Using Experiments to Test Process Theories

How and Why?

A talk based on Asay, Guggenmos, Kadous, Koonce, and Libby (forthcoming, TAR)

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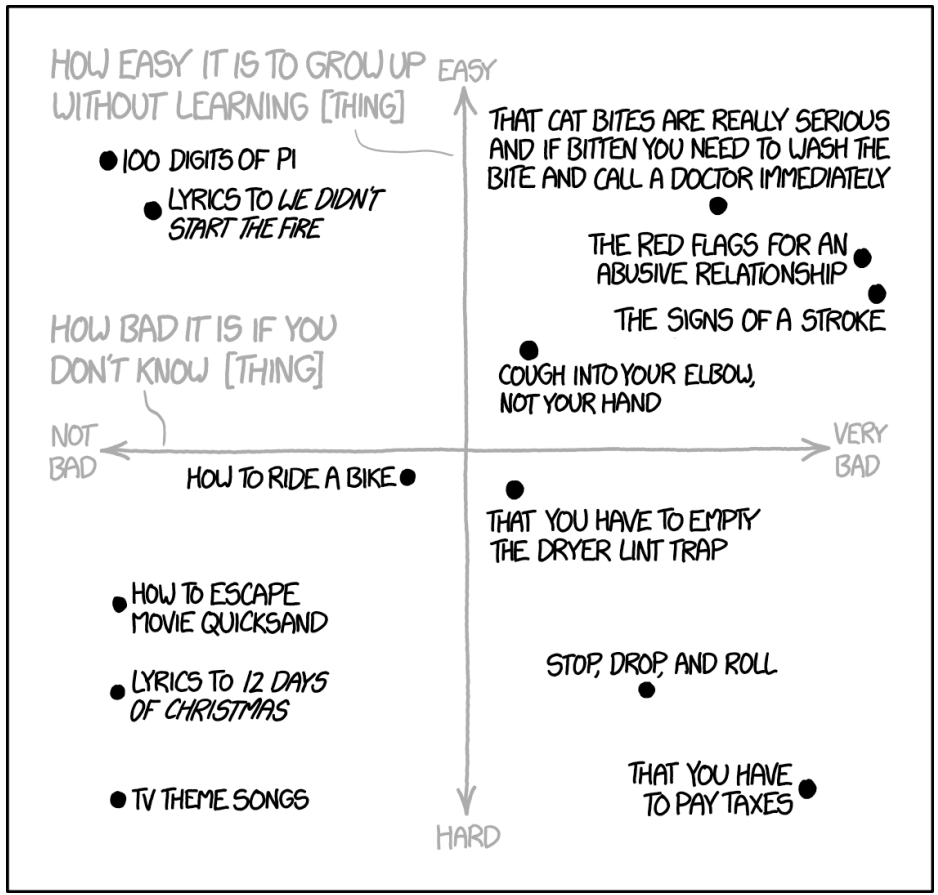
Where are we at (learning-wise)?



(xkcd.com)

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1. Communicate the value of experimental research in business and economic contexts.

2. Enhance your ability to recognize the strengths and limitations of experimental research.

3. Develop your understanding of what makes a more or less effective experiment.

4. Show how experiments can help us better understand how and why causes become effects.

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So why am I focusing on experiments…

- Well-designed experiments can provide strong causal evidence, that other approaches cannot.
- Experiments are suitable for testing nuanced theory and leveraging strict control to rule out alternative explanations.
- I am an experimental researcher, so I know more about experiments than other methods. (And I like them. :))

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Example: If our goal is to provide strong causal evidence for how or why misreporting leads to poor firm performance, then we need a tool that is designed to help us provide this kind of evidence.

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Theories vary on many dimensions, but experiments are especially good at providing theory-consistent *causal* evidence and testing "how", "when", or "why" causes become effects.

When is evidence causal?

1. The cause preceeded the effect.

2. The cause was related to the effect.

3. No plausible alternative explanations exist for the effect.

Shadish, Cook, and Campbell 2002

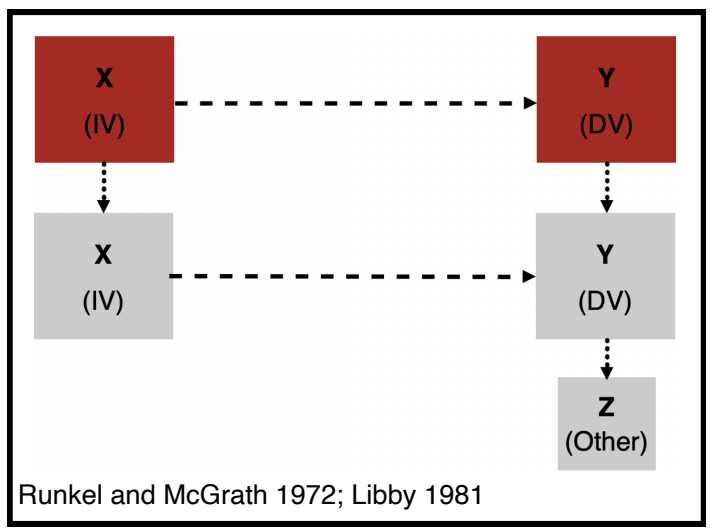
What makes a good design?

