

Compensation in children with (a risk of) reading difficulties: A scoping review



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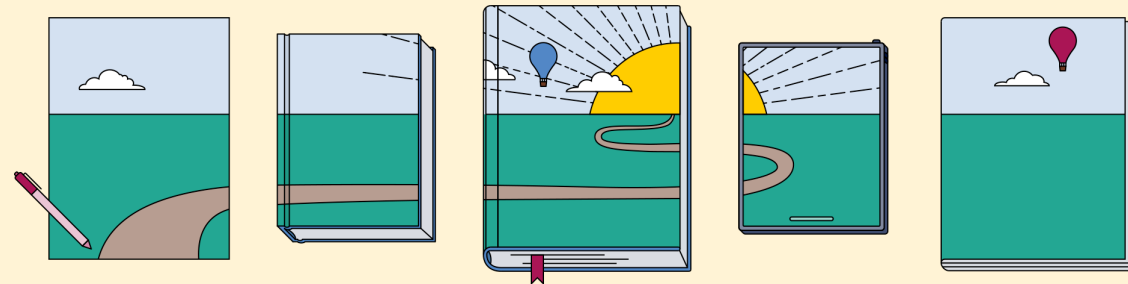


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Introduction

- Road to Resilience in Reading (RiR) project
- Scoping review = starting point



Relevance

- Lack of a clear theoretical framework
 - Existing models miss step towards compensatory mechanisms (e.g. Haft et al. (2016), Catts and Petscher (2021), Kim (2019))
- Lack of concise set of terms and definitions
- Empirical evidence for specific promotive, skill-enhancing, and protective factors, let alone compensation, is very limited

Study aims

This study aims to...

1. Clarify theoretical framework on resilience in reading and the underlying compensatory mechanisms
2. Review empirical evidence on protective, promotive, and skill-enhancing factors
3. Develop a theoretical model
 - representing factors of multiple relevant domains
 - including more possible ways in which these factors can interact

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Definitions



(Academic/cognitive) Resilience

- (Academic/cognitive) resilience = trajectory from a clear risk for and/or presence of low literacy outcomes towards positive adaptation and successful literacy acquisition (Haft et al., 2016; Masten, 2014)
- Poorly understood



Promotive factors

- Promotive factor = factor associated with positive reading and/or spelling outcomes regardless of the presence or degree of (a risk of) RSD (Masten & Barnes, 2018; Slomowitz et al., 2021)
- Gap-maintaining effect

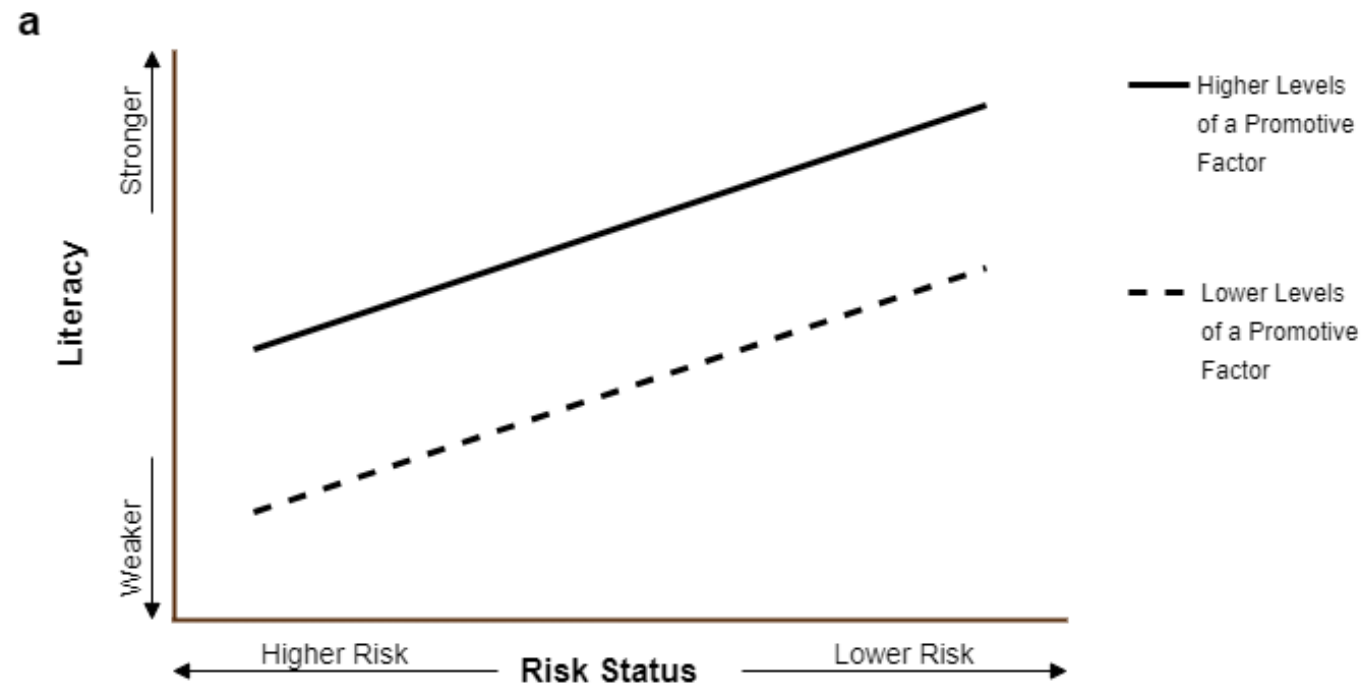


Figure 1a. Hypothetical promotive effect. A graphical representation of a gap-maintaining effect.

