A Meta-Analysis of Effortful Control and Child Outcomes Part I: Social Competence, Academic Competence, and Achievement

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Background/Purpose

- Effortful control (EC), linked to the anterior attention network[1] and important for the effective regulation of behavior and emotion[2], is defined as the ability to inhibit a dominant response in favor of a subdominant response[3].
- Numerous children's outcomes have been linked to EC.
- Central to the current study, it has been demonstrated that EC is important for children's social and academic competence as well as their ability to achieve in academic settings[4,5].
- Despite the importance of EC for social/academic competence and academic achievement, findings have not always been consistent.
  - For example, Liew et al.[6] did not observe a significant association between inhibitory control and reading whereas others[7] have noted such associations.
- Methodological differences between studies, such as how EC was measured and sample characteristics, might account for discrepant findings between studies.
- The purpose of the current study is to quantitatively synthesize existing findings across studies examining EC and social/academic competence as well as academic achievement, potentially identifying important methodological differences between studies that contribute to discrepant findings.

Hypotheses

- It was anticipated that EC would be positively associated with social competence (SC), academic competence (AC), and academic achievement (AA).
- Given prior findings of gender differences in EC[8], it was expected that findings would be moderated by gender.
- Systematic differences between measurement approaches were also expected:
  - Smaller effects were expected to be observed when behavioral EC measures were used relative to questionnaire measures.
- Although specific hypotheses were not formulated, moderation by the following sample characteristics was also evaluated:
  - Demographically high-risk vs. low-risk samples
  - Age

Method

- As part of a larger meta-analysis of EC and children's outcomes, Medline and PsycInfo databases were searched using 14 terms for EC (e.g., attentional and inhibitory control) and 53 terms for children's outcomes (e.g., academic achievement).
- Literature searches and subsequent reference list searches yielded 210 studies that met inclusion criteria; 58 studies contained data relevant for the current investigation.
- Accounting for multiple reports using the same sample, and multiple effect sizes (ES) within single studies:
  - EC & SC: *N* = 8,277 (270 total ES, 32 ES when one per study)
  - EC & AC: *N* = 296 (9 total ES, 4 ES when one per study)
  - EC & Math: *N* = 3,674 (53 total ES, 17 ES when one per study)
  - EC & Reading: *N* = 4,424 (90 total ES, 25 ES when one per study)
- Potential moderators coded based on information in studies:
  - Age: Early Childhood (0-5 years), School Aged (6-12 years), and Adolescence (13-17 years)
  - Gender
  - High Risk: ≥ 66% of the sample had at least one demographic characteristic placing children at greater risk (e.g., mean maternal education less than 14 years)
  - EC Measurement Approach: Parent Report, Other Report (e.g., teacher and child reports), Behavioral, Cross Informant (e.g., Parent rated EC and teacher reported Social Competence)
- Effect Size Coding:
  - The ES metric in the current study is the correlation coefficient.
  - The standardized mean difference ES was determined and then transformed into a correlation coefficient for studies reporting group differences (e.g., differences between participants with ADHD and controls on EC).
- Meta-Analytic Approach[9,10,11,12]:
  - Random effects models
  - Homogeneity tests were used to determine presence/absence of potential moderator variables
  - If homogeneity test was significant, follow-up analyses were performed
  - Publication bias was evaluated with the fail-safe N and sufficiency indices

Results

Outcome	Unit of Analysis	EC Source	*k*	Mean ES (*SE*)	95% CI	Fail Safe N	Sufficiency	Homogeneity
Math Ach.	**All Studies**	**Multiple ES[1]**	**21**	**0.35* (0.032)**	**0.30 to 0.43**	**2444**	**48.89**	**19.75**
	Method	Behavioral	14	0.36* (0.043)				
		Parent	3	0.31* (0.108)				
		Other	4	0.36* (0.040)				
Math Ach.	**All Studies**	**Single ES[2]**	**17**	**0.36* (0.034)**	**0.31 to 0.44**	**1785**	**35.70**	**13.91**
Reading Ach.	**All Studies**	**Multiple ES[1]**	**27**	**0.29* (0.027)**	**0.25 to 0.36**	**2342**	**46.85**	**24.63**
	Method	Behavioral	19	0.32* (0.036)				
		Parent	4	0.20* (0.050)				
		Other	4	0.31* (0.076)				
Reading Ach.	**All Studies**	**Single ES[2]**	**24**	**0.30* (0.030)**	**0.25 to 0.35**	**1931**	**38.62**	**21.02**
Social Comp.	**All Studies**	**Multiple ES[1]**	**51**	**0.29* (0.028)**	**0.24 to 0.35**	**9633**	**192.73**	**51.60**
	Method	Behavioral	17	0.17* (0.025)				
		Parent	9	0.37* (0.050)				
		Other	10	0.46* (0.073)				
		Cross Informant	15	0.21* (0.035)				
Social Comp.	**All Studies**	**Single ES[2]**	**31**	**0.24* (0.027)**	**0.19 to 0.30**	**2308**	**46.16**	**37.25**
Academic Comp.	**All Studies**	**Single ES[2]**	**4**	**0.47* (0.079)**	**0.36 to 0.67**	**66**	**1.33**	**3.20**

