The Implications of Open Science for Research Syntheses in Education

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Bias and QRPs in research syntheses and open science solutions

Introduction

(According to Erika) (2) Research syntheses and meta-analyses are critical to the health of education research, practice, and policy

FACT

Promoting Positive Youth Development Through School-Based Social and Emotional Learning Interventions: A Meta-Analysis of Follow-Up Effects

Rebecca D. Taylor Collaborative for Academic, Social, and Emotional Learning (CASEL)

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Social-emotional Learning

Considering the Social and Emotional Health of our Students, Colleagues, Families, and Ourselves

Introduction

FACT (According to Erika)

Research syntheses and meta-analyses are critical to the health of education research, practice, and policy

Existential Crisis

The results of (some) research syntheses are potentially misleading in part because the primary research they synthesize may be misleading

DISCLAIMER: Erika is an open science imposter.

The Problem of Suboptimal Practices

4%	of intervention studies report exclusively null findings in high- impact education journals (Kittelman et al., 2018)
0.13%	of articles in the top 100 impact education journals are replications (Makel & Plucker, 2014).
22%	Increase in positive-outcome bias increased between 1990 and 2007 (from 70.2% to 85%; Fanelli, 2012)

The problem:

•	Publication/dissemination biases	
	 Limited replication 	
	 Questionable researcher 	
	practices (QRPs)	



@andreahardyrd

The Problem of Suboptimal Practices

Self-admission rates from John et al. (2012)		
63%	Failing to report all dependent measures.	
56%	Collecting more data after looking at whether results were significant.	
28%	Failing to report all study conditions.	
16%	Stopping data collection earlier than planned once hypothesis confirmed.	
22%	"Rounding off" a <i>p</i> value (e.g., reporting that a <i>p</i> value of .054 is less than .05).	
38%	Making decisions about excluding data after looking at the impact of doing so on the results.	
27%	Reporting an unexpected finding as having been predicted.	

The problem:

- Publication/dissemination biases
 Limited replication
 - Questionable researcher
 practices (QRPs)



Consequences of Suboptimal Practices

- Trivial and meaningful^{**} findings are indistinguishable
 - High risk research is discouraged
 - Resources may be wasted
 - Public trust in education science is eroded

The trustworthiness of even the best research syntheses may be tentative

Consequences for Research Syntheses

- Research synthesists "standard" practices to minimize biases.
- *d* = .18 is the difference between published and unpublished effects (Polanin et al., 2016)



High quality syntheses: 🗸 clear problem definition and protocol in advance \checkmark exhaustive search (63%) ✓ collect standardized info detect QRPs 🛫 seek missing information WAH ✓ moderator analyses

Consequences for Research Syntheses

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- **d = .18** is the difference between published and unpublished effects (Polanin et al., 2016)



12 out of 15

= Number of meta-analytic pooled effects that were different (3x) from large study replication effects (Kvarven et al., 2019)

Solutions

Preregistration Transparent reporting Open access Registered reports

Preregistration and Transparent Reporting

Preregistration: prospective registration of research studies; researchers plan and document research questions, hypotheses, procedures, materials, and analyses prior to data collection (or at least prior to data analyses)

Benefits

- Creates unbiased sampling frame for research syntheses
- Preregistration discourages selective reporting and reduces missing information
 48% v. 66% = Percent of
- Increases transparency of a priori v. post-hoc denisicem mesuite in

preregistered v. nonpreregistered studies (Toth et al., 2020)

Preregistration and Transparent Reporting

Preregistration: prospective registration of research studies

Challenges

- Precautions needed to ensure flexibility in the face of challenge is not discouraged, as exploration that could lead to important discoveries
- QRPs will not be completely eliminated
- Challenging to locate relevant preregistrations for syntheses without centralized system (OSF, REES, ClinicalTrials.gov, AEA, EGAP, AsPredicted, WHO)

Pro TIP: Include popular registries among search strategies

Open Access

Open access: sharing of data, materials, and statistical code

Benefits

- Access ensures that research findings can be comprehensively and comparably included in research syntheses
- Increases opportunity for interesting moderator analyses

Challenges

 Systematically extracting information will likely be time-consuming and complicated



Registered Reports

Registered report: research is accepted for publication via a peer review process that bases acceptance on the preregistered study plan created prior to the study actually being conducted.

Benefits

- Ensures publication is based on research questions and study design/analysis (not findings)
- Creates unbiased sampling frame of studies for syntheses

Challenge: Has the potential to create bias against high risk research

Pro TIP: Explore (pre-)registration (report) status as a moderator

Problem	Description	Solution
Transparency/ Replicability	Research syntheses report about 55% of PRISMA criteria and are not always replicated (Polanin et al., 2020)	 Follow synthesis reporting guidelines (MARS; PRISMA) Open access

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Outdated	Research syntheses are often outdated by publication and require updating with new research and theory.	 Follow reporting guidelines Open access* *Challenge: incentivizing sharing

Problem	Description	Solution
Ill-defined searches, criteria, analysis plans	Poorly defined search strategies and inclusion criteria open up research syntheses to bias. Challenge to generalizability and replicability.	 Follow reporting guidelines Preregistration* Registered reports* *Challenge: amending synthesis protocols is expected

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Ill-defined searches, criteria, analysis plans	Poorly defined search strategies and inclusion criteria open up research syntheses to bias. Challenge to generalizability and replicability.	 Follow reporting guidelines Preregistration* Registered reports* *Challenge: amending synthesis protocols is expected
Publication bias	Bias exists against unexciting or null research syntheses	 Registered reports* *Challenge: syntheses may be perceived as overly predictable

Prospective Solution: Prospective Research Syntheses

Prospective research synthesis: Synthesis that plans studies in advance with the intent to include them in a synthesis or identifies and determines the eligibility of studies for inclusion in a synthesis before the results of any are known

Prospective Solution: Prospective Research Syntheses

✓ Reduces selective outcome reporting

(Ensures that primary research included in synthesis is designed to assess pre-specified outcomes and tests of outcomes are included)

✓ Reduces selective data inclusion

(Ensures that primary research is designed to collect data relevant to the synthesis)

✓ Reduces significance chasing

(Ensures that primary research is designed with the intent to conduct pre-specified analyses for inclusion in a metaanalysis)

✓ Promotes complete study reporting

(Ensures that all primary research is designed to record a standardized set of study information)

✓ Reduces search and inclusion challenges

(Primary research designed to meet pre-specified inclusion criteria for the synthesis)

✓ Facilitates updates

(Ensures that research is designed with the intent to be included in a synthesis)

Conclusions

Current research norms challenge the validity of primary research and research syntheses

Open science solutions are particularly important to consider in education syntheses

There will be worthwhile challenges to solve: Open science practices may slow down production until we find ways to implement them with efficiency Thank you for your attention

Questions?

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