Protective factors

- Protective factor = factor leading to better-than-expected outcomes specifically for children with (a risk of) RSD compared to children at lower risk of RSD (Masten & Barnes, 2018; Slomowitz et al., 2021; Wright et al., 2013)
- Gap-closing effect

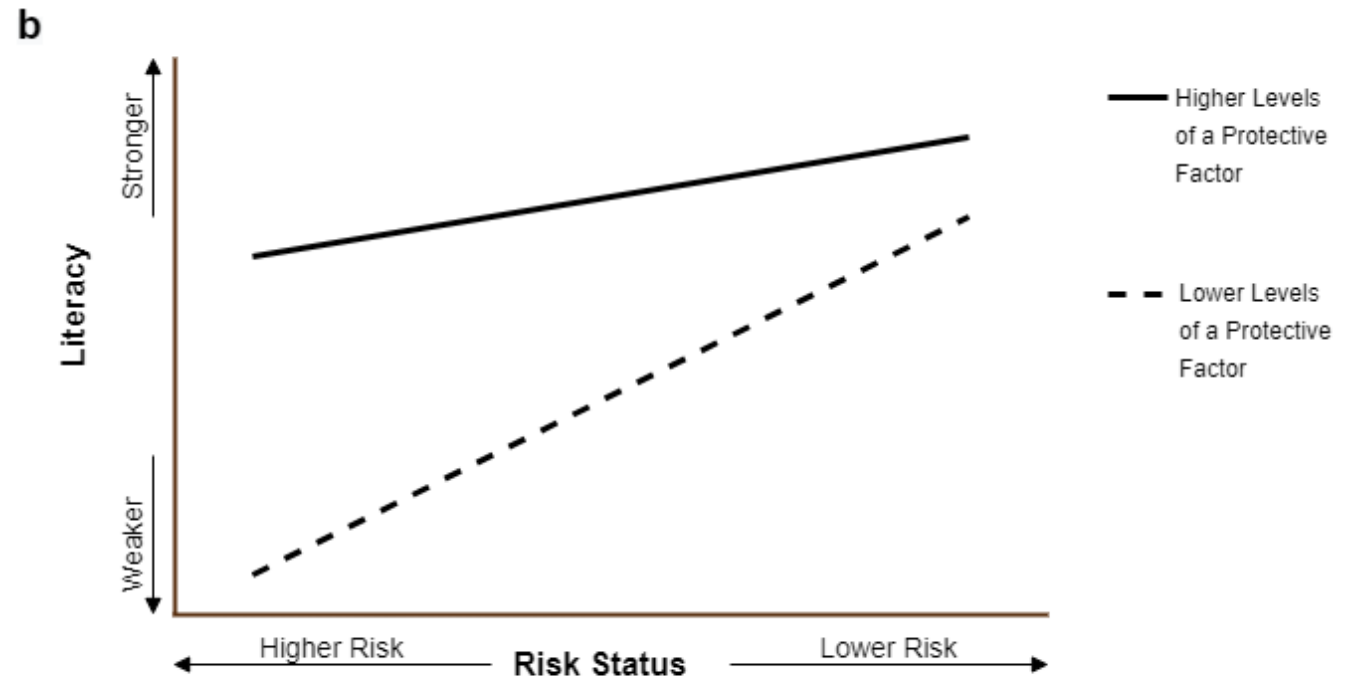


Figure 1b. Hypothetical protective effect. A graphical representation of a gap-closing effect.

Skill-enhancing factors

- Skill-enhancing factor = factor leading to even better-than-expected outcomes for children at lower risk for RSD (Slomowitz et al., 2021)
- Gap-enlarging effect

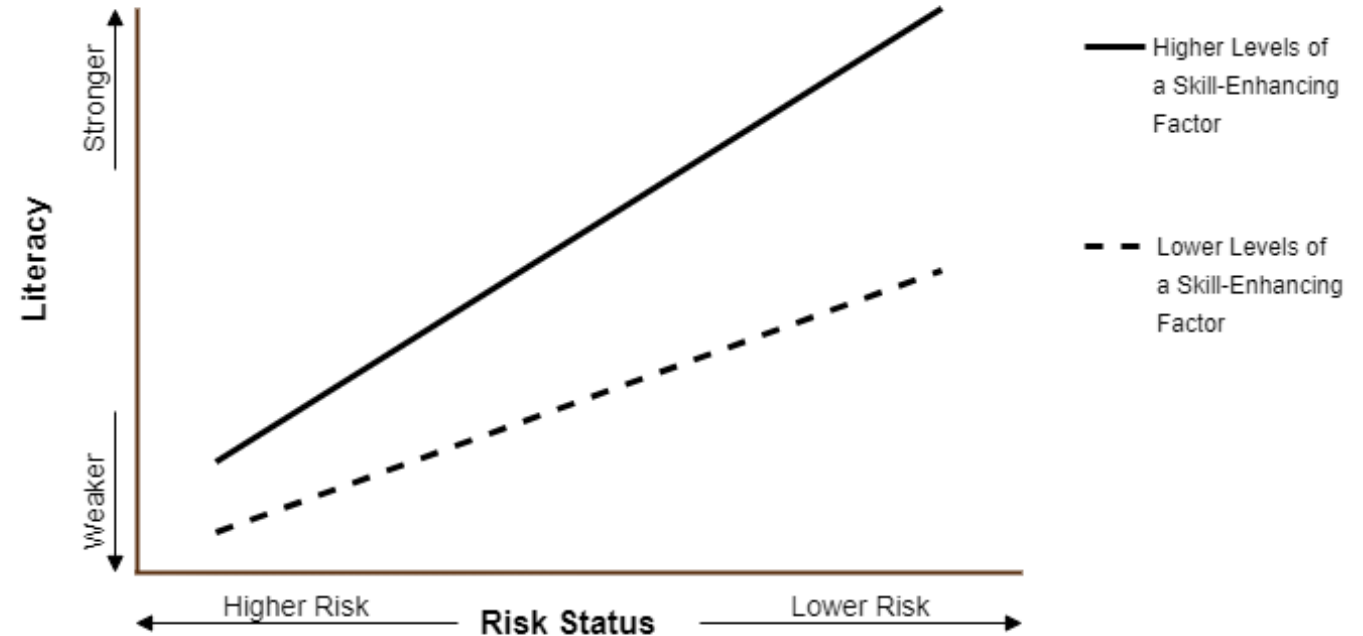
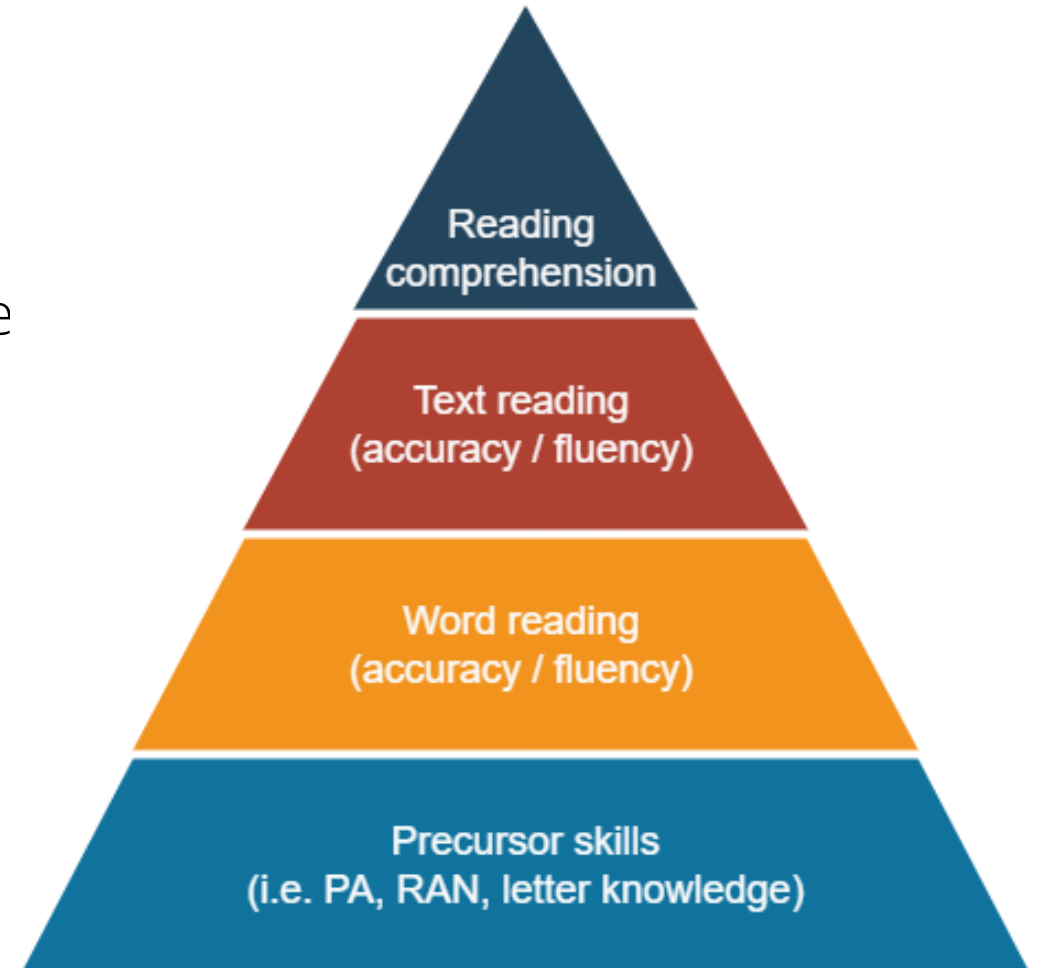


