I Wonder How, I Wonder Why

Theorising Implementation Mechanisms for a Community-based Exercise Intervention with Causal Pathway Diagrams

Nien Xiang Tou, PhD
Geriatric Education and Research Institute
Singapore

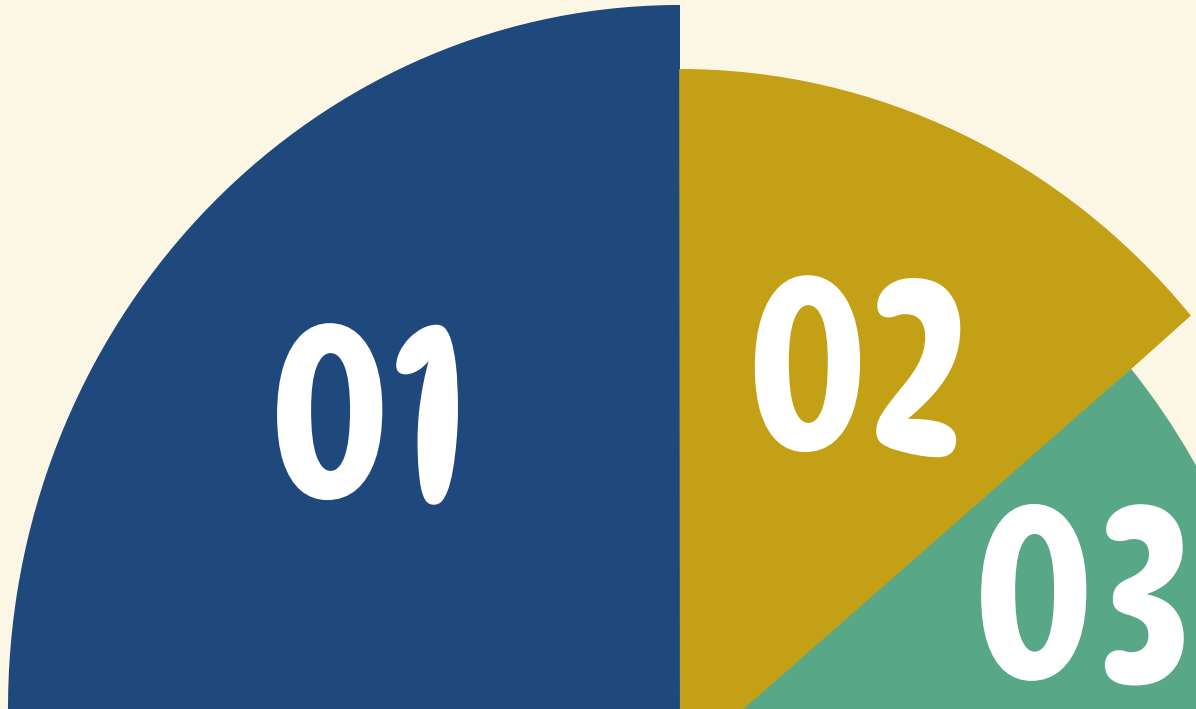
HELLO!

Imagine a world where exercise is prescribed as evidence-based medicine

Outline

Why mechanisms matter?

What are causal pathway diagrams?



Pilot study sharing

01

Why mechanisms matter?

Premise of Implementation Science

01
02
03
Why mechanisms matter?

Determinants of Implementation

Implementation Strategies

Implementation Outcomes

Clinical Outcomes

Effective health interventions **X** Effective implementation **=** Significant Health Benefits

Proctor, E., Silmere, H., Raghavan, R., Hovmand, P., Aarons, G., Bunger, A., ... & Hensley, M. (2011). Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. *Administration and Policy in Mental Health and Mental Health Services Research*, *38*, 65-76.

We know many implementation strategies...

- Engage consumers
- Use evaluative & iterative strategies
- Change infrastructure
- Adapt & tailor to the context
- Develop stakeholder interrelationships
- Utilise financial strategies
- Support clinicians
- Provide interactive assistance
- Train & educate stakeholders

Powell et al., 2012, *MCCR*; Powell et al., 2015, *Imp Sci*; Waltz et al., 2015, *Imp Sci*.

We know they work...

Printed educational materials

2% Range 0% to 11%

Local opinion leaders

12% Interquartile Range 6% to 14.5%

Audit and feedback

4.3% Interquartile Range 0.5% to 16%

Boaz et al. Implementation Science (2024) 19:15
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Implementation Science

SYSTEMATIC REVIEW Open Access

'It depends': what 86 systematic reviews tell us about what strategies to use to support the use of research in clinical practice

Annette Boaz[1*], Juan Baeza[2], Alec Fraser[2] and Erik Persson[3]

Abstract

Background The gap between research findings and clinical practice is well documented and a range of strategies have been developed to support the implementation of research into clinical practice. The objective of this study was to update and extend two previous reviews of systematic reviews of strategies designed to implement research evidence into clinical practice.

Methods We developed a comprehensive systematic literature search strategy based on the terms used in the previous reviews to identify studies that looked explicitly at interventions designed to turn research evidence into practice. The search was performed in June 2022 in four electronic databases: Medline, Embase, Cochrane and Epistemonikos. We searched from January 2010 up to June 2022 and applied no language restrictions. Two independent reviewers appraised the quality of included studies using a quality assessment checklist. To reduce the risk of bias, papers were excluded following discussion between all members of the team. Data were synthesised using descriptive and narrative techniques to identify themes and patterns linked to intervention strategies, targeted behaviours, study settings and study outcomes.

Results We identified 32 reviews conducted between 2010 and 2022. The reviews are mainly of multi-faceted interventions (*n* = 20) although there are reviews focusing on single strategies (ICT, educational, reminders, local opinion leaders, audit and feedback, social media and toolkits). The majority of reviews report strategies achieving small impacts (normally on processes of care). There is much less evidence that these strategies have shifted patient outcomes. Furthermore, a lot of nuance lies behind these headline findings, and this is increasingly commented upon in the reviews themselves.