The goals:

1. Create a high-quality, but imperfect source of counterfactual variation.

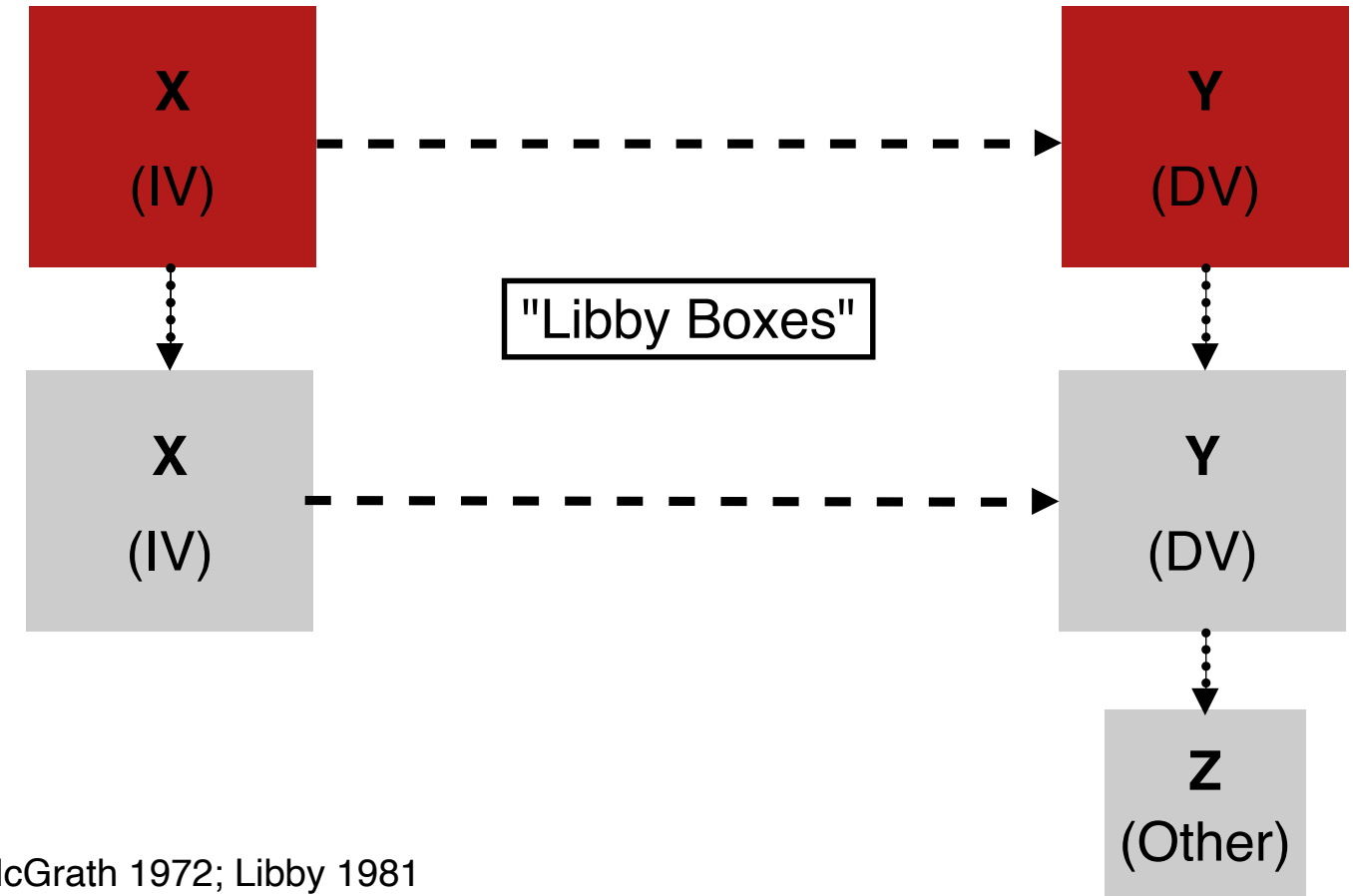
2. Understand how this source differs from the treatment condition.

Shadish, Cook, and Campbell 2002



Runkel and McGrath 1972; Libby 1981

The Predictive Validity Framework



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How do experiments do this?

1. Manipulate the cause and observe an outcome afterward.

2. See whether variation in cause is related to variation in effect.

3. Use design to rule out alternative explanations (usually through randomization and holding other variables constant).

Process Theories and Evidence

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Should we care about process? If so, when?

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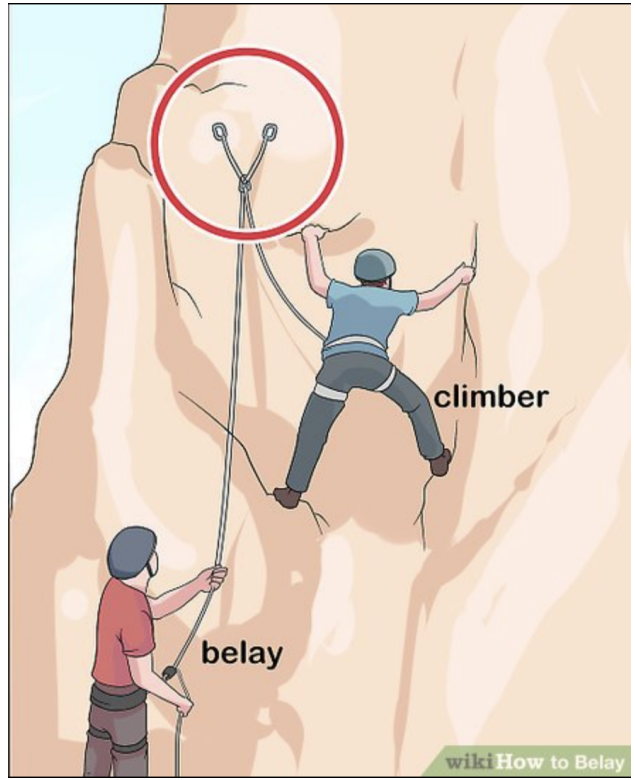
Should we care about process? If so, when? Yes, when it matters.



Belay device (ATC)


wikiHow to Belay


wikiHow to Belay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How does it work?

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Process, Experiments, and Validity

How are these three related?

