UiO : Department of Special Needs Education
University of Oslo

Hvordan kan det sikres, at en særlig indsats for elever med matematikvanskeligheder har effekt på langt sigt?

Anita Lopez-Pedersen
NCUM Årskonferanse/NORSMA 11 Teacher's day
22. November 2023

Formålet med tiltak

Matematikkvansker

Hvordan hjelpe elever som strever i matematikk

Hvordan planlegge og gjennomføre tiltak som har effekt på lang sikt?

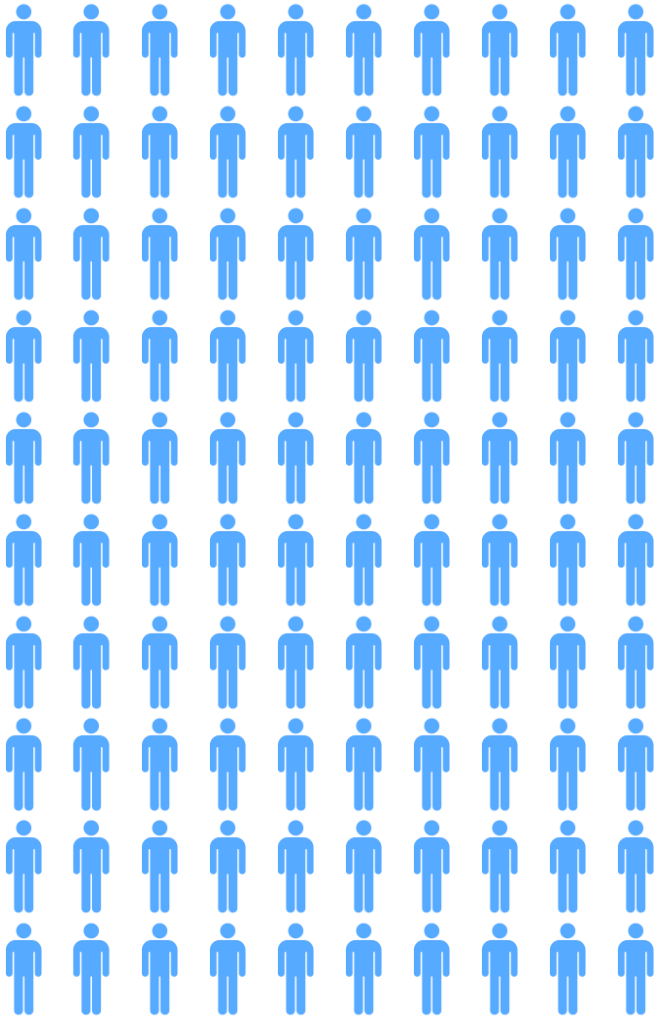
Bakgrunn

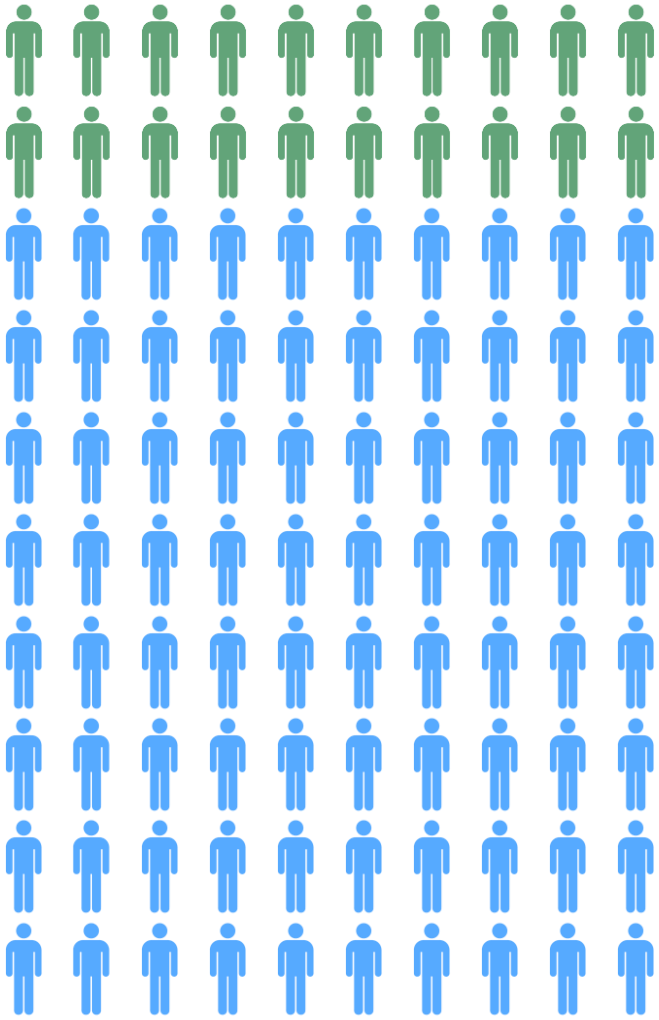
Matematikkvansker

Prediksjoner av individuelle ferdigheter og utvikling

Tidlig støtte

Photo: Shane Colvin



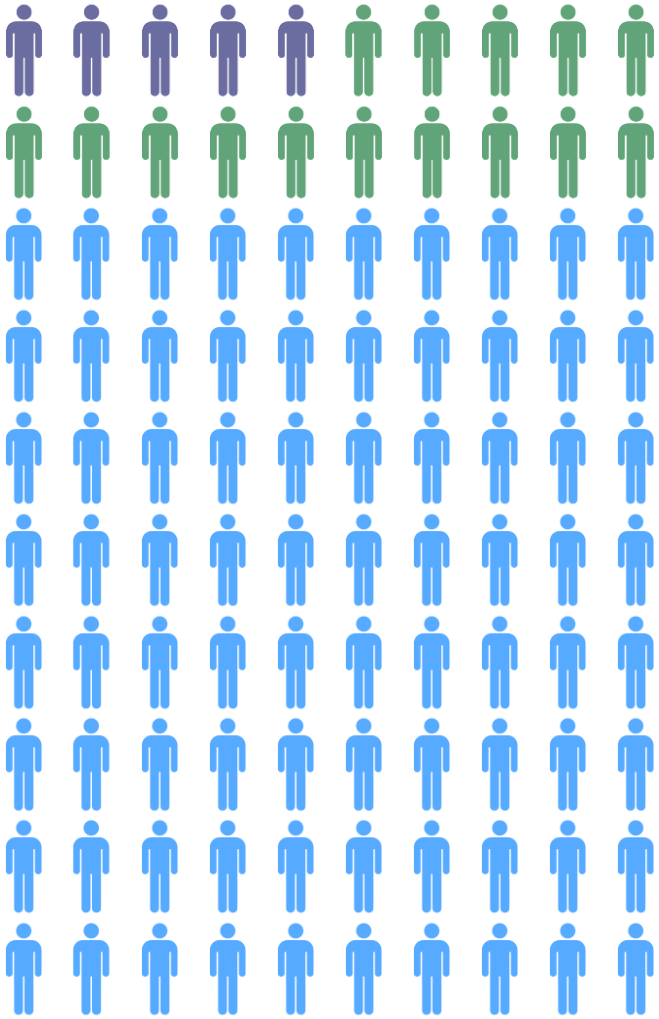


15–20 %

Mathematical (learning) difficulties

Matematikk-vansker

Dysfunksjoner i de nevrologiske og kognitive funksjoner det er behov for forståelse og prosessering av tallforståelse.