Discussion Combined with the two previous reviews, 86 systematic reviews of strategies to increase the implementation of research into clinical practice have been identified. We need to shift the emphasis away from isolating individual and multi-faceted interventions to better understanding and building more situated, relational and organisational capability to support the use of research in clinical practice. This will involve drawing on a wider range of research perspectives (including social science) in primary studies and diversifying the types of synthesis undertaken to include approaches such as realist synthesis which facilitate exploration of the context in which strategies are employed.

Keywords Systematic review, Implementation, Strategies, Interventions, Clinical practice, Research evidence, Single, Multi-faceted

*Correspondence:
Annette Boaz
Annette.Boaz@kcl.ac.uk
Full list of author information is available at the end of the article

BMC

But they don't work all the time

Powell, B. J., Fernandez, M. E., Williams, N. J., Aarons, G. A., Beidas, R. S., Lewis, C. C., ... & Weiner, B. J. (2019). Enhancing the impact of implementation strategies in healthcare: a research agenda. *Frontiers in Public Health*, *7*, 3.

Boaz, A., Baeza, J., Fraser, A., & Persson, E. (2024). 'It depends': what 86 systematic reviews tell us about what strategies to use to support the use of research in clinical practice. *Implementation Science*, *19*(1), 15.

It depends on context...

01
02
03

Why mechanisms matter?

Context matters

Context is unique

Context Trap

Works under what conditions?

Works for whom?

Advancing the Science of Implementation Science

01 02 03

Why mechanisms matter?

1 | Science is based on **falsifiable predictions** and **testable hypotheses** to know whether something works.

2 | Science figures out **how** things work so outcomes are **replicable**.

3 | Science aims to build and test **theories** to explain **why** things work.

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EDITED BY
Antonio Neme,
National Autonomous University of Mexico, Mexico

REVIEWED BY
James Lorenz Merle,
University of Utah Hospital, United States
Joy D. Doll,
Creighton University, United States

*CORRESPONDENCE
Dean L. Fixsen
dfixsen1@gmail.com

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Is implementation science a science? Not yet

Dean L. Fixsen*, Melissa K. Van Dyke and Karen A. Blase

Active Implementation Research Network, Inc., Chapel Hill, NC, United States

Getting the science right for implementation is critical for making the processes for improving outcomes more predictable and effective in global public health. Unfortunately, "implementation science" has become a catchphrase for ideas, assumptions, and findings concerning the science to service gap and how to close it. The purpose of this paper is to explore the dimensions of a "science of implementation" that meets the definitions of a science and is focused on implementation variables (i.e., purposeful processes to put innovations into effect so that intended benefits can be realized). A science of implementation is important for accomplishing the goals related to improving the health and well-being of populations around the world. Much of public health involves interaction-based interventions. In a typology of science, interaction-based interventions are created by specifying the nature of certain exchanges between and among individual people or groups. The complexity of developing interaction-based independent variables requires meeting benchmarks for fidelity to assure the presence and strength of implementation independent variables. The paper presents information related to the following tenets: (1) A science of implementation is based on if-then predictions. Science is cumulative. As predictions are made, tested, and elaborated, the facts accumulate to form the knowledge base for science and practice. (2) Implementation variables are interaction-based inventions and, therefore, must be created and established so the specific set of activities related to implementation can be studied. (3) A science of implementation is based on theory that organizes facts, leads to testable predictions, and is modified or discarded based on outcomes. (4) A science of interaction-based implementation depends on frequent measures of independent and dependent variables specific to implementation methods and outcomes. Two examples illustrate the implications for theory, research, and practice. The paper advocates a paradigm shift to a new mental model that values fidelity over tailoring, has one size fits all as a goal, and is concerned with the function of evidence rather than the form of evidence based on RCTs. Global health fundamentally requires scaling implementation capacity so that effective innovations can be used as intended and with good effect to achieve population benefits.

KEYWORDS
science, implementation, independent variable, measurement, theory, fidelity

Introduction

Since its beginnings in policy research and behavioral sciences in the 1960s (1–10) "implementation science" has become a catchphrase, a label for loosely related ideas, assumptions, and findings. There is nothing wrong with implementation science as a label, but it should not be confused with a science of implementation.

The National Institutes of Health (NIH) defines implementation science as the study of how to integrate evidence-based practices into routine health care and public health

Fixsen, D. L., Van Dyke, M. K., & Blase, K. A. (2024). Is implementation science a science? Not yet. *Frontiers in Public Health*, *12*, 1454268.

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Importance of Studying Mechanisms

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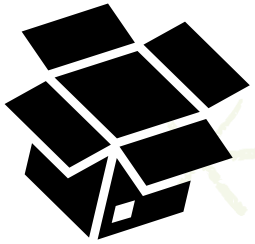
03

Why mechanisms matter?



Unravelling the black box

Establish the '**basic science**' by understanding how and why strategies work

Greater precision

Better **tailoring** of implementation strategies to different contexts

Greater benefits

Better implementation translates into **better clinical outcomes**

Lewis et al.
Implementation Science Communications (2024) 5:98
https://doi.org/10.1186/s43058-024-00633-5

Implementation Science Communications

RESEARCH Open Access

A research agenda to advance the study of implementation mechanisms

Cara C. Lewis[1*], Hannah E. Frank[2], Gracelyn Cruden[3], Bo Kim[4,5], Aubyn C. Stahmer[6], Aaron R. Lyon[7], Bianca Albers[8], Gregory A. Aarons[9], Rinad S. Beidas[10], Brian S. Mittman[11], Bryan J. Weiner[12], Nate J. Williams[13], Byron J. Powell[14,15,16] and MNoE Group

Abstract

Background Implementation science scholars have made significant progress identifying factors that enable or obstruct the implementation of evidence-based interventions, and testing strategies that may modify those factors. However, little research sheds light on *how or why* strategies work, in what contexts, and for whom. Studying implementation mechanisms—the processes responsible for change—is crucial for advancing the field of implementation science and enhancing its value in facilitating equitable policy and practice change. The Agency for Healthcare Research and Quality funded a conference series to achieve two aims: (1) develop a research agenda on implementation mechanisms, and (2) actively disseminate the research agenda to research, policy, and practice audiences. This article presents the resulting research agenda, including priorities and actions to encourage its execution.