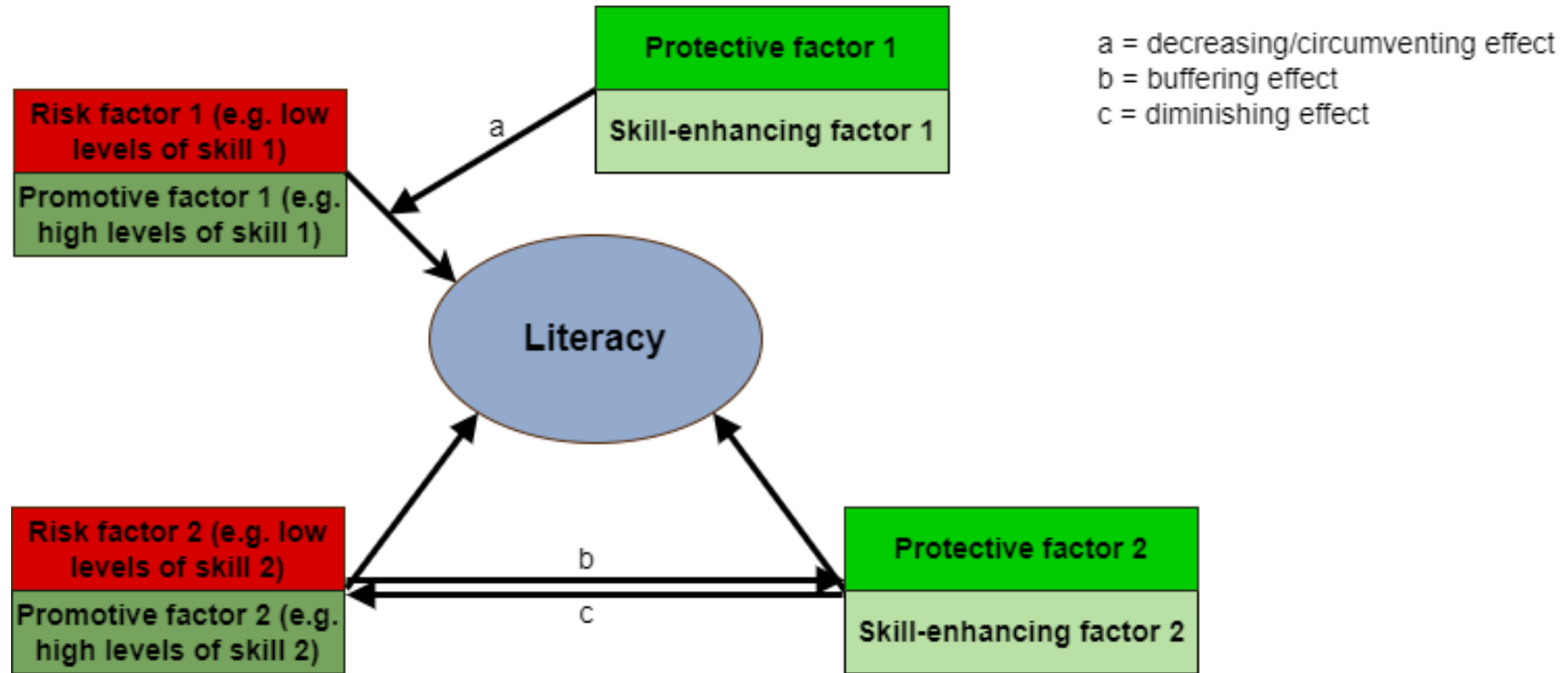
Figure 1c. Hypothetical skill-enhancing effect. A graphical representation of a gap-enlarging effect.