5–7 % (3-6%)

Dyscalculia

Mathematical learning disability/disorder

Dyskalkuli

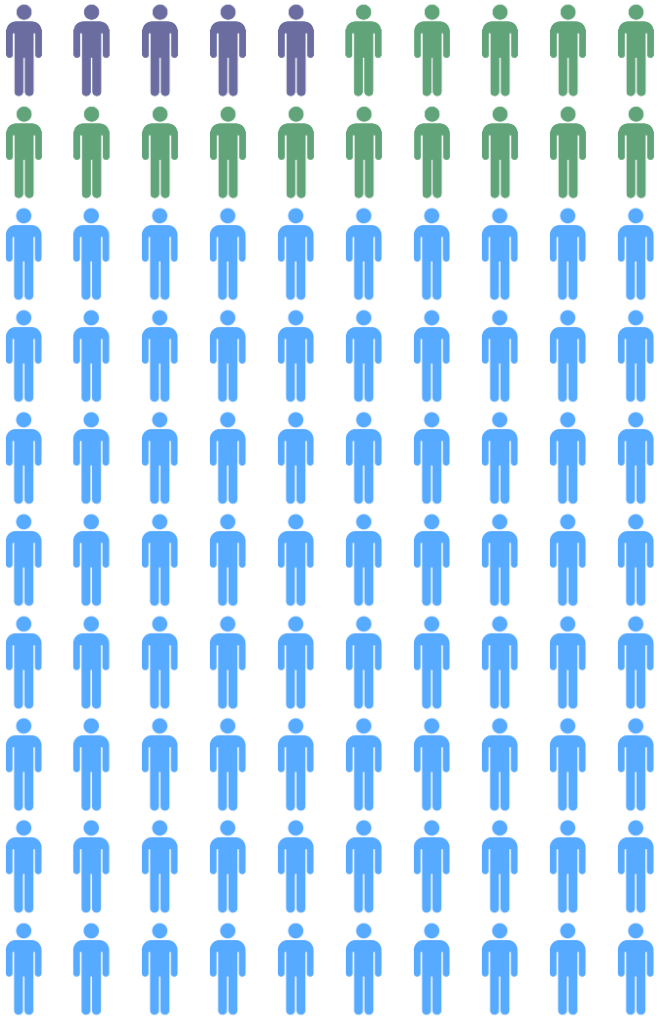
Spesifikke matematikk-vansker

ICD-10: Spesifikk regnevanske

ICD-11: Impairments in mathematics

DSM-5:
Specific impairment in mathematics

Årsaker til vansker: Kognitive, motivasjon, miljømessige faktorer (hjemmemijlø, læringsmiljø).



10–15 %

Lavt-presterende elever

Low-performing

Vanskene er mildere sammenlignet med dyskalkuli.

Photo: Shane Colvin

Hva forteller forskning oss om elever som er i risiko for å utvikle matematikkvansker og hvordan vi best kan hjelpe dem?

Photo: Shane Colvin

Hva vet vi om elever som er risiko for å utvikle matematikkvansker?

Longitudinell stabilitet

Hvilke ferdigheter skal vi styrke?

Cut-off scores – hvilke barn skal vi hjelpe?

Er det noen tidsperioder som er mer sensitive for støtte enn andre?

(Duncan et al., 2007; Hawes et al., 2022; Jordan et al., 2017; Landerls et al., 2014; Melby—Lervåg et al., 2016;; Watts et al., 2014;)

Hvordan kan vi vite hvilke matematikkferdigheter vi skal trene på?

Utviklingsperspektiv

Hvilke undersøkelser gir oss informasjon om ferdigheter i et utviklingsperspektiv?

Photo: Shane Colvin

Hva predikerer utvikling av matematiske ferdigheter og matematikkvansker?

Hva er en prediksjon?

Domenegenerelle faktorer

Domenespesifikke faktorer

Longitudinelle studier

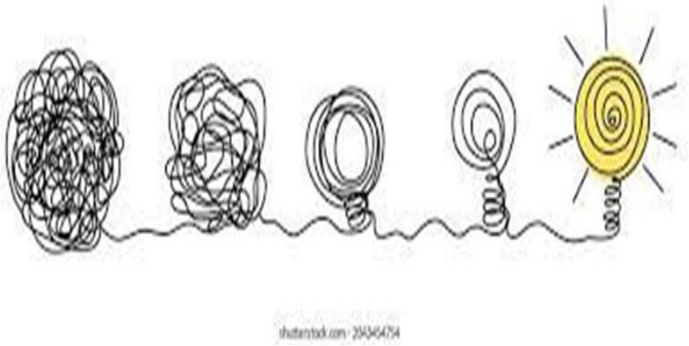
Hva er en prediksjon?

Hvor mange time points?

Assosiasjon

Retning

Predictive value

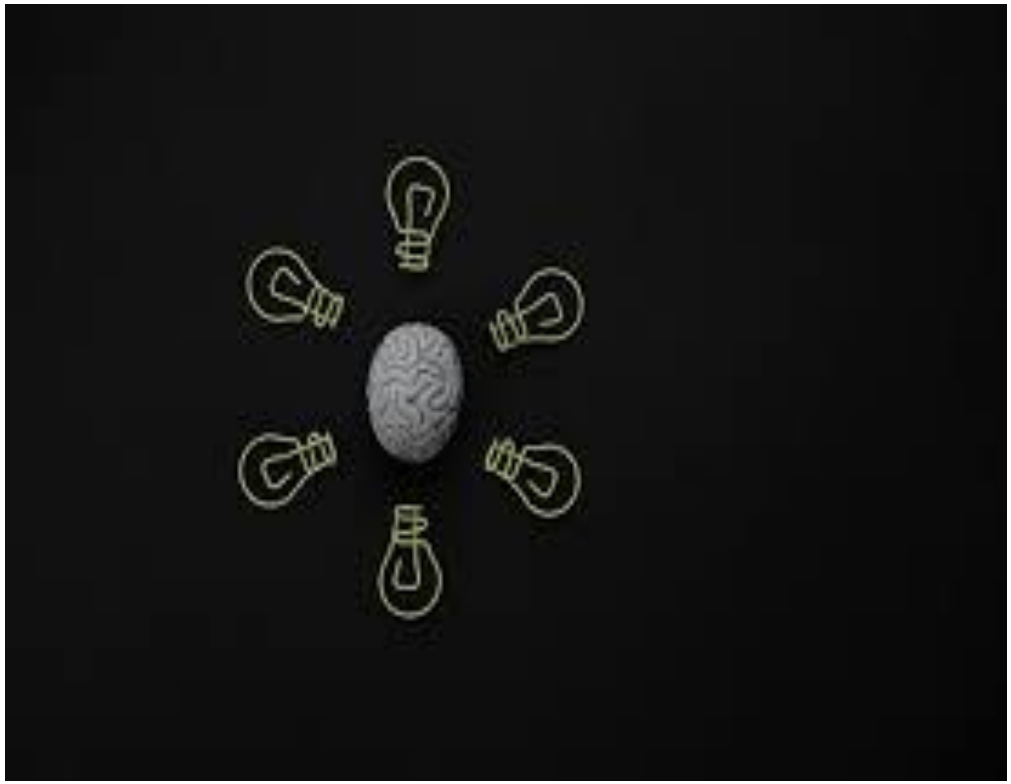


(Hamaker et al., 2020; Kline, 2016)

DOMENEGENERELLE ELLER DOMENSPESIFIKKE FAKTORER?