Method Building on prior concept mapping work, in a semi-structured, 3-day, in-person working meeting, 23 US-based researchers used a modified nominal group process to generate priorities and actions for addressing challenges to studying implementation mechanisms. During each of the three 120-min sessions, small groups responded to the prompt: "What actions need to be taken to move this research forward?" The groups brainstormed actions, which were then shared with the full group and discussed with the support of facilitators trained in structured group processes. Facilitators grouped critical and novel ideas into themes. Attendees voted on six themes they prioritized to discuss in a fourth, 120-min session, during which small groups operationalized prioritized actions. Subsequently, all ideas were collated, combined, and revised for clarity by a subset of the authorship team.

Results From this multistep process, 150 actions emerged across 10 priority areas, which together constitute the research agenda. Actions included discrete activities, projects, or products, and ways to shift how research is conducted to strengthen the study of implementation mechanisms.

Conclusions This research agenda elevates actions to guide the selection, design, and evaluation of implementation mechanisms. By delineating recommended actions to address the challenges of studying implementation mechanisms, this research agenda facilitates expanding the field of implementation science, beyond studying what works to how and why strategies work, in what contexts, for whom, and with which interventions.

Keywords Implementation science, Mechanisms, Mediators, Determinants, Implementation strategies, Methods, Measurement, Design, Theory, Causality

*Correspondence:
Cara C. Lewis
Cara.Lewis@nih.gov
Full list of author information is available at the end of the article

BMC

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02

What are causal pathway diagrams?

Causal Pathway Diagram

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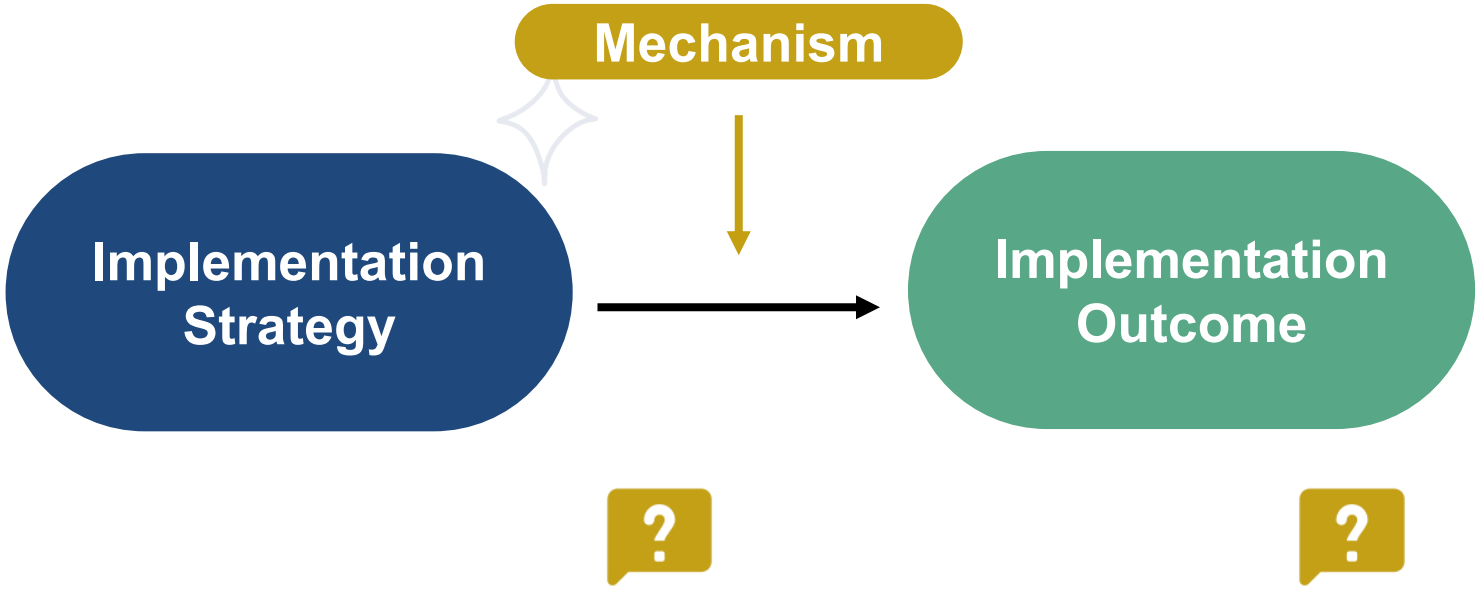
What are causal pathway diagrams?



frontiers in Public Health

PERSPECTIVE
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From Classification to Causality: Advancing Understanding of Mechanisms of Change in Implementation Science

Cara C. Lewis[1,2,3]†, Predrag Klasnja[1†], Byron J. Powell[4], Aaron R. Lyon[5], Leah Tuzzio[1], Salene Jones[1], Callie Walsh-Bailey[1] and Bryan Weiner[6]*

[1] Kaiser Permanente Washington Health Research Institute, Seattle, WA, United States, [2] Department of Psychological and Brain Sciences, Indiana University, Bloomington, IN, United States, [3] Department of Psychiatry and Behavioral Sciences, University of Washington, Seattle, WA, United States, [4] Department of Health Policy and Management, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, United States, [5] Public Health Sciences Division, Fred Hutchinson Cancer Research Center, Seattle, WA, United States, [6] Department of Global Health, University of Washington, Seattle, WA, United States

Background: The science of implementation has offered little toward understanding *how* different implementation strategies work. To improve outcomes of implementation efforts, the field needs precise, testable theories that describe the causal pathways through which implementation strategies function. In this perspective piece, we describe a four-step approach to developing causal pathway models for implementation strategies.