Compensation

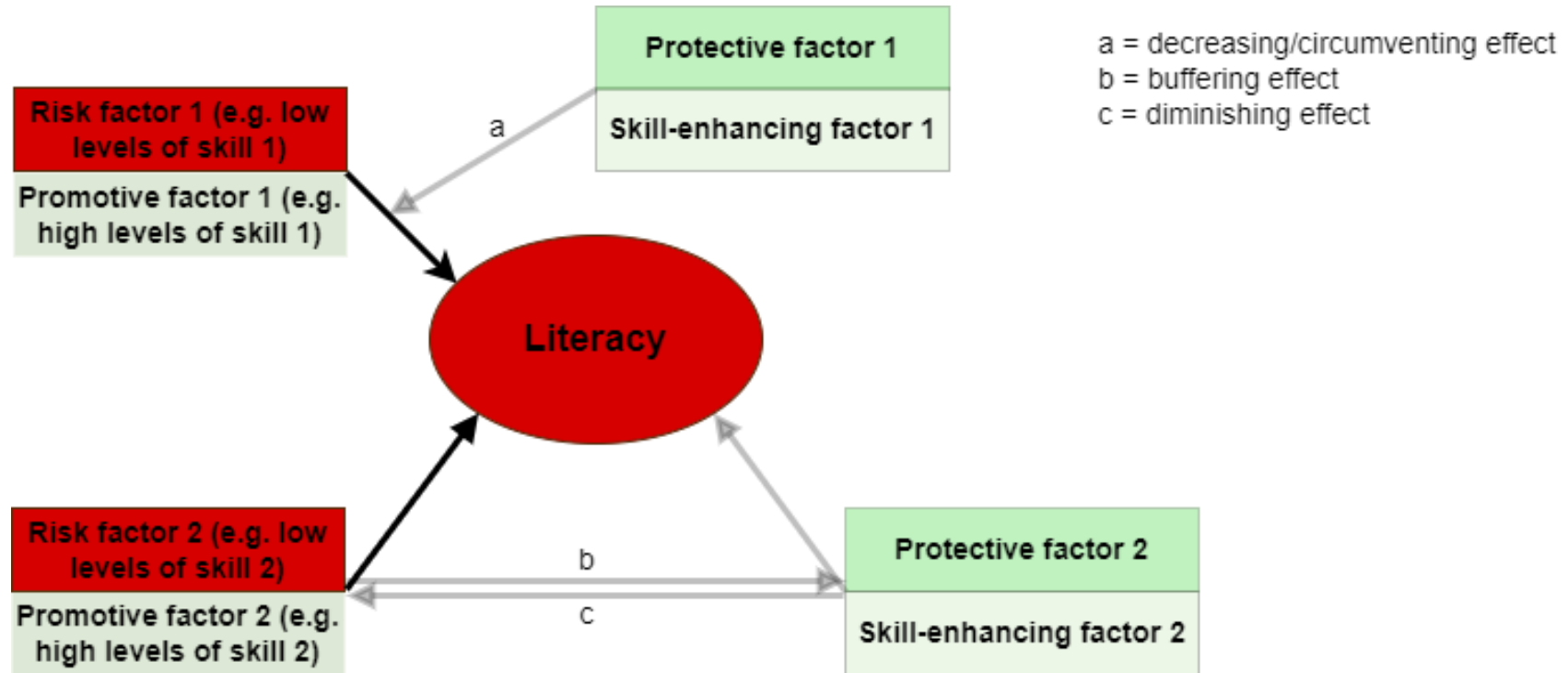
- Literacy = hierarchical skill
- Compensation = assumed to take place a higher level than the level on which (risk of) RSD takes place



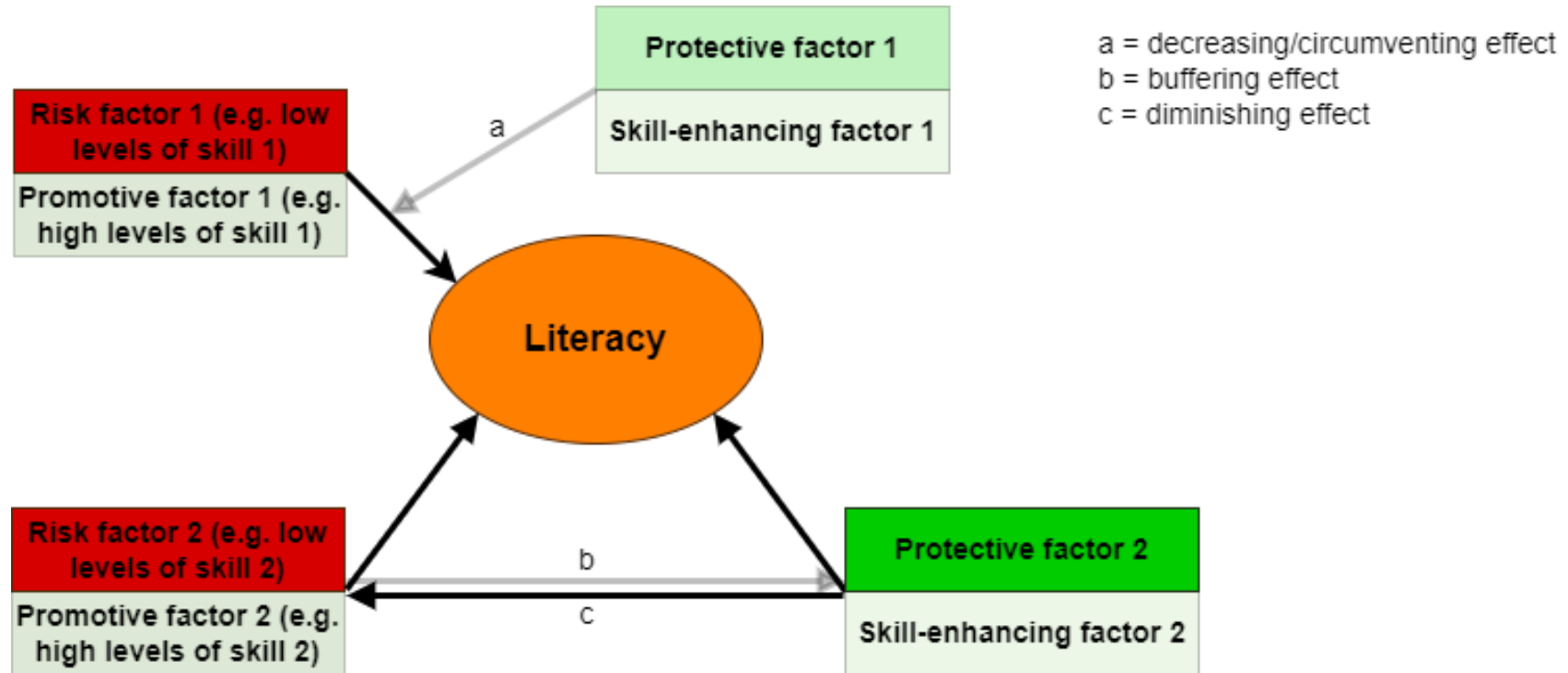
Overview of risk and protective factors interacting in the context of resilience in literacy