Domenegenerelle faktorer

Språk
IQ
Arbeidsminne
Eksekutive funksjoner



(Cragg et al., 2017; Ferrer & McArdle, 2004; Lee & Bull, 2016; Raghubar et al., 207; vand der Ven et al., 2011)

Photo: Pexels

Domenespesifikke faktorer

Telleferdigheter
Tallkunnskap
Aritmetiske ferdigheter

(Dehaene, 2001; Feigenson et al., 2004)

Photo: Unsplash

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2020, Vol. 112, No. 6, 1167–1182
http://dx.doi.org/10.1037/edu0000426

Number Knowledge and the Approximate Number System Are Two Critical Foundations for Early Arithmetic Development

Stephanie A. Malone
Australian Catholic University

Kelly Burgoyne
University of Manchester and Australian Catholic University

Charles Hulme
University of Oxford and Australian Catholic University

Malone et al., 2020

Method

Participants n = 569, M*age* 5y3m

Variabler:

Approximate Number System, tallkunnskap, telleferdigheter, aritmetikk, eksekutive funksjoner, inhibisjon, nonverbal IQ

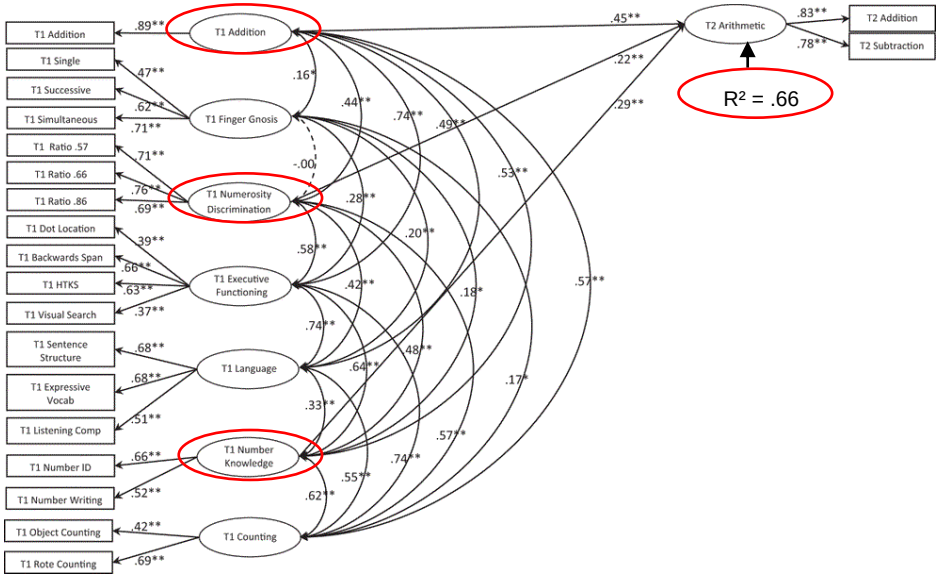
To tidspunkt

Analyse

Latent variable path model

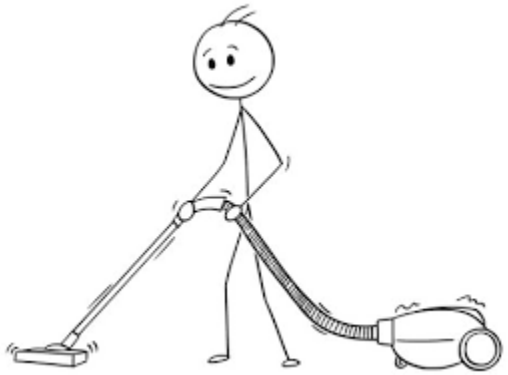
Tre unike prediktorer på tidspunkt 2 når det gjelder aritmetikk

Tallkunnskap, addisjon, mengeforståelse tidspunkt 1 – 66% av variansen



Malone, S. A., Burgoyne, K., & Hulme, C. (2020). Number knowledge and the approximate number system are two critical foundations for early arithmetic development. *Journal of Educational Psychology, 112*(6), 1167-1182. http://dx.doi.org/10.1037/edu0000426

Meta-analyser



Effekt størrelser

Metodologiske svakheter

Hvilke ferdigheter skal vi fokusere på

Hvilke undervisningsprinsipper kjennetegner effektive intervensjoner

(Chodura et al., 2015; Dennis et al., 2016; Gersten et al., 2009; Jitendra et al., 2018; Kroesbergen & Van Luit, 2003; Monei & Pedro,2017; Wang et al., , 2016).

Eksperimentell forskning

Design

Randomized trials

Umiddelbar effekt

Research Study

Improving Numeracy Skills in First Graders with low performance in early numeracy: A Randomized Controlled Trial

Anita Lopez-Pedersen, PhD[1], Riikka Mononen, PhD[1,2], Pirjo Aunio, PhD[3], Ronny Scherer, PhD[1], and Monica Melby-Lervåg, PhD[1]

Hammill Institute on Disabilities

Remedial and Special Education
1–11
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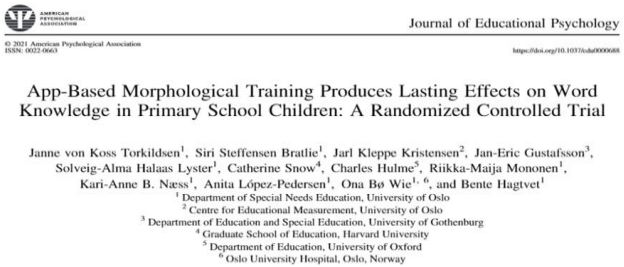

Journal of Educational Psychology

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https://doi.org/10.1037/edu0000688

App-Based Morphological Training Produces Lasting Effects on Word Knowledge in Primary School Children: A Randomized Controlled Trial

Janne von Koss Torkildsen[1], Siri Steffensen Bratlie[1], Jarl Kleppe Kristensen[2], Jan-Eric Gustafsson[3], Solveig-Alma Halaas Lyster[1], Catherine Snow[4], Charles Hulme[5], Riikka-Maija Mononen[1], Kari-Anne B. Næss[1], Anita López-Pedersen[1], Ona Bø Wie[1, 6], and Bente Hagtvet[1]

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[2] Centre for Educational Measurement, University of Oslo
[3] Department of Education and Special Education, University of Gothenburg
[4] Graduate School of Education, Harvard University
[5] Department of Education, University of Oxford
[6] Oslo University Hospital, Oslo, Norway