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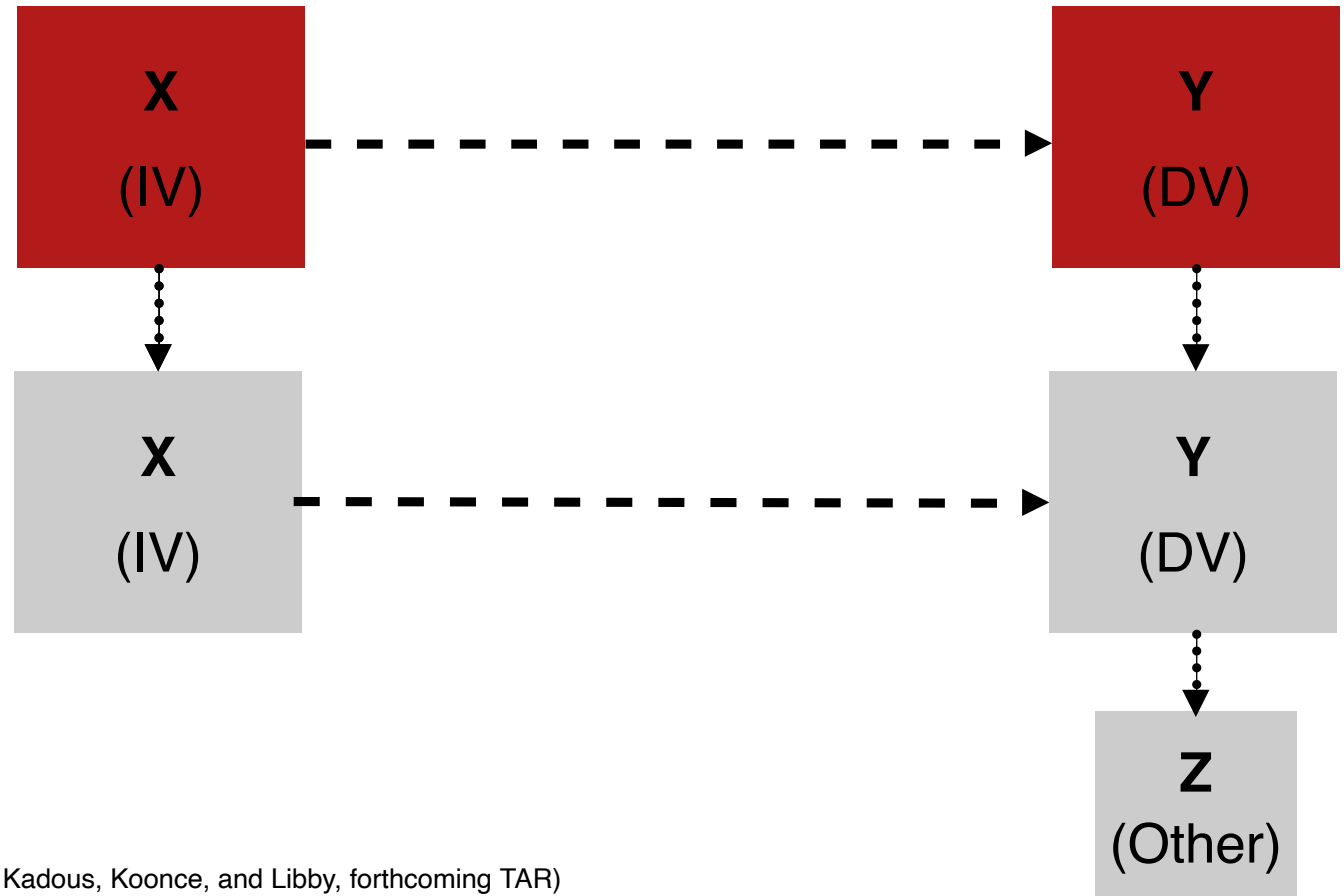
...And theory is what generalizes from an experiment.

Convincing process evidence helps us generalize from our experiment to the "real world".

Let's get more complicated.



(Asay, Guggenmos, Kadous, Koonce, and Libby, forthcoming TAR)