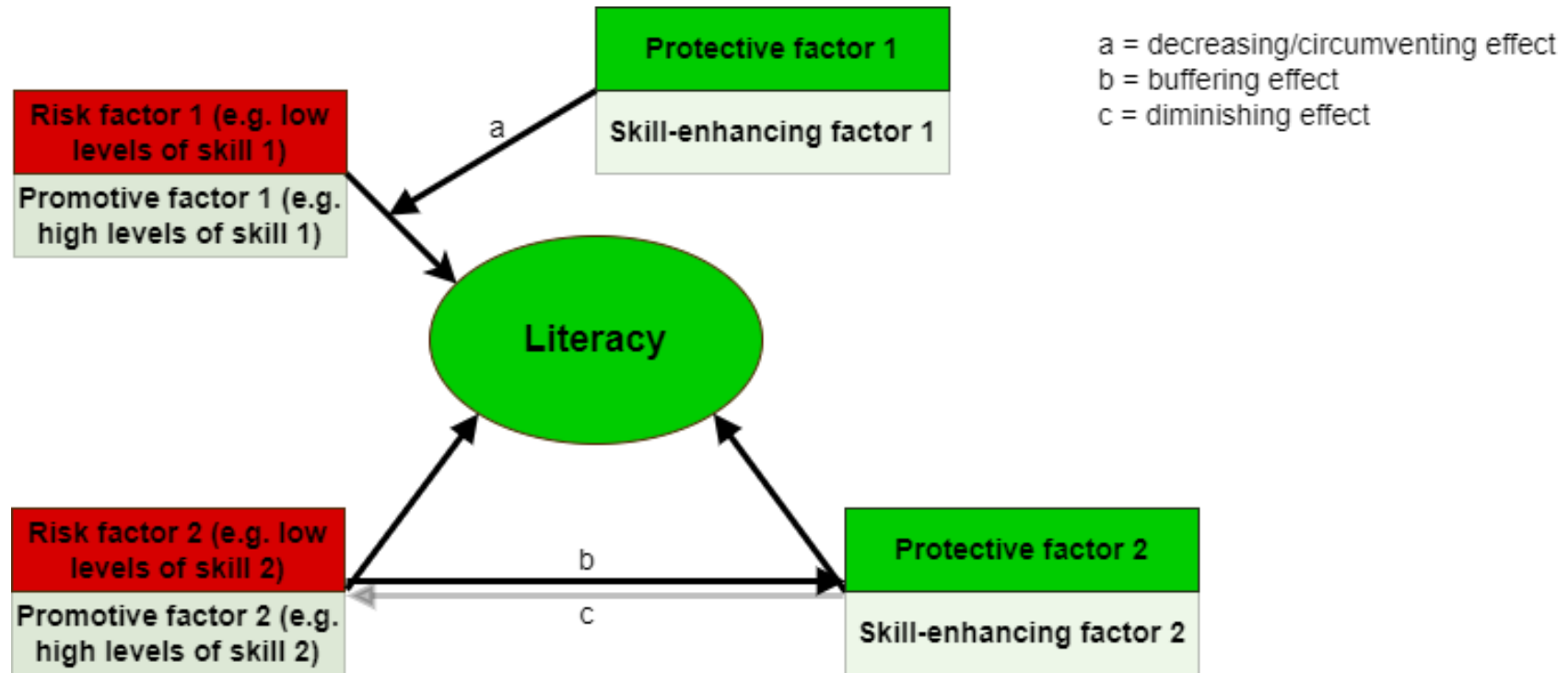
Overview of risk and protective factors interacting in the context of resilience in literacy