(Lopez-Pedersen et al., 2023; Torkildsen et al., 2021)

Journal of Educational Psychology
2013, Vol. 105, No. 1, 58–77

0022-0663/13/$12.00 DOI: 10.1037/a0030127

Effects of First-Grade Number Knowledge Tutoring With Contrasting Forms of Practice

Lynn S. Fuchs
Vanderbilt University

David C. Geary
University of Missouri

Donald L. Compton and Douglas Fuchs
Vanderbilt University

Christopher Schatschneider
Florida State University

Carol L. Hamlett, Jacqueline DeSelms, Pamela M. Seethaler, Julie Wilson, Caitlin F. Craddock, Joan D. Bryant, and Kurstin Luther
Vanderbilt University

Paul Changas
Metropolitan-Nashville Public Schools

The purpose of this study was to investigate the effects of 1st-grade number knowledge tutoring with contrasting forms of practice. Tutoring occurred 3 times per week for 16 weeks. In each 30-min session, the major emphasis (25 min) was number knowledge; the other 5 min provided practice in 1 of 2 forms. Nonspeeded practice reinforced relations and principles addressed in number knowledge tutoring. Speeded practice promoted quick responding and use of efficient counting procedures to generate many correct responses. At-risk students were randomly assigned to number knowledge tutoring with speeded practice (n = 195), number knowledge tutoring with nonspeeded practice (n = 190), and control (no tutoring, n = 206). Each tutoring condition produced stronger learning than control on all 4 mathematics outcomes. Speeded practice produced stronger learning than nonspeeded practice on arithmetic and 2-digit calculations, but effects were comparable on number knowledge and word problems. Effects of both practice conditions on arithmetic were partially mediated by increased reliance on retrieval, but only speeded practice helped at-risk children compensate for weak reasoning ability.

Keywords: mathematics, practice, fluency, arithmetic, word problems

Supplemental materials: http://dx.doi.org/10.1037/a0030127.supp

American Educational Research Journal
June 2015, Vol. 52, No. 3, pp. 516–546
DOI: 10.3102/0002831214565787

Intervention for First Graders With Limited Number Knowledge: Large-Scale Replication of a Randomized Controlled Trial

Russell Gersten
Instructional Research Group
Eric Rolfhus
Edvance Research, Inc.
Ben Clarke
University of Oregon
Lauren E. Decker
Chuck Wilkins†
Edvance Research, Inc.
Joseph Dimino
Instructional Research Group

Journal of Educational Psychology
2012, Vol. 104, No. 3, 647–660

0022-0663/12/$12.00 DOI: 10.1037/a0029018

Building Kindergartners' Number Sense: A Randomized Controlled Study

Nancy C. Jordan, Joseph Glutting, Nancy Dyson, Brenna Hassinger-Das, and Casey Irwin
University of Delaware

Math achievement in elementary school is mediated by performance and growth in number sense during kindergarten. The aim of the present study was to test the effectiveness of a targeted small-group number sense intervention for high-risk kindergartners from low-income communities. Children were randomly assigned to 1 of 3 groups (n = 44 in each group): a number sense intervention group, a language intervention group, or a business-as-usual control group. Accounting for initial skill level in mathematical knowledge, children who received the number sense intervention performed better than controls at immediate posttest, with meaningful effects on measures of number competencies and general math achievement. Many of the effects held 8 weeks after the intervention was completed, suggesting that children internalized what they had learned. There were no differences between the language and control groups on any math-related measures.

Keywords: at risk, mathematics, number sense, low income, intervention

Routledge
Taylor & Francis Group

Journal of Research on Educational Effectiveness

ISSN: 1934-5747 (Print) 1934-5739 (Online) Journal homepage: http://www.tandfonline.com/loi/uree20

Testing the Immediate and Long-Term Efficacy of a Tier 2 Kindergarten Mathematics Intervention

Ben Clarke, Christian Doabler, Keith Smolkowski, Evangeline Kurtz Nelson, Hank Fien, Scott K. Baker & Derek Kosty

To cite this article: Ben Clarke, Christian Doabler, Keith Smolkowski, Evangeline Kurtz Nelson, Hank Fien, Scott K. Baker & Derek Kosty (2016) Testing the Immediate and Long-Term Efficacy of a Tier 2 Kindergarten Mathematics Intervention, Journal of Research on Educational Effectiveness, 9:4, 607-634, DOI: 10.1080/19345747.2015.1116034

To link to this article: https://doi.org/10.1080/19345747.2015.1116034

HVA ER "THE ROADS LESS TRAVELLED" I INTERVENSJONSSTUDIER FOR ELEVER SOM ER I RISIKO FOR Å UTVIKLE MATEMATIKKVANSKER?