Building causal models: First, it is important to ensure that implementation strategies are appropriately specified. Some strategies in published compilations are well defined but may not be specified in terms of its core component that can have a reliable and measureable impact. Second, linkages between strategies and mechanisms need to be generated. Existing compilations do not offer mechanisms by which strategies act, or the processes or events through which an implementation strategy operates to affect desired implementation outcomes. Third, it is critical to identify proximal and distal outcomes the strategy is theorized to impact, with the former being direct, measurable products of the strategy and the latter being one of eight implementation outcomes (1). Finally, articulating effect modifiers, like preconditions and moderators, allow for an understanding of where, when, and why strategies have an effect on outcomes of interest.

Future directions: We argue for greater precision in use of terms for factors implicated in implementation processes; development of guidelines for selecting research design and study plans that account for practical constructs and allow for the study of mechanisms; psychometrically strong and pragmatic measures of mechanisms; and more robust curation of evidence for knowledge transfer and use.

Keywords: implementation, mechanism, mediator, moderator, theory, causal pathway, strategy

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Thomas Rundall,
University of California, Berkeley, United States

Reviewed by:
Carolyn Berry,
New York University, United States
Thomas J. Waltz,
Eastern Michigan University, United States

****Correspondence:***
Cara C. Lewis
lewis.cc@ghc.org

†Joint first authorship.

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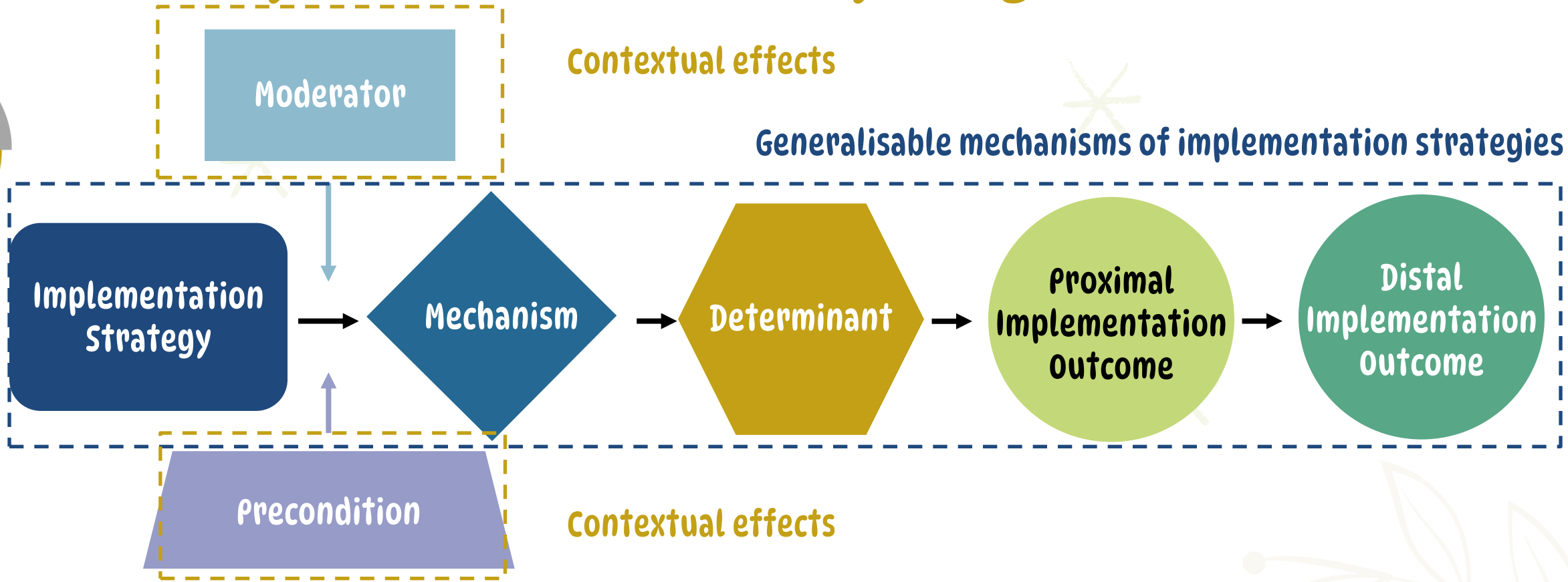
BACKGROUND: WHY BUILD CAUSAL PATHWAY MODELS?

In recent years, there has been growing recognition of the importance of implementing evidence-based practices as a way to improve the quality of health care and public health. However, the results of implementation efforts have been mixed. About two-thirds of efforts fail to achieve the intended change (2), and nearly half have no effect on outcomes of interest (3). Implementation strategies are

Lewis, C. C., Klasnja, P., Powell, B. J., Lyon, A. R., Tuzzio, L., Jones, S., ... & Weiner, B. (2018). From classification to causality: advancing understanding of mechanisms of change in implementation science. *Frontiers in Public Health*, *6*, 136.