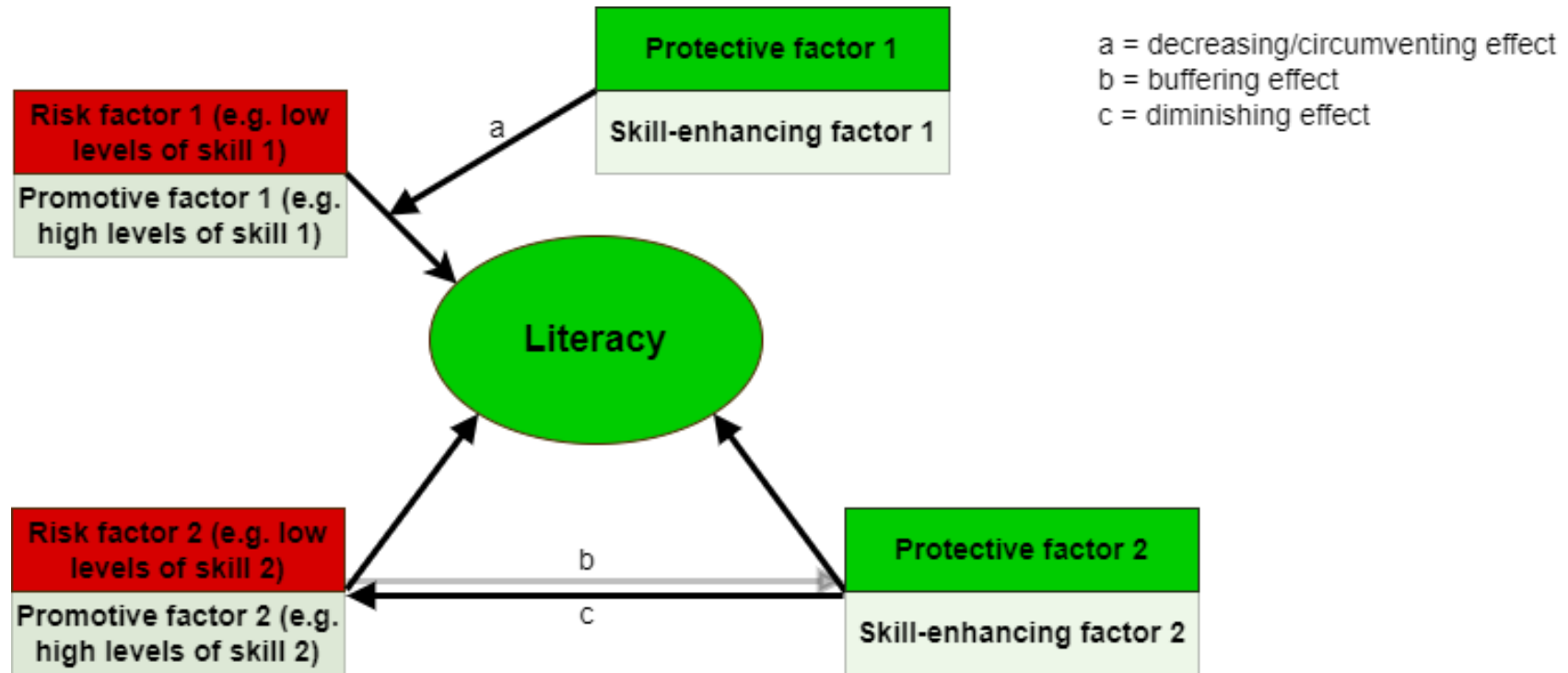
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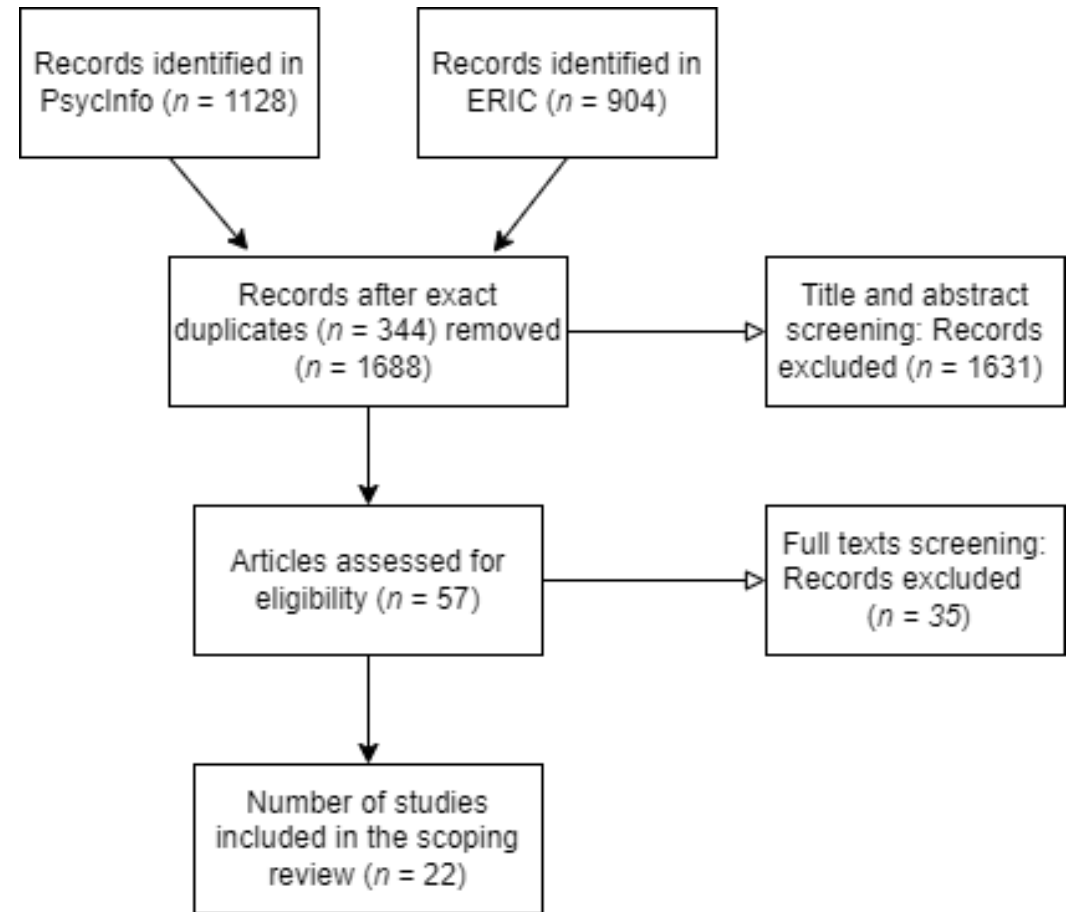


Overview of risk and protective factors interacting in the context of resilience in literacy



Study selection

- **Participants:** 6-16 years old, identified (risk of) RD (i.e., family risk [FR] or developmental language disorder [DLD], low pre-literacy skills [phonological awareness, rapid automatized naming, verbal short term memory, letter knowledge], or diagnosed word-level reading and/or spelling difficulties [dyslexia])
- **Outcomes:** at least one relevant literacy measure (i.e., at a 'higher level' than risk was established); word-reading accuracy or fluency, text-reading fluency, reading comprehension, and/or word-level spelling
- **Focus:** a clear focus on protective, skill enhancing or promotive effects or, alternatively, a mention of strengths or compensatory factors that turn out to be protective, skill-enhancing or promotive using the definitions stated before
- **Study characteristics:** Peer-reviewed, published between 2010 and 2023, written in English



Preliminary findings: Categories

22 included studies divided in categories:

Variable-centered studies

- Family-Risk studies ($n = 2$)
- Early-Risk studies ($n = 9$)
- Diagnosis of Dyslexia Studies ($n = 4$)
- Neurostudies ($n = 1$)

Person-centered studies

- LPA/LCA studies ($n = 3$)
- Mixed level Descriptive studies ($n = 3$)

Preliminary findings: general issues

Two main general issues:

- Low statistical power
- Design or statistical approach is insufficient to distinguish promotive/protective factors

Preliminary findings: evidence for protective factors

	Protective factors
Cognitive factors	
Neural correlates/indicators	
Socio-emotional factors	Behavioral self-regulation, Temperament-based adaptability
Educational factors	Quantity of late preschool ECEC
Interpersonal factors	Teacher-reported task-focussed behavior (Grade 1)

Preliminary findings: evidence for protective factors

	Protective factors	Candidate protective factors
Cognitive factors		Precursor skills (letter knowledge, phonological awareness, RAN), language skills (grammar, vocabulary, listening comprehension), orthographic learning, speech processing, verbal and visuospatial STM and WM, processing speed, nonverbal and verbal IQ.
Neural correlates/indicators		Functional activity in superior longitudinal fasciculus, gray matter volume in left dorsolateral prefrontal cortex (associated with WM and cognitive control)
Socio-emotional factors	Behavioral self-regulation, Temperament-based adaptability	
Educational factors	Quantity of late preschool ECEC	
Interpersonal factors	Teacher-reported task-focused behavior (Grade 1)	

Implications

- Increase sample size *or* make adjustments to correct for relatively low sample sizes (e.g. Bayesian approach)
- Think about the study design and statistical analyses
 - Design: which subgroups need to be included?
 - Statistical analyses: moderation/mediation analyses
- Combine both cognitive and non-cognitive factors to investigate compensatory mechanisms