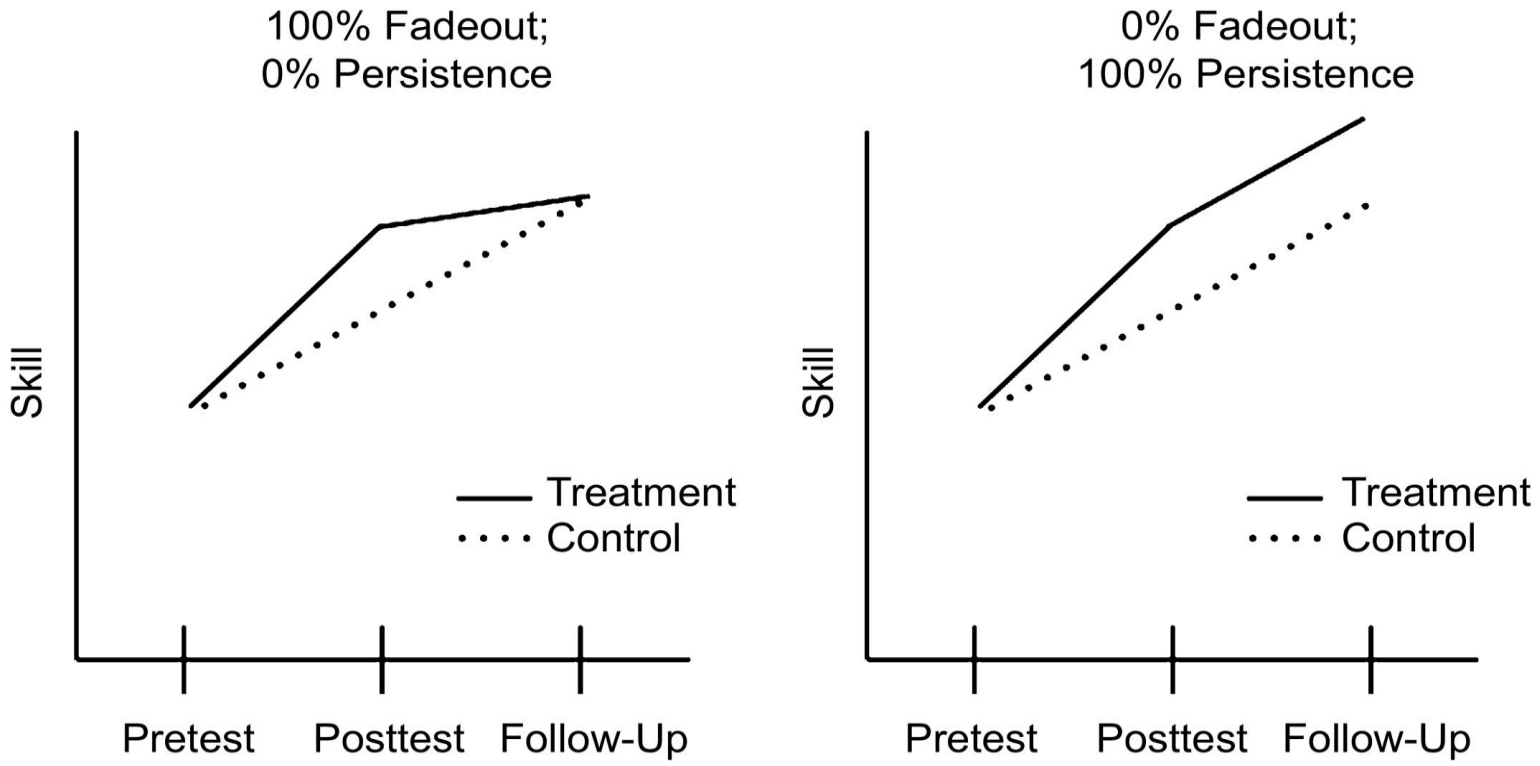
Språk

Well-being

Langtidseffekt av intervensjoner

(Bailey et al., 2020; Donolato et al., 2021; Espinas & Fuchs, 2022; Peng et al., 2021)

Prevention: Necessary But Insufficient? A 2-Year Follow-Up of an Effective First-Grade Mathematics Intervention



Child Development, Volume: 91, Issue: 2, Pages: 382-400, First published: 25 October 2018, DOI: (10.1111/cdev.13175)

Fadeout effekt

Avtakende effekt etterfulgt en intervensjon

Forskjellige forklaringer

Constraining content hypothesis

Opplæringen etter endt intervensjon

Miljømessige årsaker til fadeout

Takeffekt

Teaching Students What They Already Know? The (mis)alignment between mathematics instructional content and student knowledge in kindergarten

Mimi Engel
Vanderbilt University

Amy Claessens
University of Chicago

Maida Finch
Salisbury University

May 31, 2012

Acknowledgements: Generous support for this project was provided by the National Institute of Child Health and Human Development Grant #5R24HD051152-07, the Oak Ridge Associated Universities Ralph E. Powe Junior Faculty Enhancement Award, the University of Chicago Population Research Center, and Vanderbilt University. Thanks to Dale Ballou, Doug Clements, Pamela Davis-Kean, Will Doyle, Greg Duncan, Guanglei Hong, Susanna Loeb, Susan Levine, Steve Raudenbush, and Bob Siegler for helpful comments on earlier drafts of this paper. Thanks also to conference participants at the American Educational Research Association 2011 Annual Meeting and the Society for Research on Educational Effectiveness 2011 Annual Meeting, and participants at the Workshop on Education at the University of Chicago, and the Quantitative Workshop at Vanderbilt University for helpful feedback. All errors are our own.

Preexisting differences

Stabile variasjoner mellom barn

Sårbare elever

Developmental Psychology
2009, Vol. 45, No. 3, 850–867

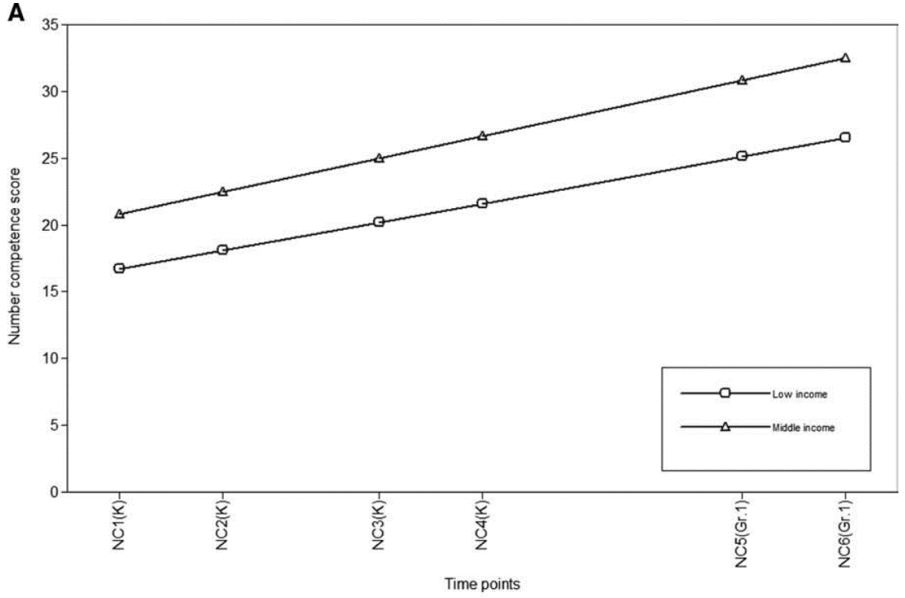
0012-1649/09/$12.00 DOI: 10.1

Early Math Matters: Kindergarten Number Competence and Later Mathematics Outcomes

Nancy C. Jordan
University of Delaware

David Kaplan
University of Wisconsin–Madison

Chaitanya Ramineni and Maria N. Locuniak
University of Delaware



Hva gjør at effekt av særlige innsatser fader ut - Constraining content or preexisting differences hypothesis

og hvor mye er det realistisk at vi kan endre?

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Journal of Research on Educational Effectiveness

ISSN: 1934-5747 (Print) 1934-5739 (Online) Journal homepage: https://www.tandfonline.com/loi/uree20

Persistence and Fadeout in the Impacts of Child and Adolescent Interventions

Drew Bailey, Greg J. Duncan, Candice L. Odgers & Winnie Yu

Modest transfer

Hvor mye er det mulig å endre?

Boosts er ikke nok

Implikasjoner

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Journal of Research on Educational Effectiveness

ISSN: 1934-5747 (Print) 1934-5739 (Online) Journal homepage: http://www.tandfonline.com/loi/uree20

Testing the Immediate and Long-Term Efficacy of a Tier 2 Kindergarten Mathematics Intervention

Ben Clarke, Christian Doabler, Keith Smolkowski, Evangeline Kurtz Nelson, Hank Fien, Scott K. Baker & Derek Kosty

To cite this article: Ben Clarke, Christian Doabler, Keith Smolkowski, Evangeline Kurtz Nelson, Hank Fien, Scott K. Baker & Derek Kosty (2016): Testing the Immediate and Long-Term Efficacy of a Tier 2 Kindergarten Mathematics Intervention, Journal of Research on Educational Effectiveness, DOI: 10.1080/19345747.2015.1116034

To link to this article: http://dx.doi.org/10.1080/19345747.2015.1116034

Hvordan kan vi planlegge tiltak (særlig innsats) for å opprett holde effekt?