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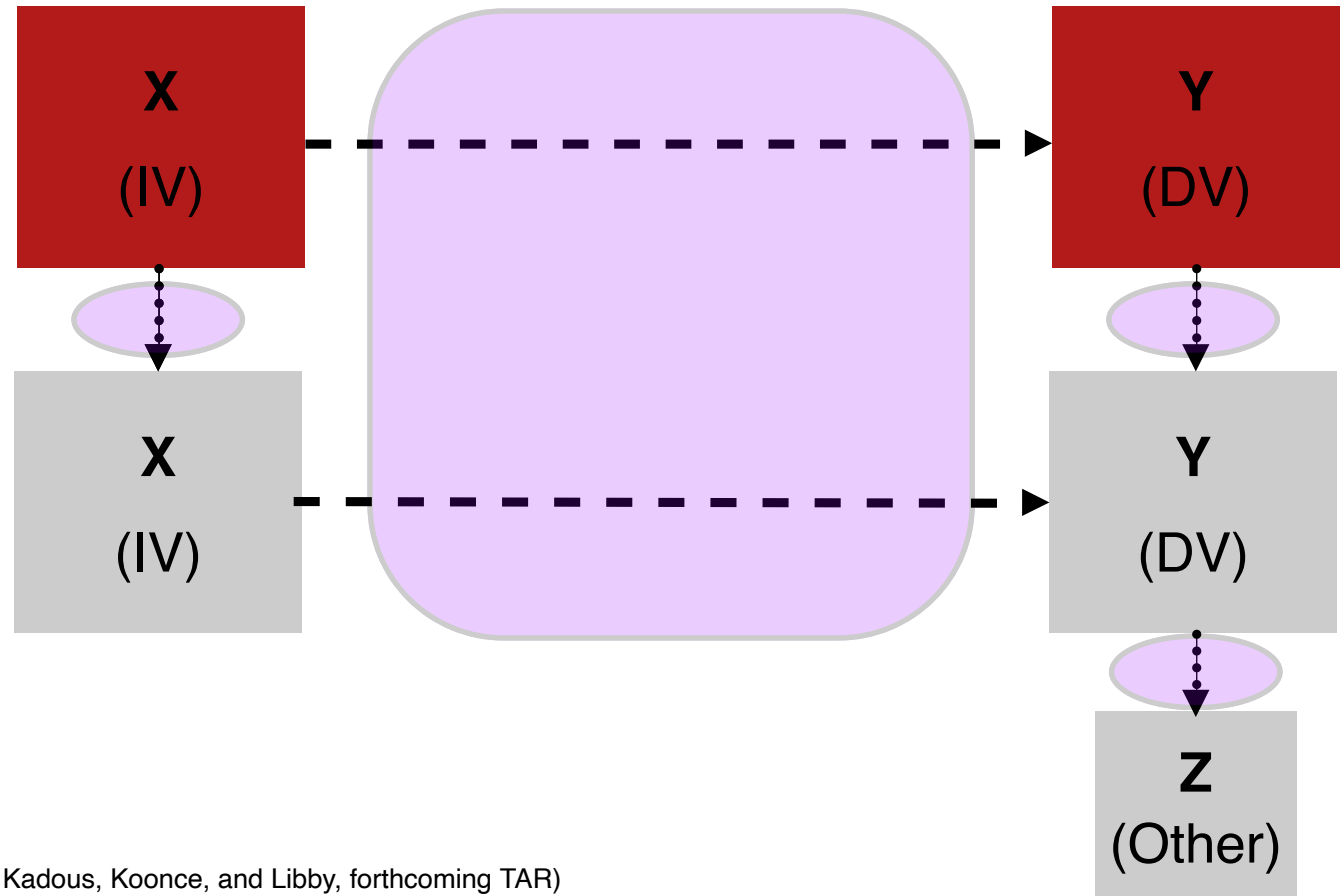

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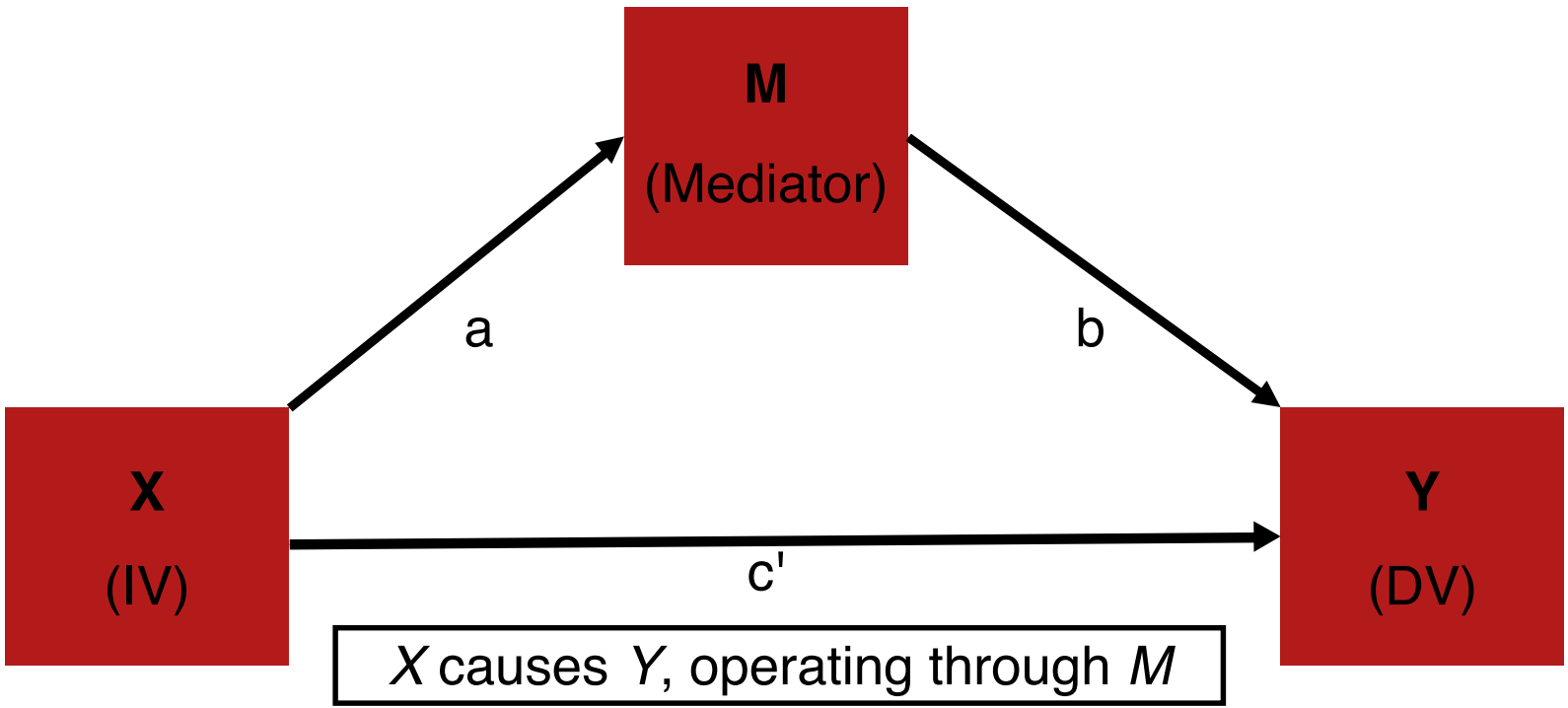