Anatomy of Causal Pathway Diagrams



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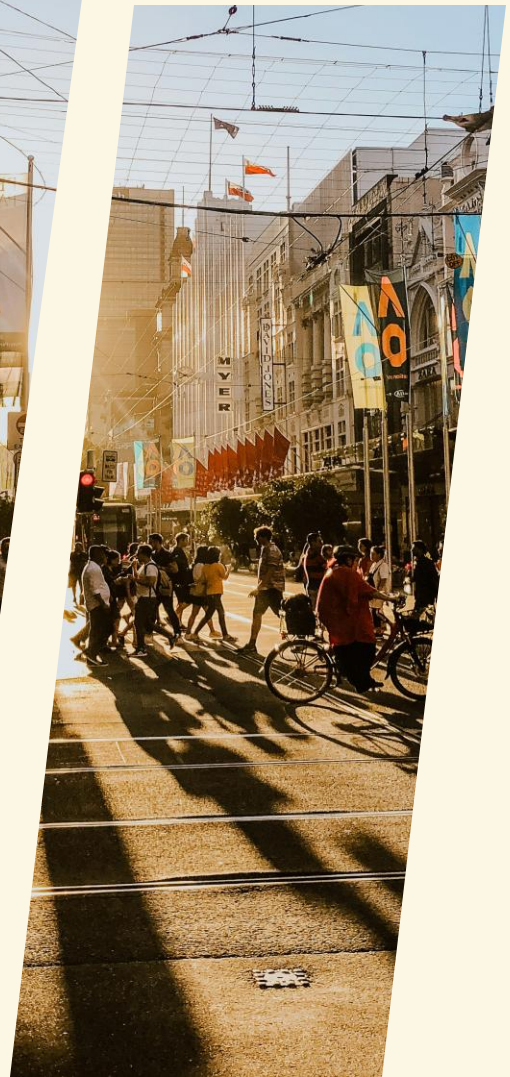
What are causal pathway diagrams?

Klasnja, P., Meza, R. D., Pullmann, M. D., Mettert, K. D., Hawkes, R., Palazzo, L., ... & Lewis, C. C. (2024). Getting cozy with causality: Advances to the causal pathway diagramming method to enhance implementation precision. *Implementation Research and Practice*, *5*, 26334895241248851.

03

Pilot study sharing



Evidence-based Exercise Prescription

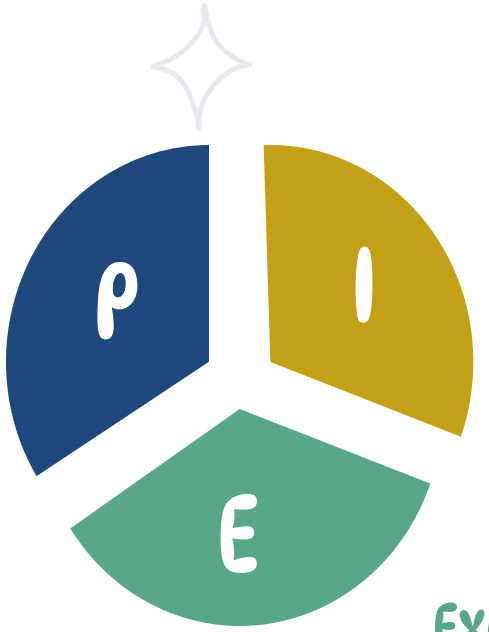
01 02 03

Pilot study sharing

Implementation of a minimal-equipment resistance training programme in community dementia care settings

Progression

Increase in exercise dosage over time



Intensity

Adequate intensity to elicit adaptations

Execution

Correct performance of exercises targeted at major muscle groups

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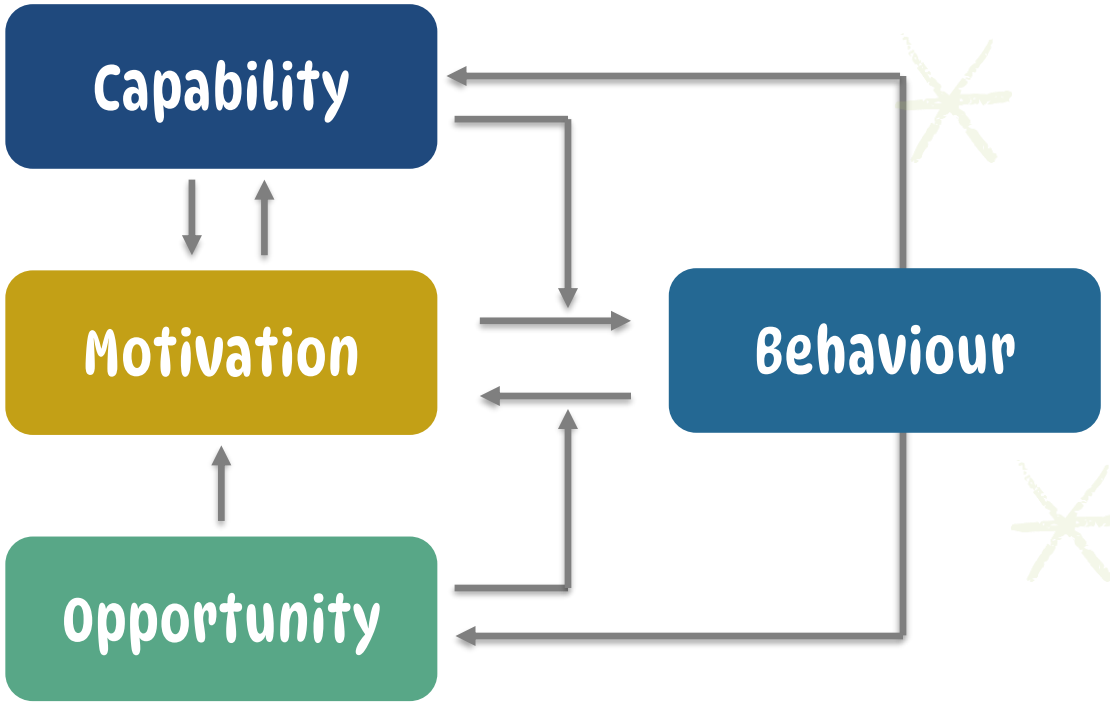
Theoretical Frameworks

Are the staff **able to** implement the core components?

Do the staff **want to** implement the core components?

Do the staff **have the chance** to implement the core components?



Centre staff to implement the **core components** of the exercise programme

Michie, S., Van Stralen, M. M., & West, R. (2011). The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implementation Science*, *6*(1), 42.