Planlegge tiltak – særlig innsats

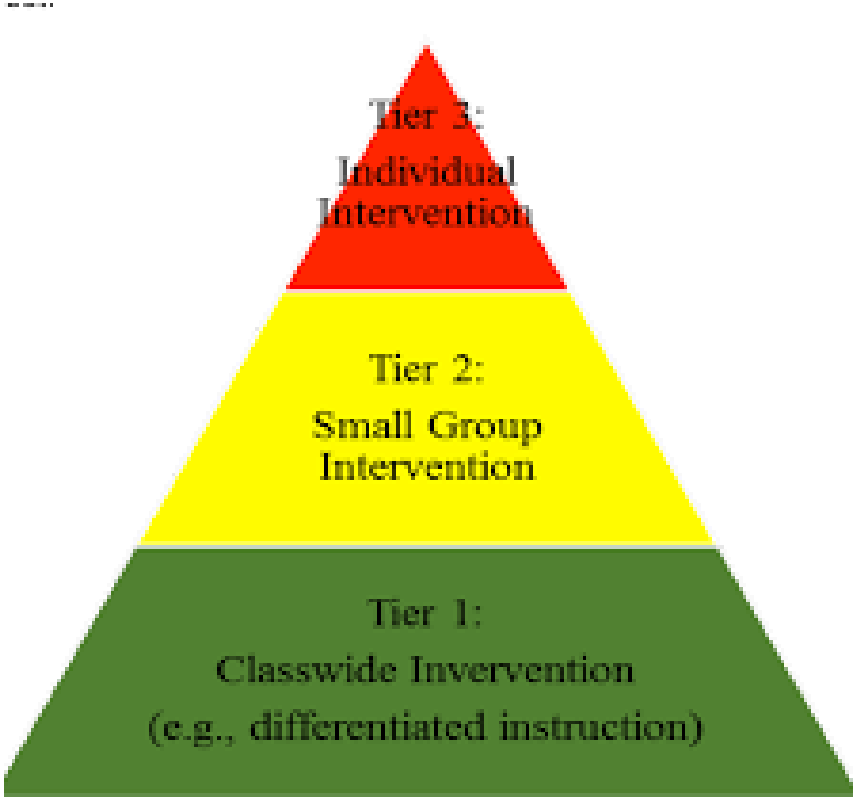


Photo: Pexels

Trifecta ferdigheter

Noe som faktisk kan endres gjennom en intervensjon

Grunnleggene for akademiske prestasjoner

Counterfactual conditions – at de ikke oppstår uten at man eksponeres for det

Kunnskap om karakteristikkene hos barn som er i risiko for matematikkvansker

(Bailey et al, 2017)

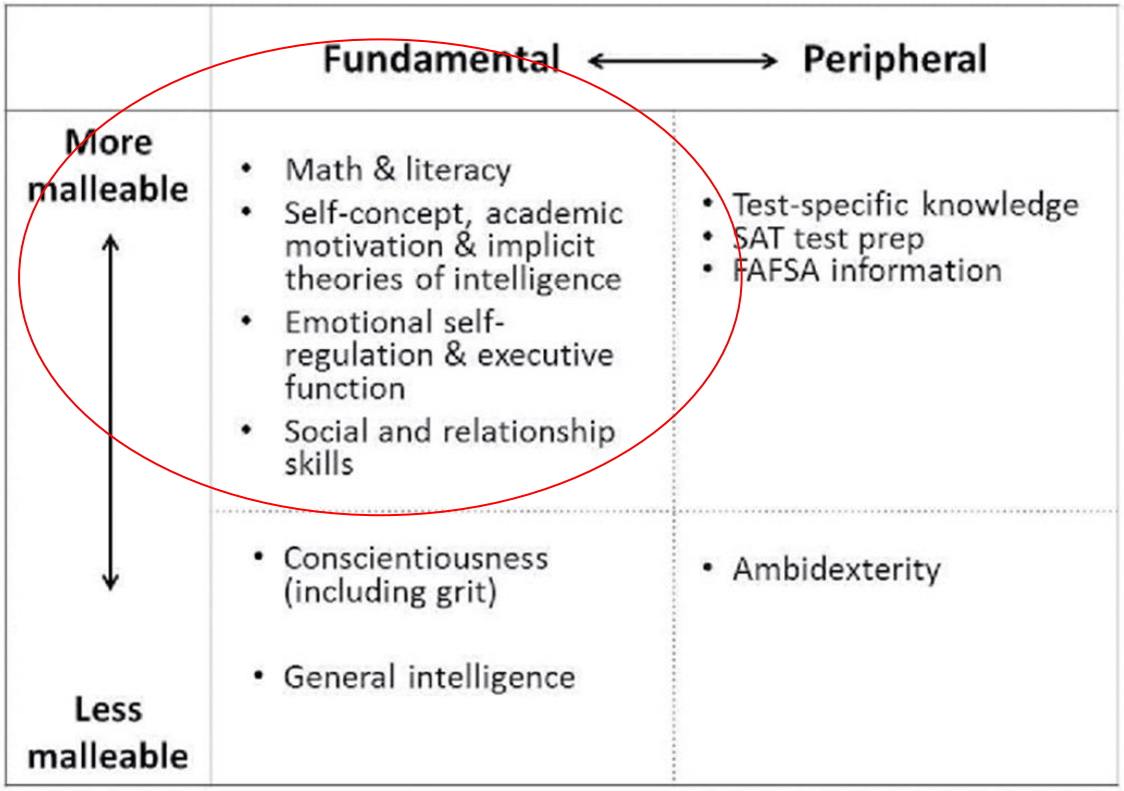


Figure displaying fundamentality and malleability in skills, behavors and beliefs (Bailey et al., 2017)

Trifecta skills:

Endringsbare

Fundamentale

Counterfactual

(Bailey et al., 2017; Melby-Lervåg et al., 2016)

Hvilke ferdigheter skal trenes på og når?

Utviklingsmessig timing

Foot-in-the door intervensjoner

Kaskadeteori

(Bailey et al., 2017)

Photo: Pixabay

Foot-in-the-door

Photo: Pixabay

Kan vi sette inn tiltak som gir en kaskadeeffekt?

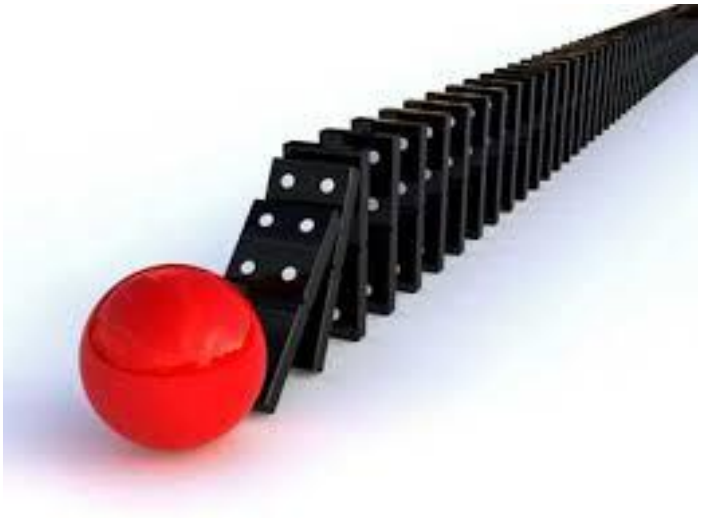


Photo: Flickr

Sustaining environments

Opprettholde effekten
av tiltak

Hva gjør man når
intervensjonen/tiltaket
er avsluttet?

