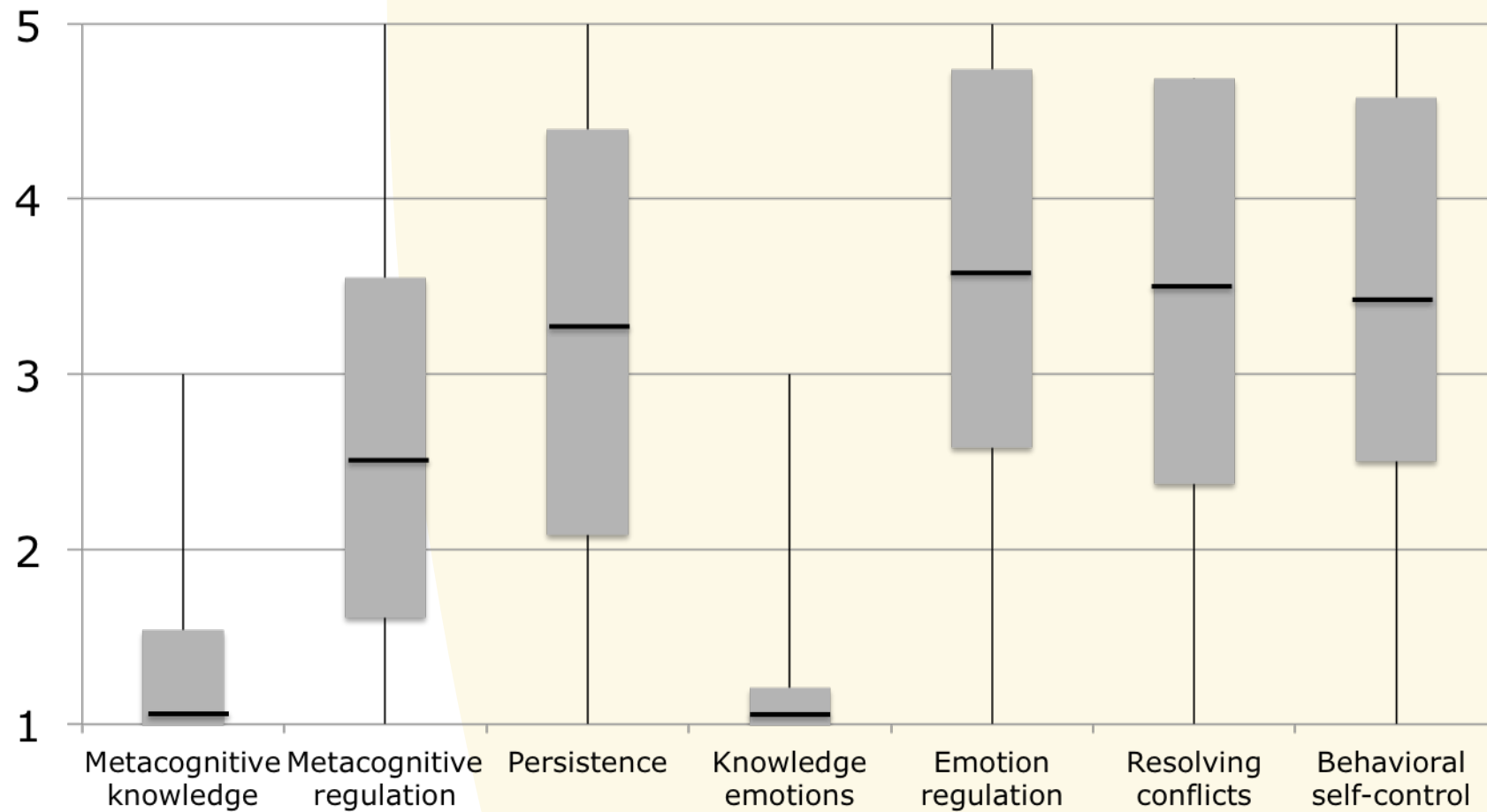
Descriptive statistics

Subsample of PreCOOL:

- 113 children of which 59 (52.2%) boys
- Age at test $M=28$ months, $SD=2.7$ months, range= 23-35 months (N=95)
- Age at observation $M=37$ months, $SD=3.5$ months, range=28-45 (N=113)
- 71 monolingual Dutch children (62.8%)