Theoretical Frameworks

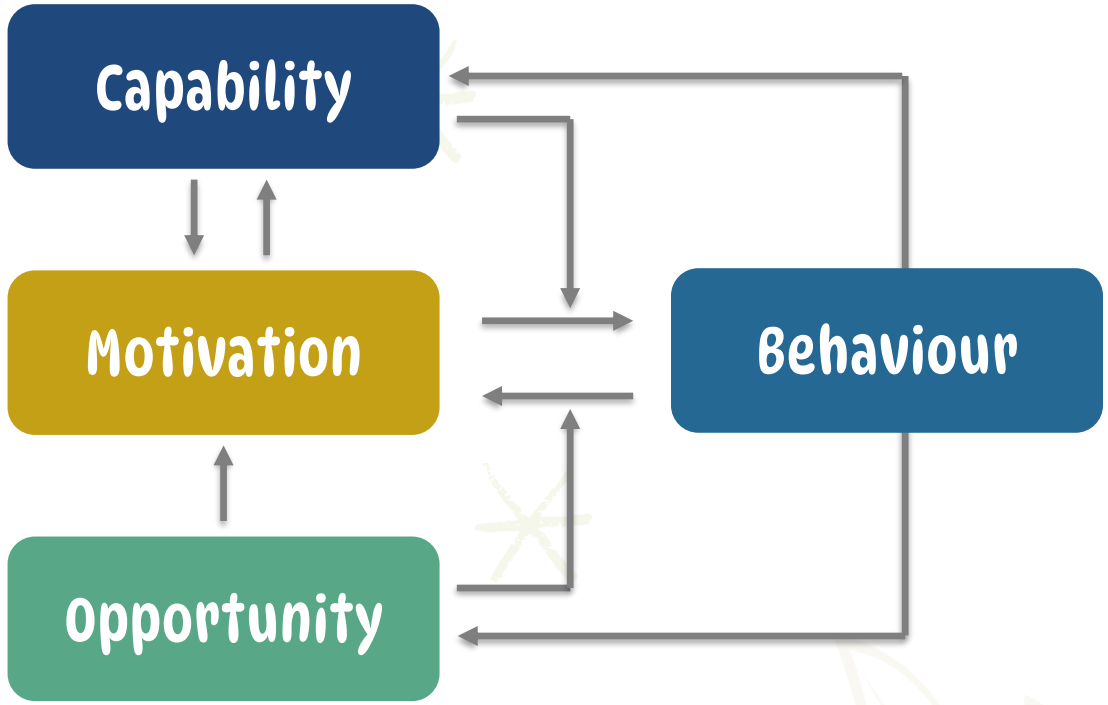
01 02 03

Pilot study sharing

Theoretical Domains Framework

- Knowledge
- Skills
- Memory, Attention, Decision processes
- Behavioural Regulation
- Beliefs about Capabilities
- Beliefs about Consequences
- Social/ Professional Role & Identity
- Intentions
- Goals
- Identity
- Emotion
- Optimism
- Reinforcement
- Environmental Context & Resources
- Social Influences

COM-B Model



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Cane, J., O'Connor, D., & Michie, S. (2012). Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implementation Science*, *7*(1), 37.

Key Determinants

01 02 03

Pilot study sharing

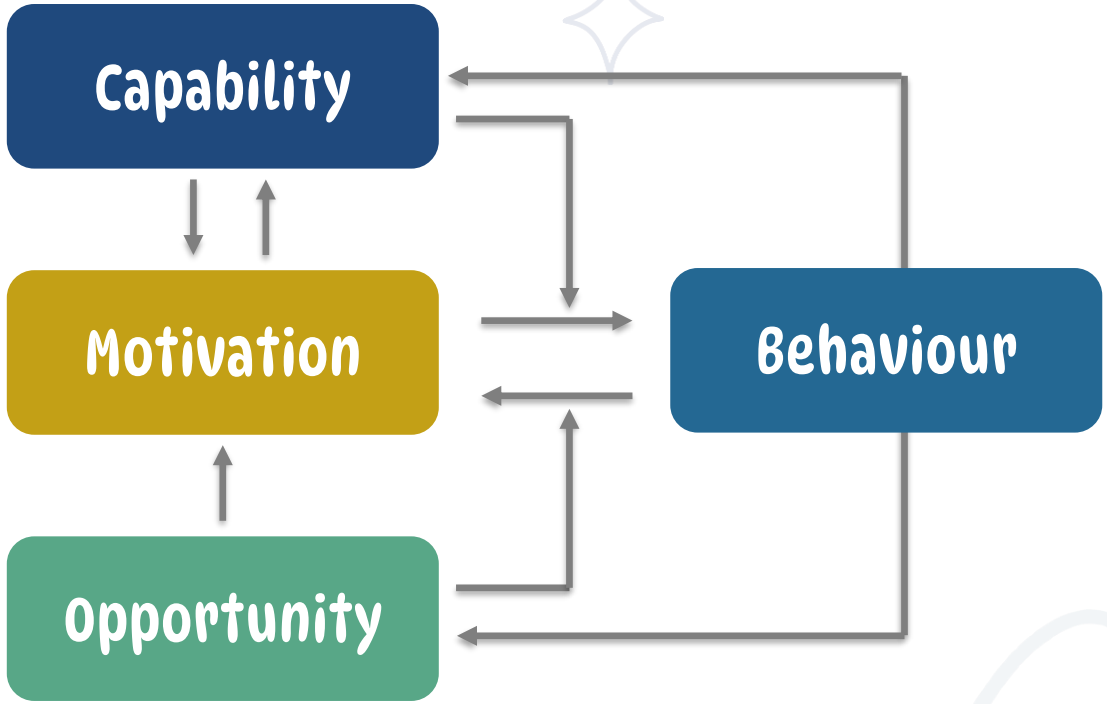
Centre staff lack the **knowledge** and **skills** to deliver the exercise intervention as intended

Misperception of exercise among staff as a **social activity** instead of a therapeutic intervention to improve muscle function

Knowledge

Skills

Beliefs about Consequences



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Tailoring of Implementation Strategies

Education & Training

Broad labelling of implementation strategies obscure the causal effects of underlying components

What are the active ingredients?