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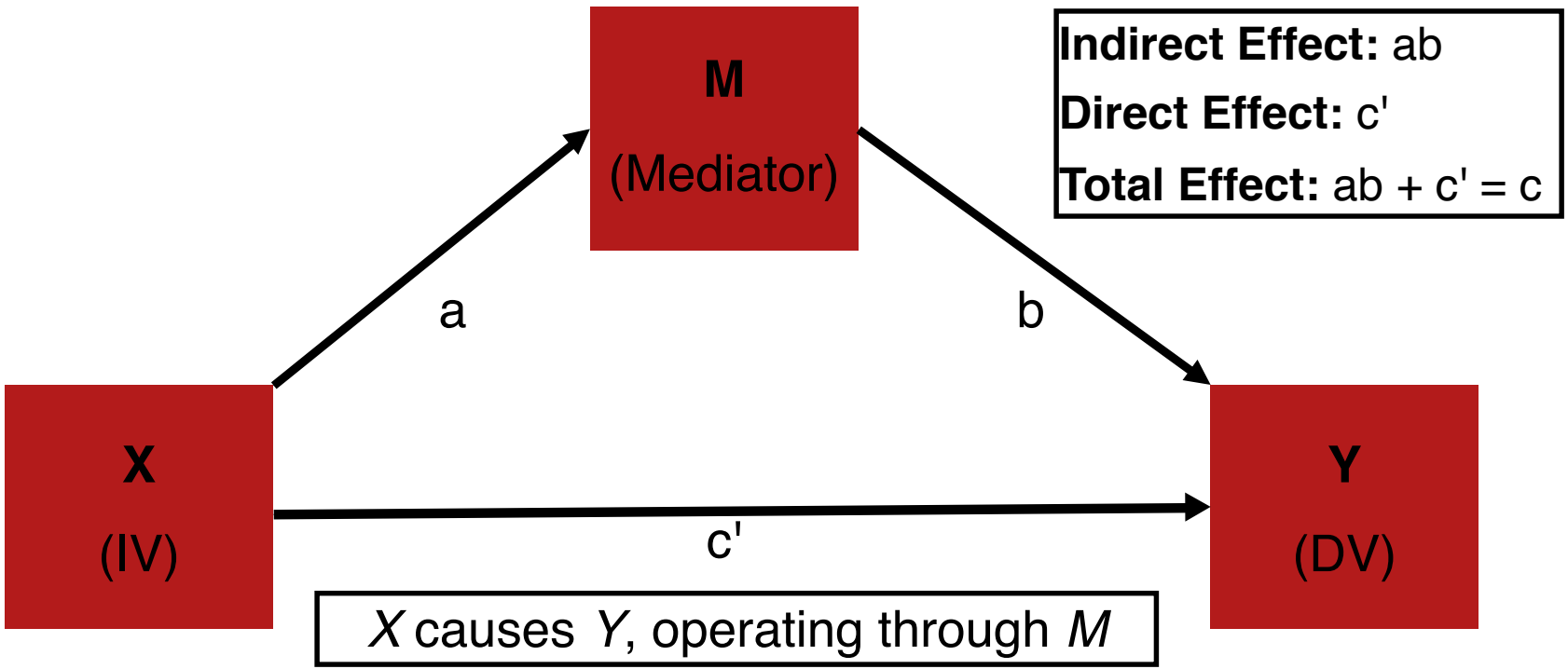

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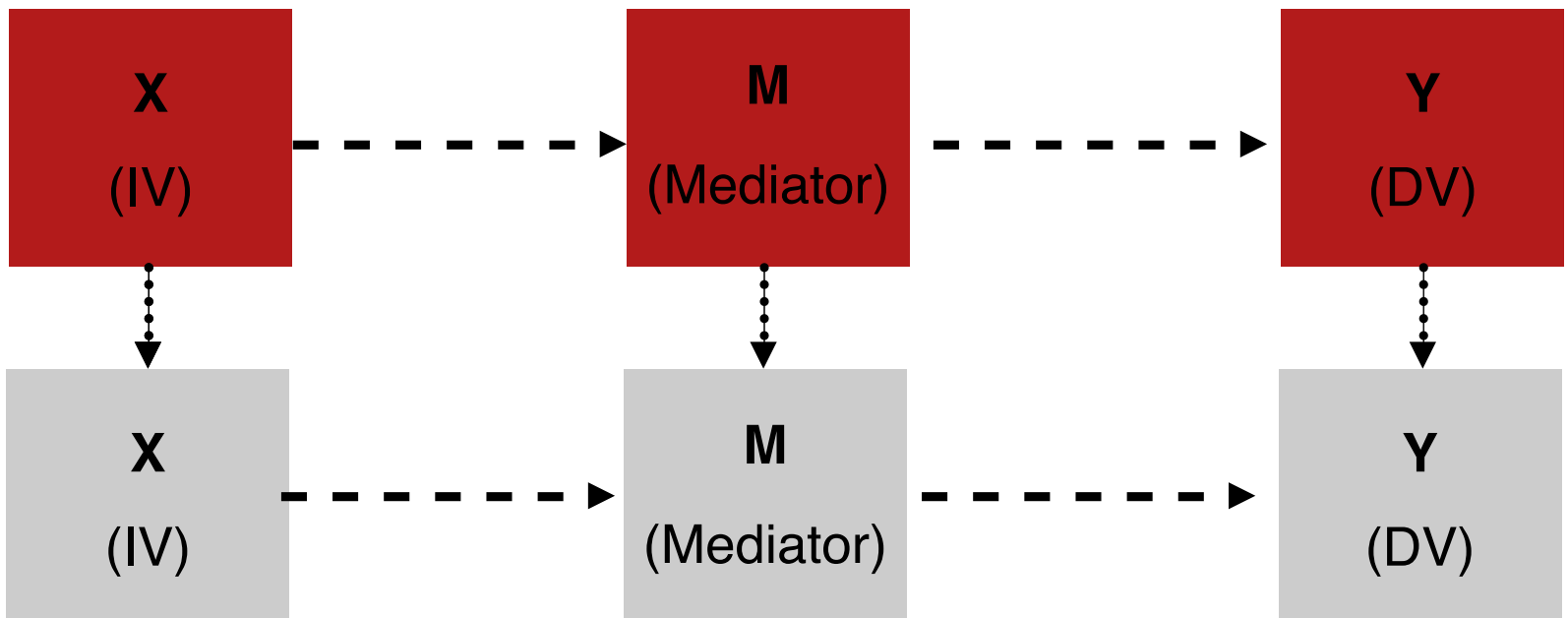
Weaknesses

- Can only provide *correlational*, not causal evidence.
- Often relies on PEQs or participant self-insight, which can introduce validity threats.
- Relies on measured variables, so subject to measurement error concerns.
- No benefit of random assignment to the mediator.
- Coefficients are often biased.