Photo: Pixabay

Veiskille i forskning?

Photo: Pixabay

Hva forsker vi på?

Og hva anbefaler vi at skoler og praksisfeltet skal gjøre?

Journal of Educational Psychology
2013, Vol. 105, No. 1, 241–247

0022-0663/13/$12.00 DOI: 10.1037/a0030368

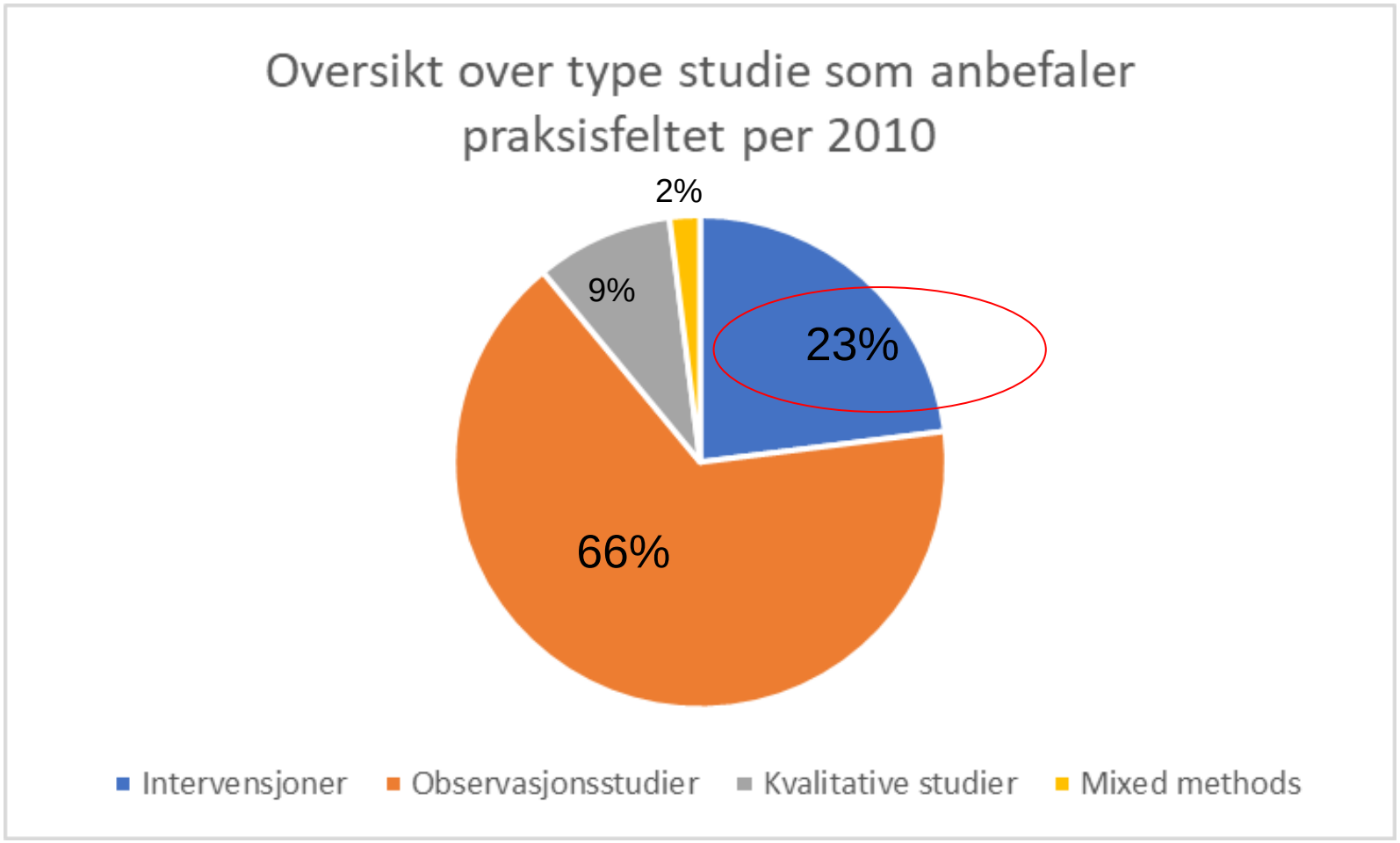
Models of Not-So-Good Behavior: Yet Another Way to Squeeze Causality and Recommendations for Practice Out of Correlational Data

Alyssa L. Reinhart and Samuel H. Haring
The University of Texas at Austin

Joel R. Levin
University of Arizona

Erika A. Patall
The University of Texas at Austin

Daniel H. Robinson
Colorado State University



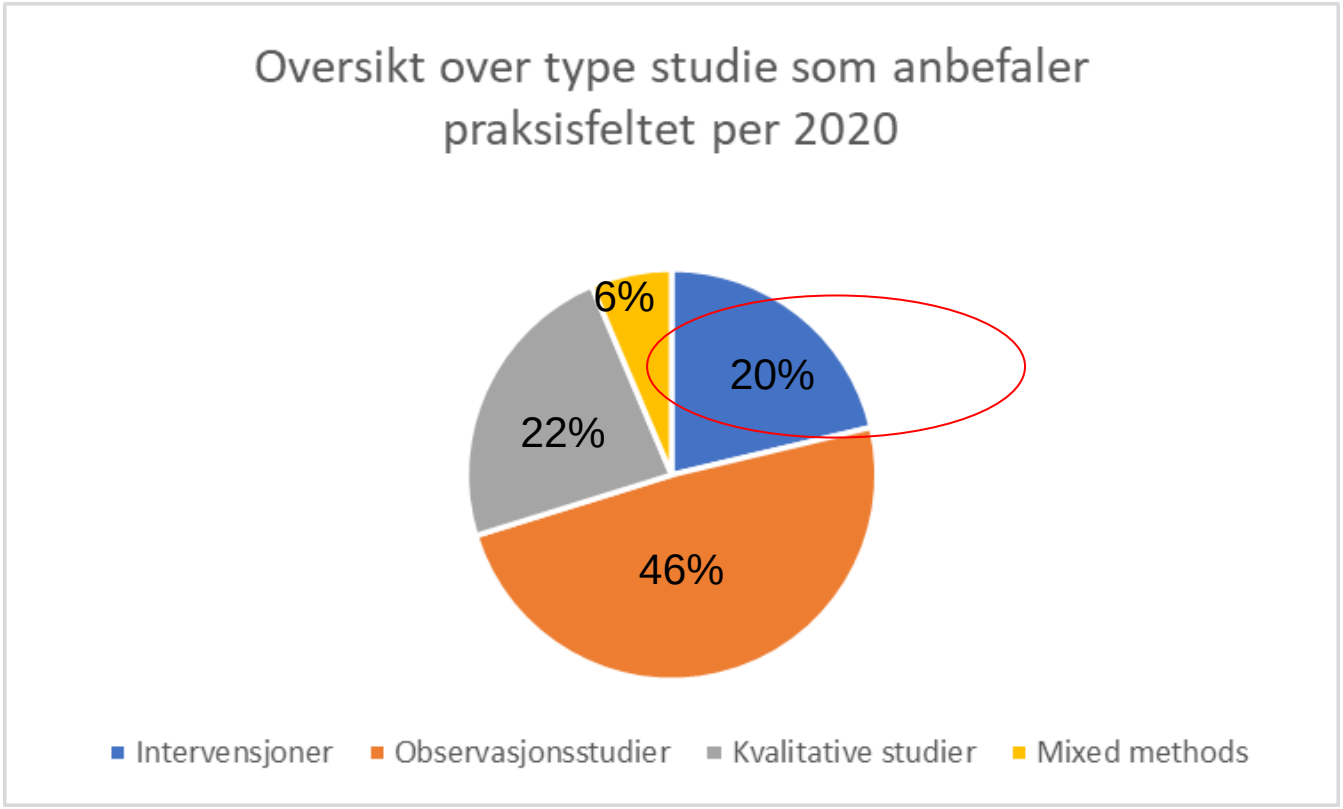
(Reinhart et al., 2010)