- Educational Materials
- Hands-on skills practice
- Didactics
- Interactive discussion

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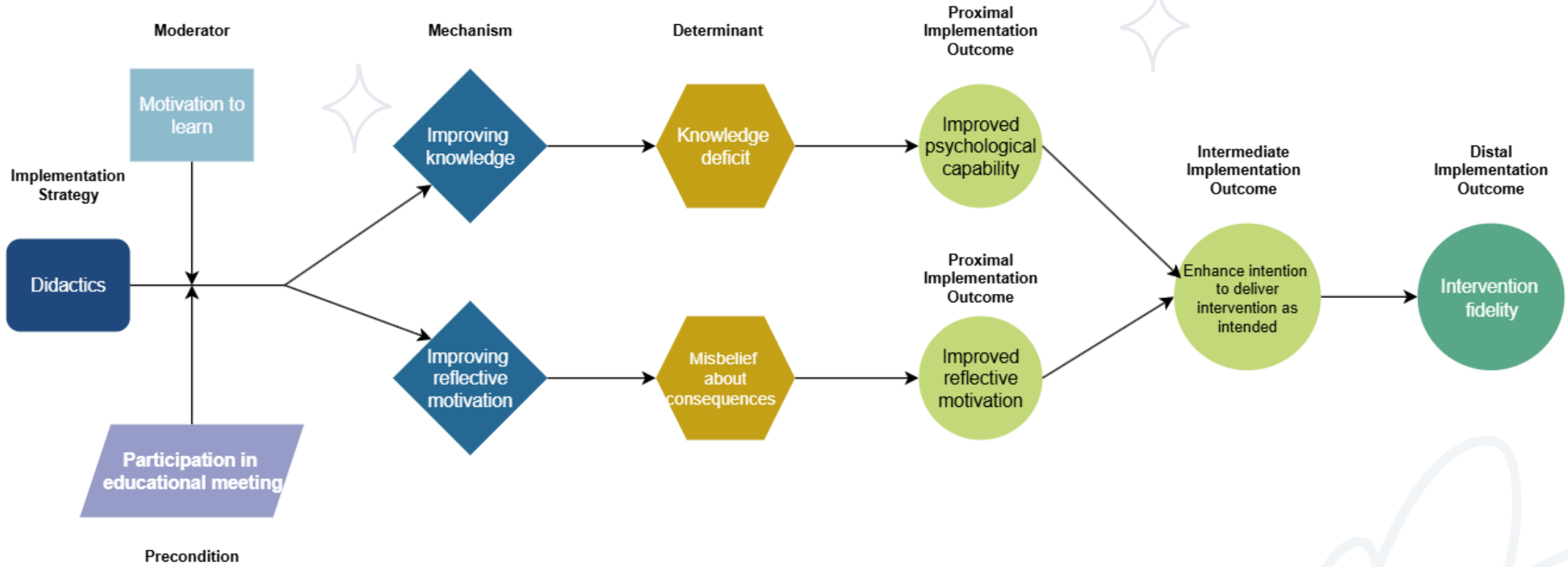
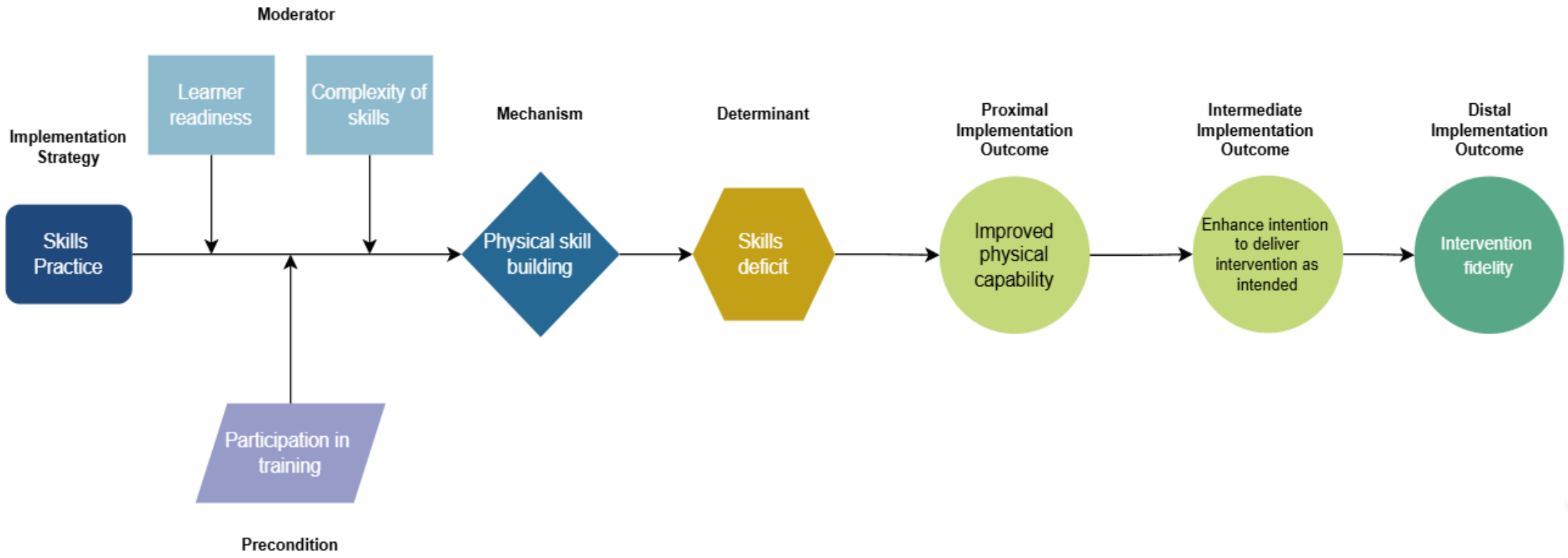
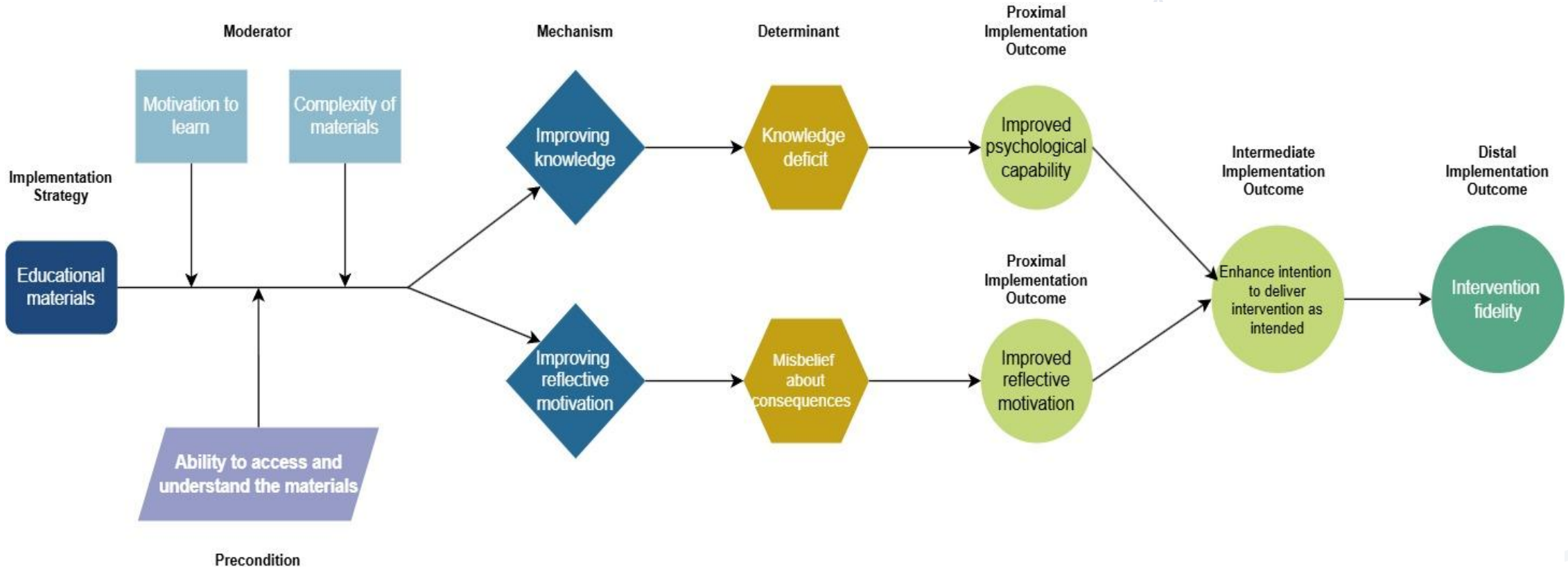
Theorising how each strategy works