Mediation: What could go wrong?



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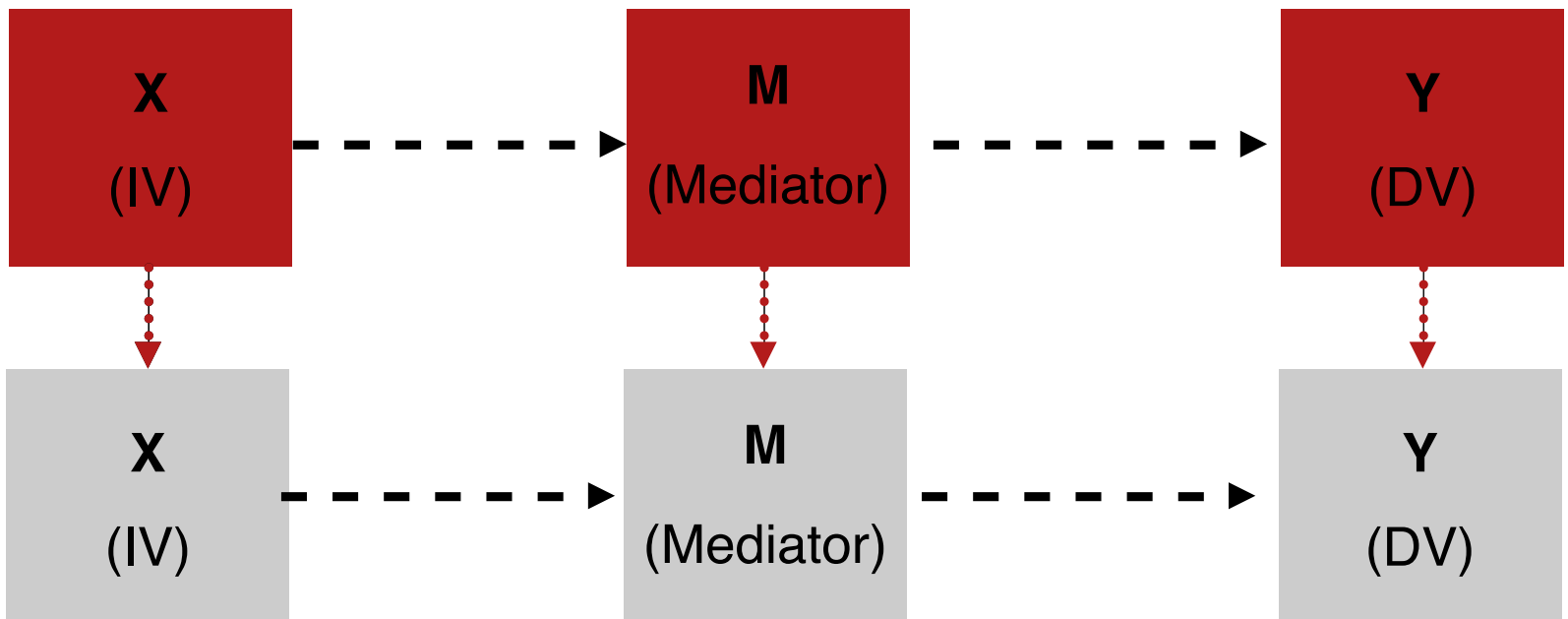
Construct Operationalization Threats



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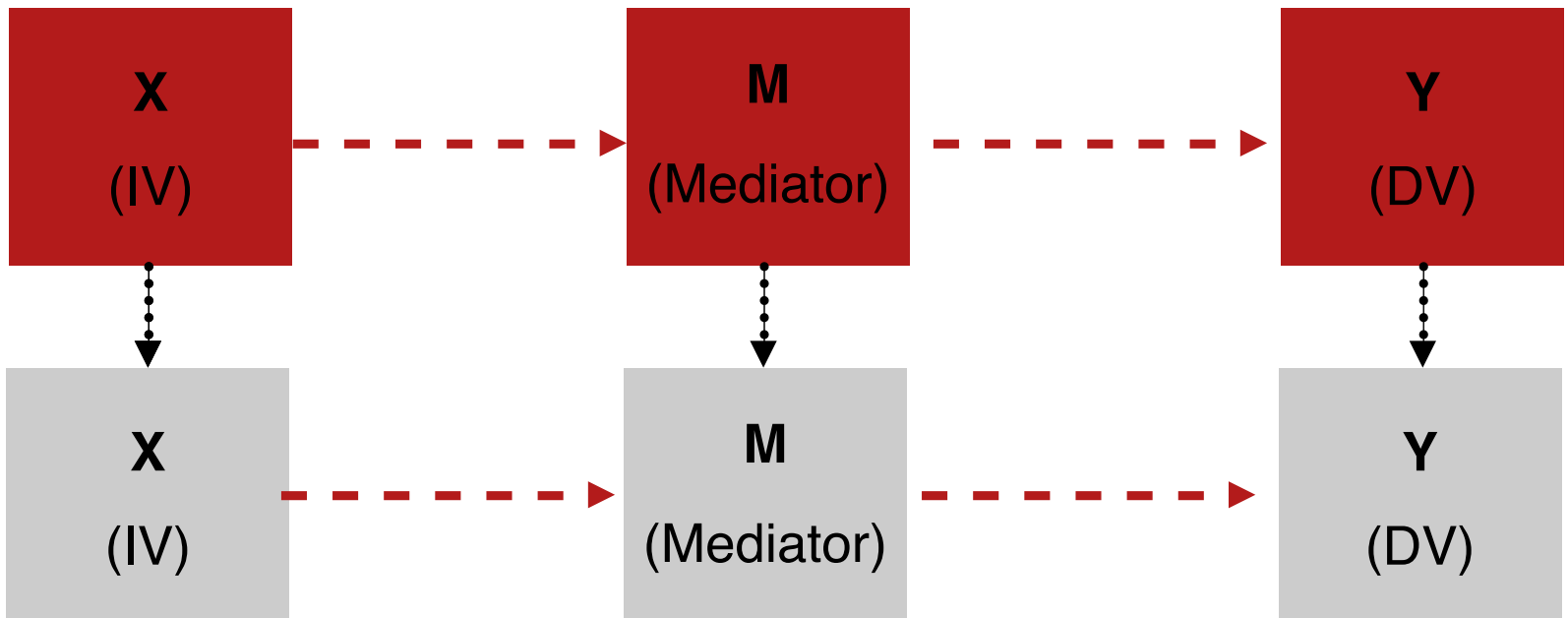
Variable Sequence Threats