Special issue “Resilience in learning: In Search of Protective Factors and Compensatory Mechanisms” in Learning and Instruction



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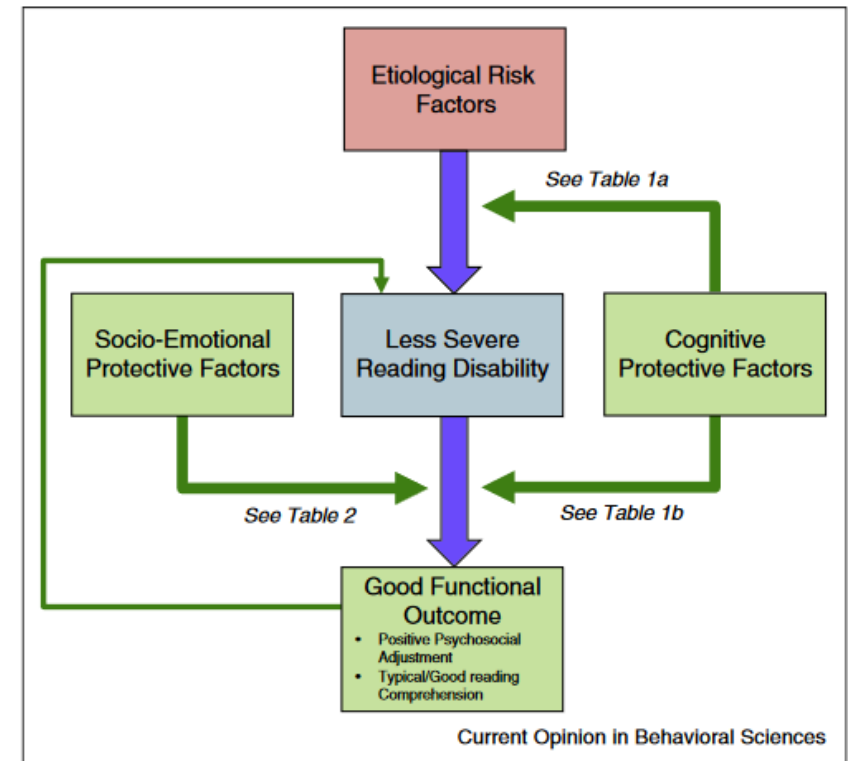
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Models of resilience in literacy (1)

Haft et al. (2016)

- Multiple mechanisms of resilience
- Only for cognitive protective factors

Figure 1



Models of resilience in literacy (2)

Catts and Petscher (2021)

- Multiple risk and resilience factors
- How factors interact is missing

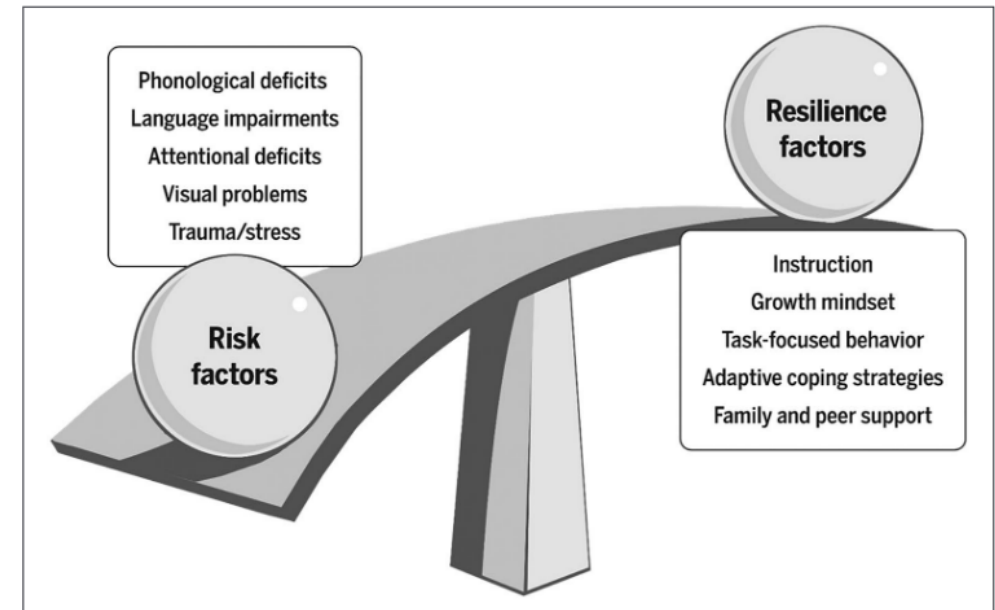


Figure 1. Cumulative risk and resilience model of dyslexia.