* = $p < .05$ 1) Studies contributed more than one ES if EC was measured using multiple methods. 2) Each study contributed one ES.

Results Continued & Discussion

- When studies were allowed to contribute more than one ES, based on the use of multiple EC measurement methods, the anticipated moderation, based on non-significant homogeneity tests, was not observed.
- In subsequent analyses, a single ES was derived for each study retrieved, meeting inclusion criteria, and containing sufficient data to determine the ES.
- With the exception of Academic Competence (Large Effect), the mean ES for Math and Reading Achievement, and Social Competence fell between a medium and large effect based on Cohen's[13] criteria for ES interpretation.
- None of the homogeneity tests, used to indicate the potential presence of moderators, were significant.
- The fail-safe N's (i.e. the number of studies with a mean null effect needed to reduce the observed ES to non-significant) were large relative to the number of ES in the distributions; sufficiency indices were all larger than 1.0, indicating a sufficient number of effects in the respective distributions to establish the overall effect .
- Findings from this study summarize a growing literature and highlight the importance of EC for children's outcomes in academic achievement and social competence.
- Few studies have examined gender differences despite established gender differences in EC; future work should address this limitation.
- The robust effects observed across areas of achievement and with social competence suggest that programs designed to improve children's EC specifically, and self-regulation generally, could enhance children's social and academic functioning .

Author Contact, Copies, & References

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- To download a copy of this poster, including references cited in the poster, references to studies contributing an effect size to the analyses reported in this presentation, and supplemental data tables qualitatively describing the effect sizes for each level of the potential moderators not included in the table, please visit the Emotion Regulation and Temperament Lab's website at: http://www.niu.edu/emotionreg

A Meta-Analysis of Effortful Control and Child Outcomes Part I: Social Competence, Academic Competence, and Achievement References and Supplemental Tables

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Results – Supplemental Table

Outcome	Unit of Homogeneity Analysis	EC Source	*k*	Mean ES(SE)	95% CI	Fail Safe N	Sufficiency
Math Ach.	**All Studies**	**Single ES[1]**	**17**	**0.36* (0.034)**	**0.31 to 0.44**	**1785**	**35.70**	**13.91**
	Age	Early Childhood	7	0.34* (0.020)				
		School Age	8	0.25* (0.040)				
		Adolescence	2	0.28* (0.083)				
	Demographic Risk	Low	3	0.27* (0.058)				
		High	3	0.36* (0.048)				
		Mixed	1	0.09* (0.040)				
		Cannot Determine	10	0.31* (0.021)				
Reading Ach.	**All Studies**	**Single ES[1]**	**24**	**0.30* (0.030)**	**0.25 to 0.35**	**1931**	**38.62**	**21.02**
	Age	Early Childhood	12	0.31* (0.028)				
		School Age	12	0.25* (0.040)				
		Adolescence	N/A					
	Demographic Risk	Low	2	0.19* (0.044)				
		High	5	0.35* (0.045)				
		Mixed	3	0.11* (0.035)				
		Cannot Determine	14	0.31* (0.020)				
Social Comp.	**All Studies**	**Single ES[1]**	**31**	**0.24* (0.027)**	**0.19 to 0.30**	**2308**	**46.16**	**37.25**
	Age	Early Childhood	16	0.21* (0.018)				
		School Age	13	0.22* (0.016)				
		Adolescence	2	0.07 (0.067)				
	Demographic Risk	Low	13	0.30* (0.023)				
		High	5	0.20* (0.053)				
		Mixed	N/A					
		Cannot Determine	13	0.17* (0.014)				

* = $p < .05$ 1. Each study contributed one ES

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