Descriptives observed self-regulation



Correlations between indicators

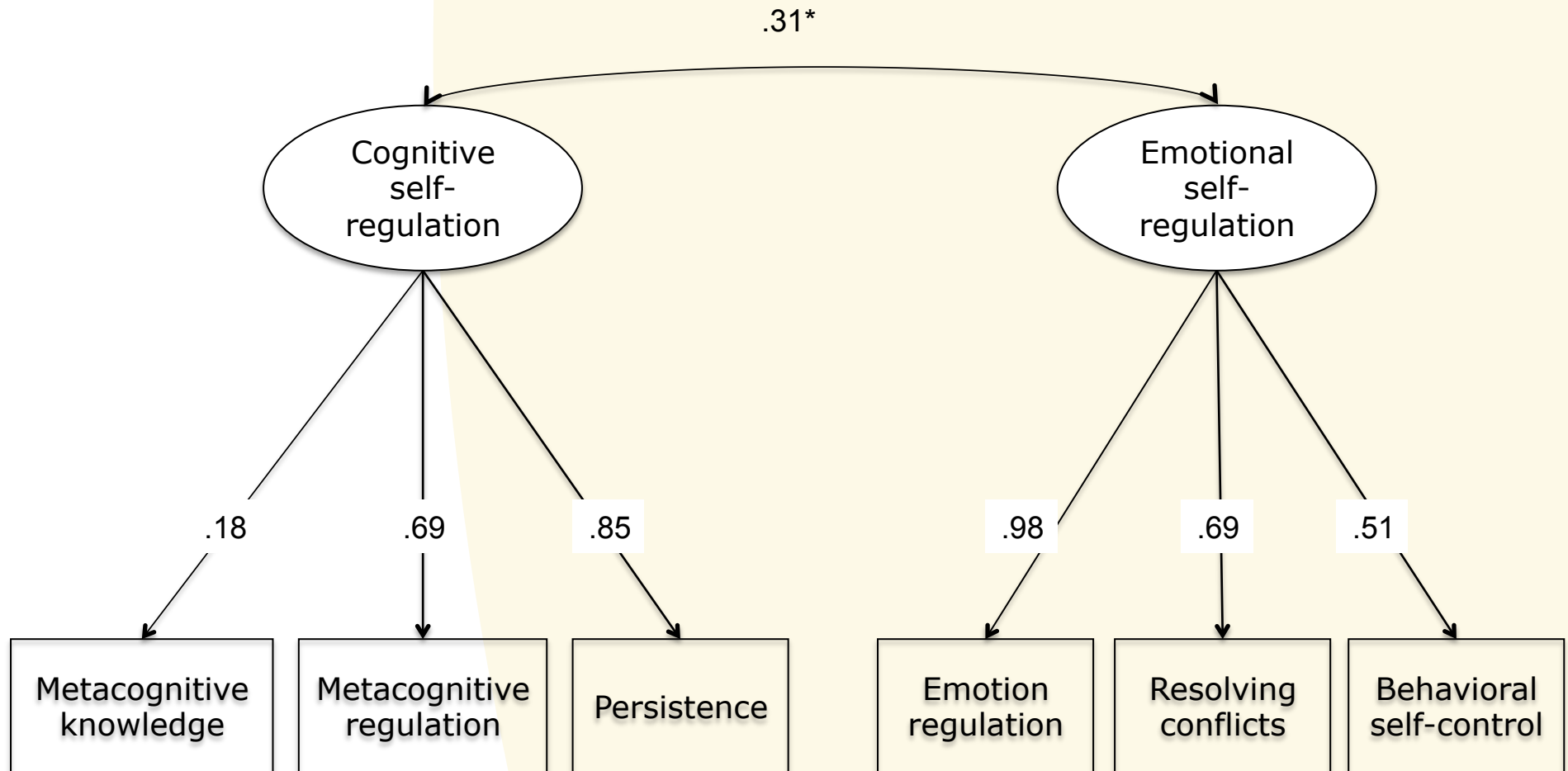
	Metacognitive regulation	Persistence	Knowledge emotions	Emotion regulation	Resolving conflicts	Self-control
Metacognitive knowledge	.11	.16	.42**	-.08	.06	.01
Metacognitive regulation		.58**	-.08	.15	.16	.01
Persistence			-.02	.18	.22*	.14
Knowledge emotions				-.07	.04	.11
Emotion regulation					.49**	.45*
Conflict						.34*
Self-control						