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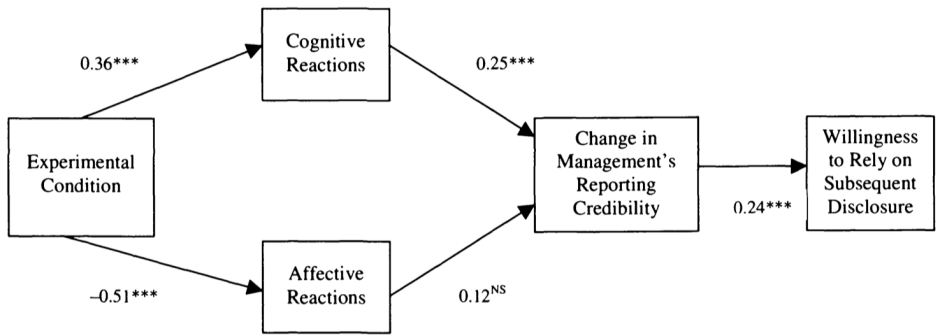
What to Measure

- One "thing", all "things", or somewhere in-between?

Credibility and forthcomingness

Panel A: Determinants and Consequences of Reporting Credibility in the Short-Term



Panel B: Determinants and Consequences of Reporting Credibility in the Long-Term

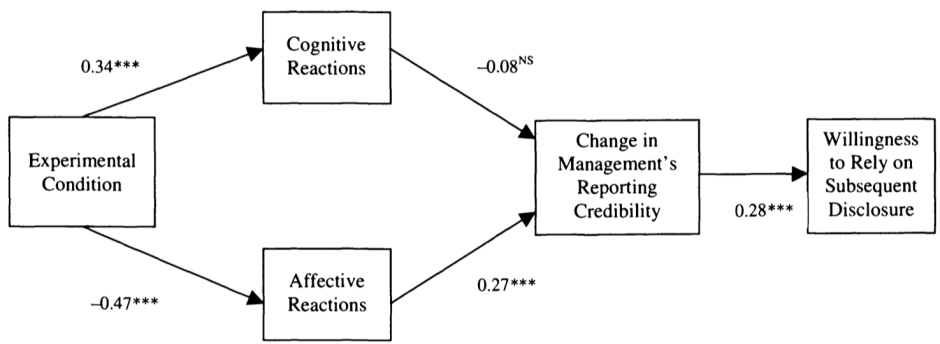
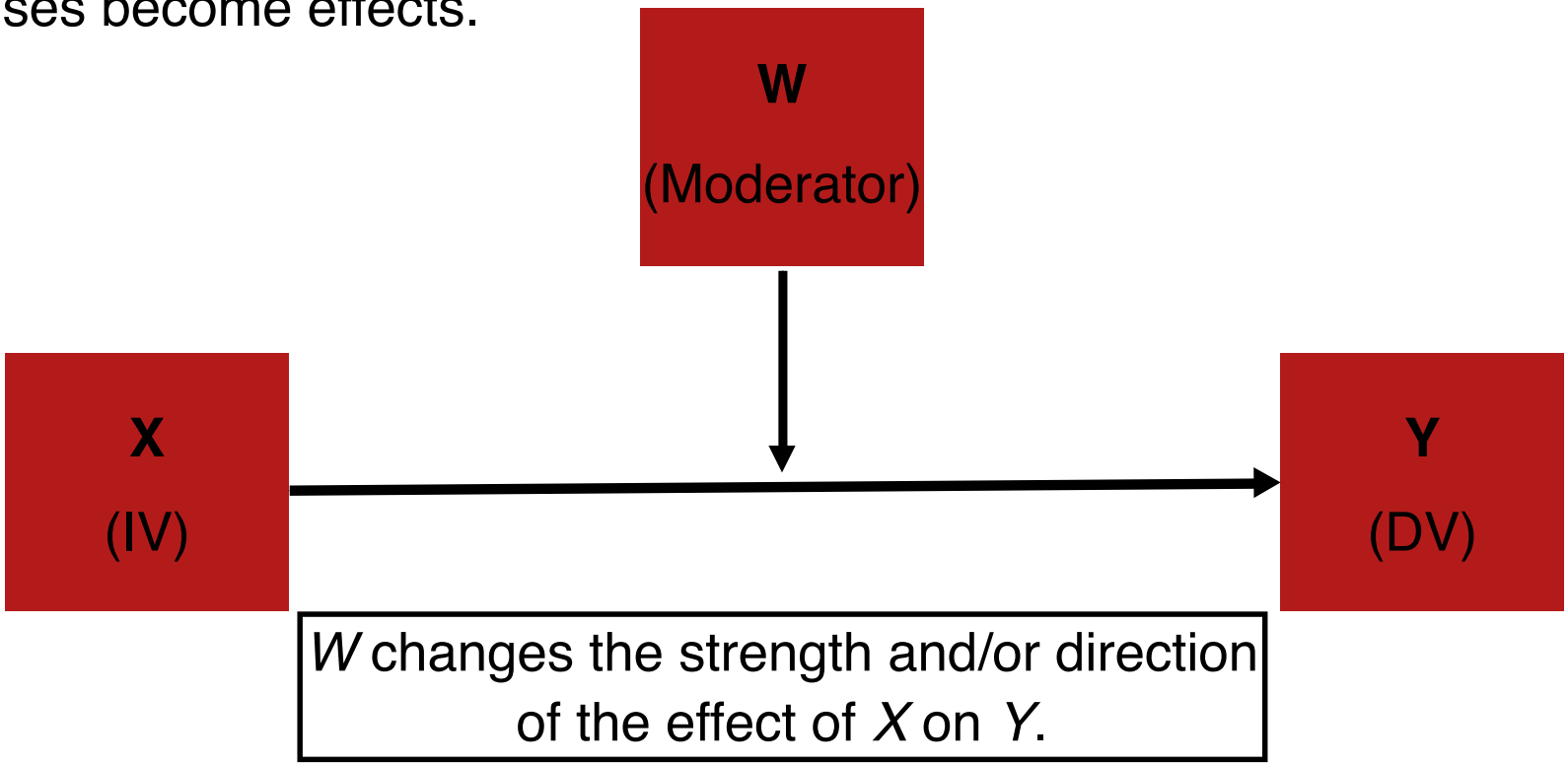