Educational Psychology Review (2023) 35:37
https://doi.org/10.1007/s10648-023-09759-9

REFLECTION ON THE FIELD

How Scientific Is Educational Psychology Research? The Increasing Trend of Squeezing Causality and Recommendations from Non-intervention Studies

Anna C. Brady[1] · Marlynn M. Griffin[1] · Ariah R. Lewis[2] · Carlton J. Fong[3] · Daniel H. Robinson[4]



(Brady et al., 2023)

Konsekvenser for forskning som skal forbedre praksis?

UiO : Department of Special Needs Education
University of Oslo

Universitetet i Stavanger
UiA Universitetet i Agder
UNIVERSITETET I BERGEN
NORD universitet
UNIVERSITETET I OSLO
Forskningsrådet

En multi-site randomisert kontrollert undersøkelse

UiO : Department of Special Needs Education
University of Oslo

Vibeke Rønneberg

Anita Lopez-Pedersen

Monica Melby-Lervåg

Oddny J. Solheim

SPEDAIMS ABC123

Tonje Amland

Elin Nordbø

Ellinor Waaland

Sigrun Ertesvåg

Åsmund Gjære

Arne Lervåg

Luna Mikelsen

Haris Bosnic

Photo: Shane Colvin; UiS

Formålet med studien

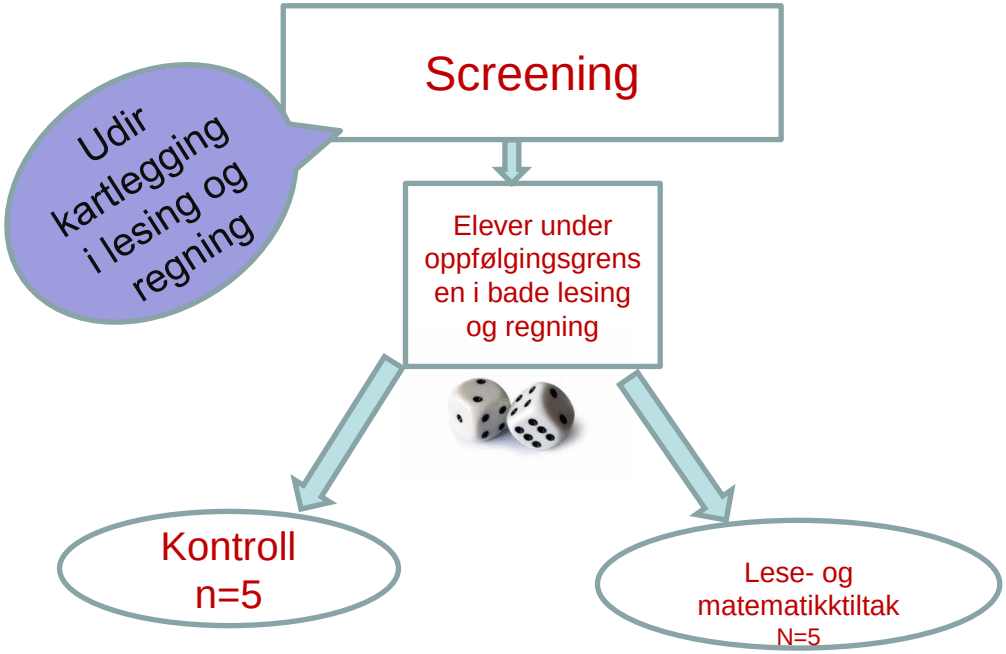
Elever som strever med både lesing og matematikk – komorbide vansker

Hypotese: elever med komorbide lese- og matematikkvansker strever med den felles underliggende flytkomponenten

500 førstreklassinger skal delta

SPEDAIMS ABC123

Gjennomføring på den enkelte skole – multisite randomisering



SPEDAIMS ABC123

Våren 1.klasse 2024



Pretest
Forskningsassistenter kommer til skolene

Intervensjon fase 1
6 uker
fire økter per uke

Høsten 2.klasse 2024

Intervensjon fase 2
7 uker
fire økter per uke

Intervensjon fase 3
7 uker
fire økter per uke

Posttest 1
Forskningsassistenter kommer til skolene

Våren 2.klasse 2025

Oppfølgingstest
Forskningsassistenter kommer til skolene

Langtidseffekt

Kartleggingsprøver 3. trinn
Nasjonale prøver 5. trinn

Hvordan kan det sikres, at en særlig indsats for elever med matematikvanskeligheder har effekt på langt sigt?

Photo: Pixabay

Hvordan kan vi planlegge for at effekt av intervensjon varer over tid?

Sustaining environments – legge til rette for at opplæring etter særlig innsats bygger videre intervensjonen

Universelle og tilpasset undervisning etter endt intervensjon

Progress monitoring – følge elevens utvikling

Forskning på fadeout – hva er det disse studiene ikke klarer å fange effekten av?

(Bailey et al., 2017)

Photo: Pixabay

To sum up

Er tidlig intervensjon nok for å gi varig læringsutbytte?

Hvoran kan vi dra nytte av effective intervensjoner - Capitalizing on benefits

Nødvendig vs. tilstrekkelig

Kombinere tidlig intervensjon med opprettholdelse av tiltak– post-intervention screening prosess

Photo: Shane Colvin

TAKK FOR MEG!

E-mail: anita.lopez-Pedersen@isp.uio.no
Twitter: @lopez_pedersen

Photo: Privat

Referanser

Bull, R., Lee, K., Muñez, D. (2021). Numerical magnitude understanding in kindergarteners: a specific and sensitive predictor of later mathematical difficulties? *Journal of Educational Psychology, 113(5),* 911-928.

Bailey, D.H. (2019). Explanations and implications of diminishing intervention impacts across time. In D.C. Geary, D.B. Berch, & K.M. Koepke (Eds.). *Cognitive Foundations for Improving Mathematical Learning, volume 5,* (pp. 321-346).Cambridge: Academic Press.

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