* p < .05, *** p < .001



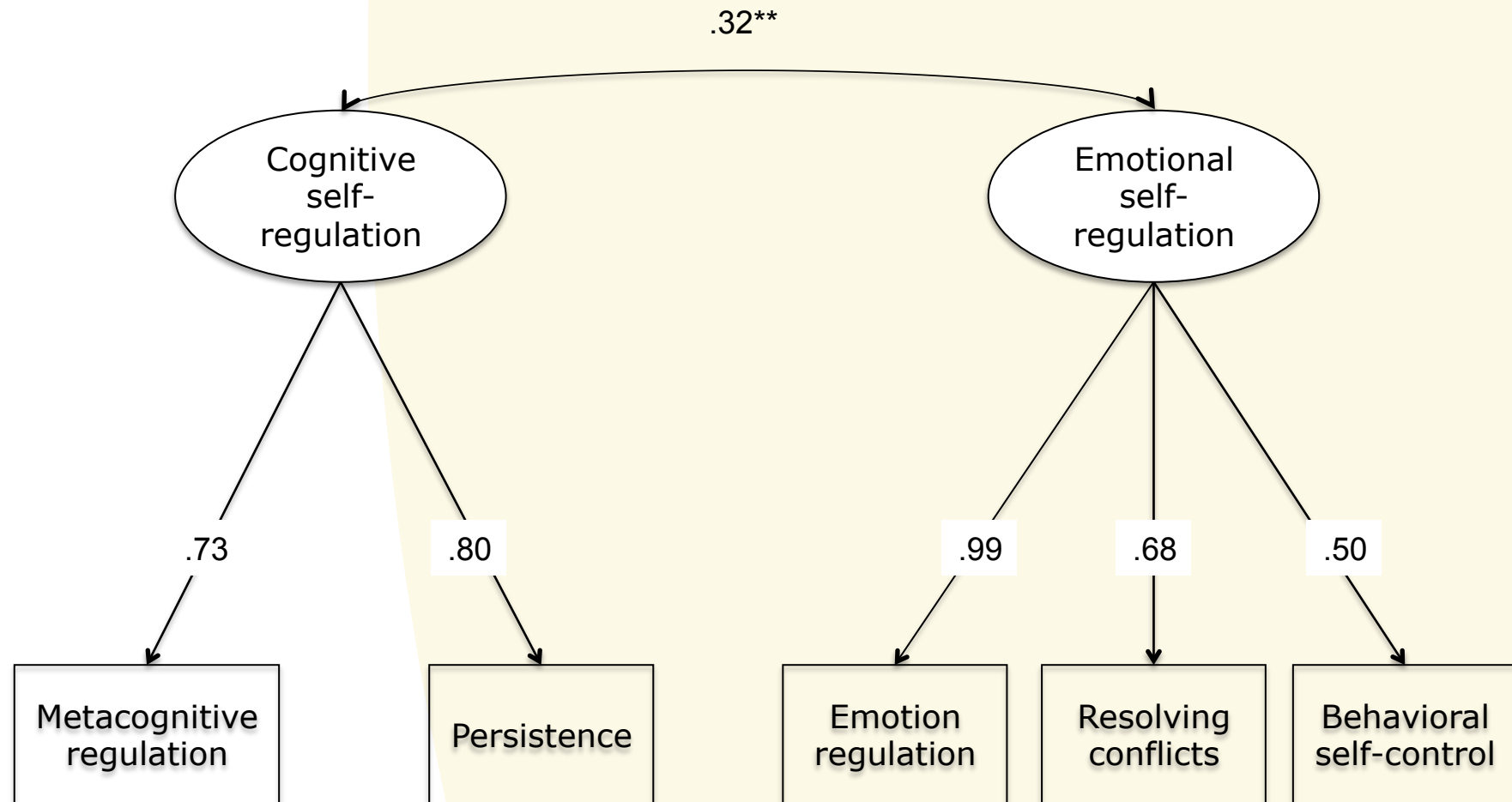
CFA Observed self-regulation

($\chi^2(8)=11.29$, $p=.19$; CFI=0.97; SRMR=.04)



Final model observed self-regulation

$\chi^2(4)=9.43$, $p=.05$; CFI=.95; SRMR=.04



Relations between SR and EF

	<i>Cognitive SR</i>			<i>Emotional SR</i>		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Gender	#			#		
Age	#			.05	.03	.17
Home language	.14	.14	.11	#		
Time between test and observations	.06	.02	.27**	-.03	.03	-.08
Vocabulary	.42	.23	.24	-.40	.25	-.14
Cool EF	.19	.15	.21	.68	.22	.47**
Hot EF	-.30	.22	-.22	-.48	.29	-.23



Conclusions

- Children as young as three years of age already show cognitive and emotional self-regulation in a naturalistic play setting, in line with previous research (Whitebread et al., 2009)
- Two distinct, but interrelated, constructs in line with previous research (Rimm-Kaufmann et al., 2009; Ursache, Blair & Raver, 2012)
- (lack of) Relation between Hot EF-emotional SR: observed SR was a broader construct (incl. expression and modulation of emotions and not inhibition of emotions). Separate correlations with the indicators did show correlations between hot EF with resolving conflicts ($r=.27$) and with behavioral self-control ($r=.22$)
- Relation between Cool EF and emotional SR: fits in with theoretical models that emphasize the role of cool EF, and particularly attention, in effortful control or affect-driven behavioral impulses (Kochanska et al., 2000; Posner & Rothbart, 2000; Rothbart et al., 2011)



Future directions

- Confirmation of results in larger sample
- Developmental trends of both observed self-regulation and test-based EF and investigate direction of effects (bi-directional?)
- Predictive value of SR and EF in children's social-emotional development and school readiness skills in view of interventions targeted at improving these skills



Thank you for your attention!

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