Model of typical literacy development

Kim (2019). DIER model

- Complex nature of literacy captured
- Not about resilience in literacy

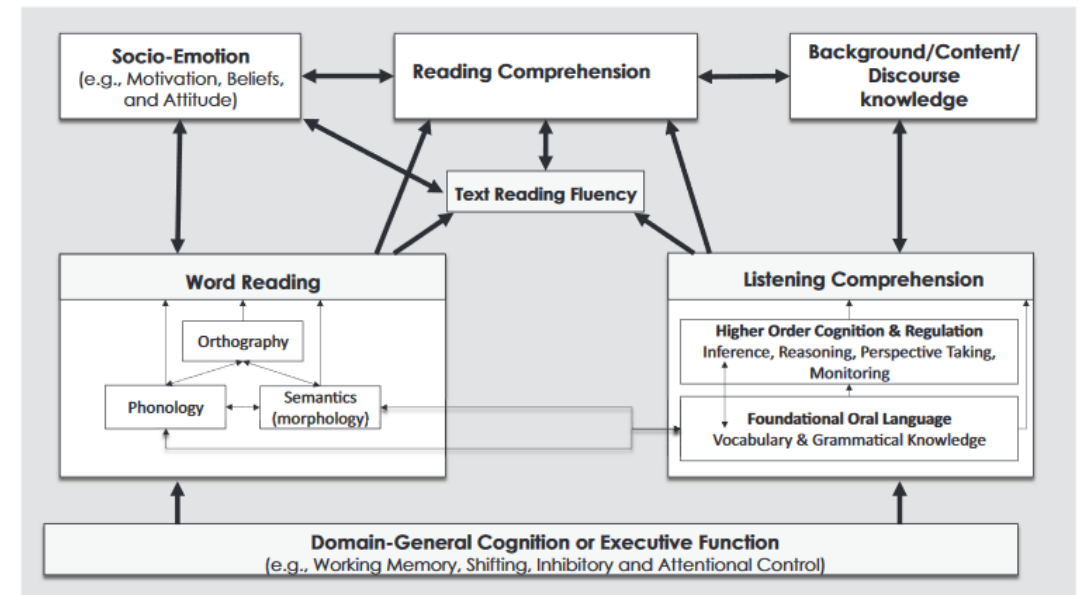
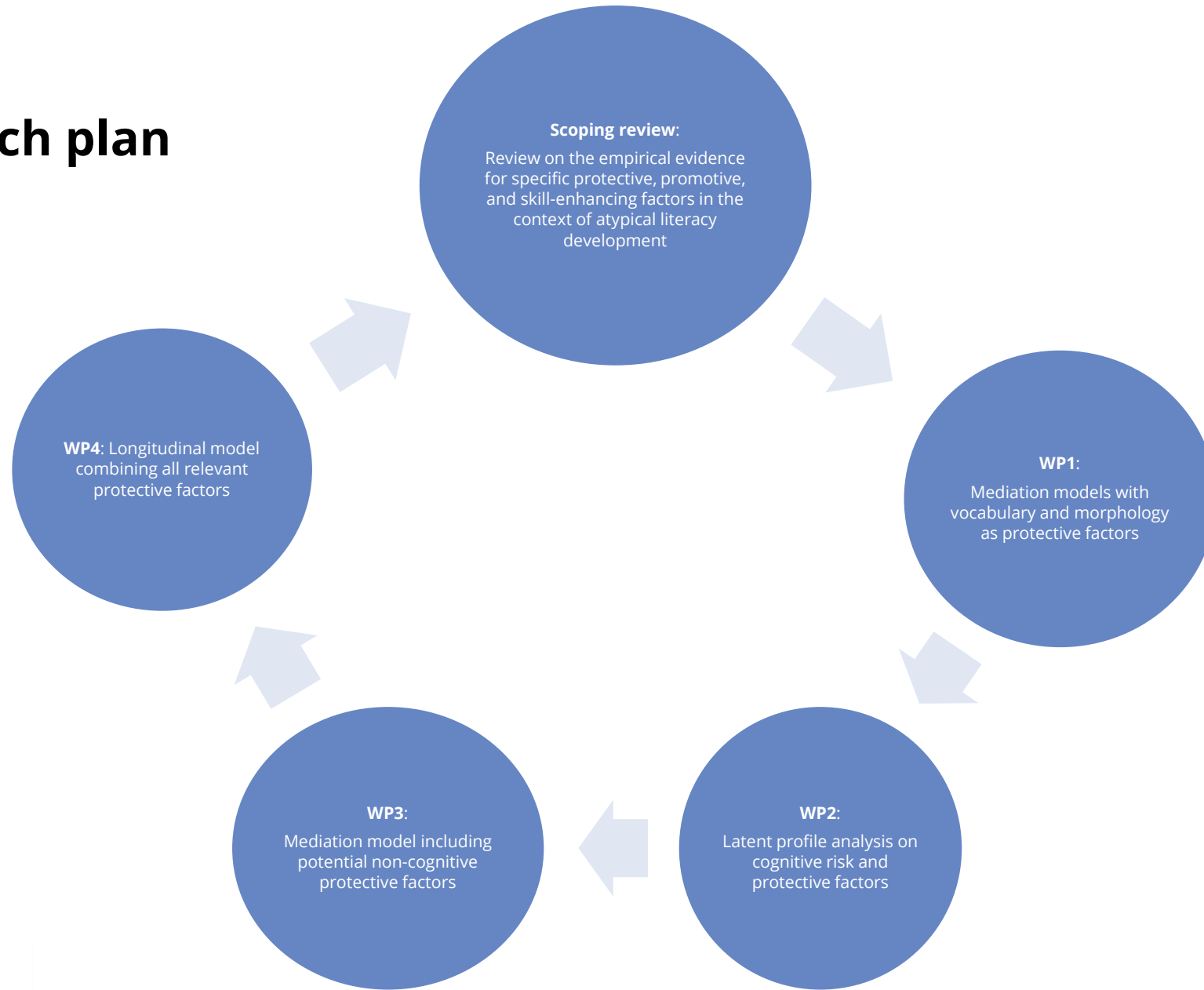


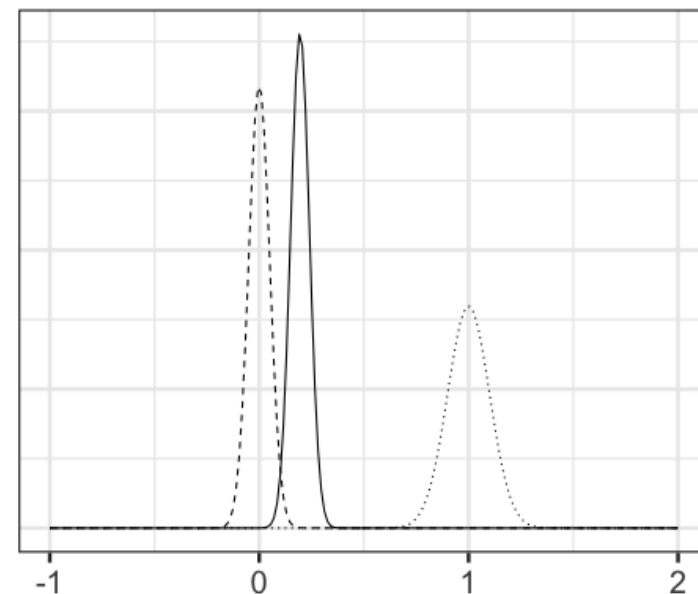
Figure 1. Direct and indirect effects model of reading (DIER). The skills are hypothesized to have hierarchical, dynamic (as a function of text characteristics and reading development), and interactive (or bidirectional) relations. Double-headed arrows represent interactive relations whereas single-headed arrows represent mostly unidirectional relations.

Research plan



Bayesian regularized SEM

- Bayesian approach:
 - a) enables estimation of complex models of relations between risk and protective factors without running into convergence issues or inadmissible estimates,
 - b) allows inclusion of prior information when assessing atypical trajectories of smaller samples of children with LaL difficulties (dyslexia or developmental language disorder [DLD])
 - c) avoids overfitting in the case of a smaller sample relative to a large number of potential protective factors by using so-called shrinkage priors.



.... Likelihood — Posterior -- Prior