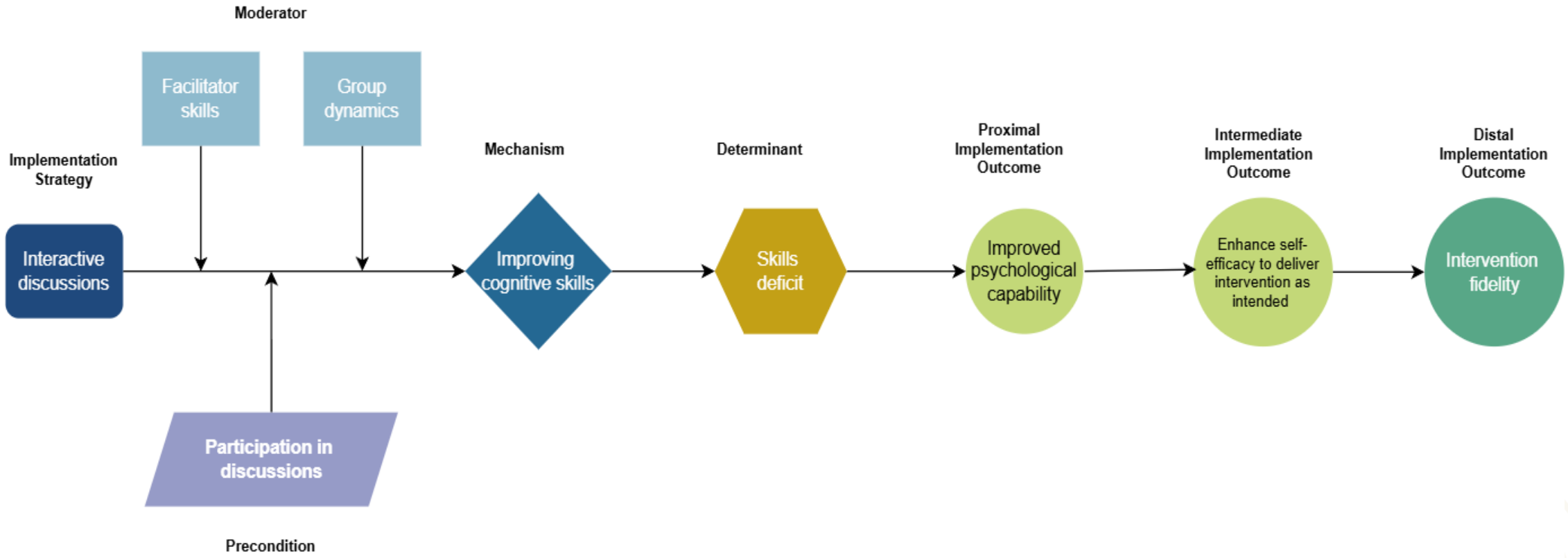
Theorising how each strategy works



Theorising how each strategy works



Theorising how each strategy works



Some Thoughts...

1

Make our mental models explicit

2

Generative process

3

Strive to build context agnostic theories

Thank You!

tou.nien.xiang@geri.com.sg

www.geri.com.sg

Nien Xiang Tou

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