Figure 3 - Mercer (2005 TAR)

Moderation

Moderation helps us understand *when (or under what circumstances)* causes become effects.



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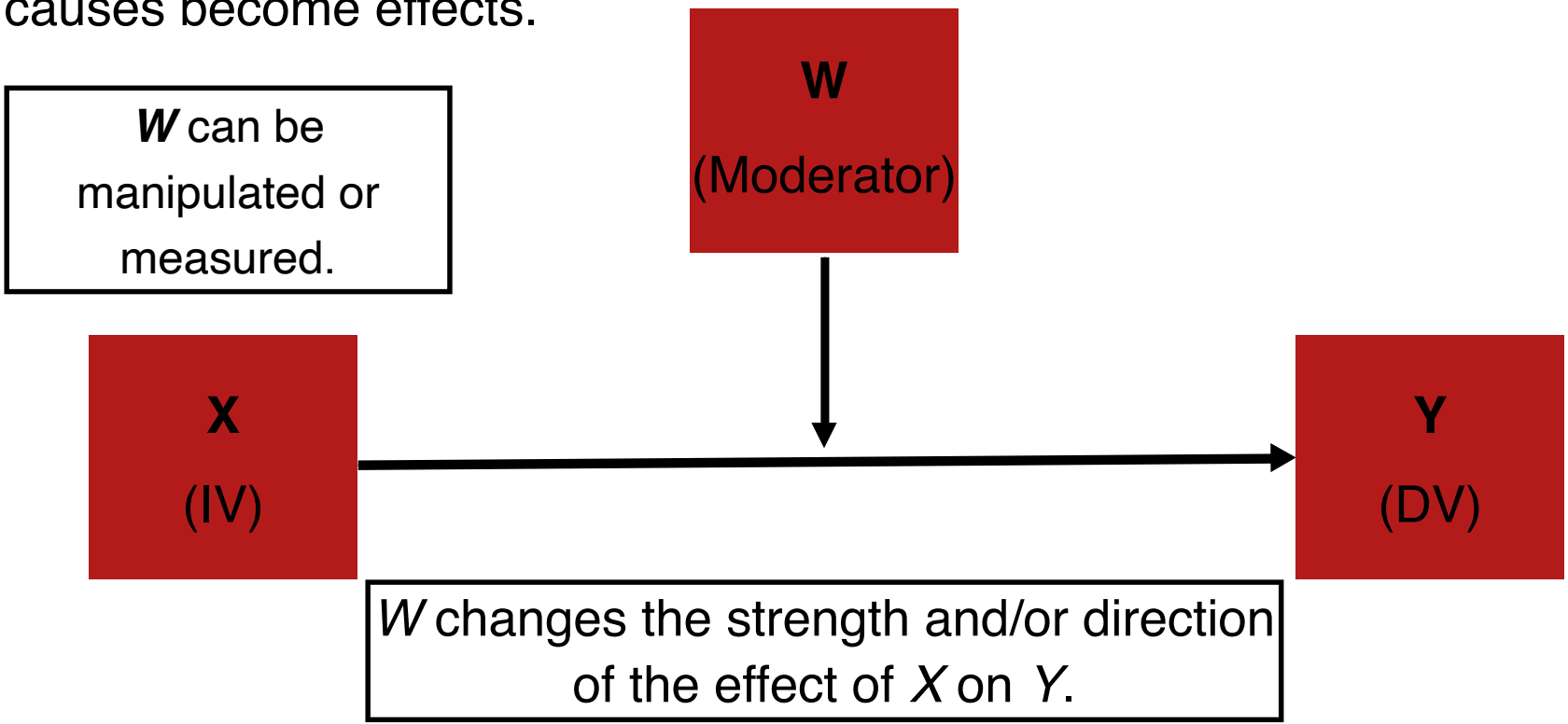

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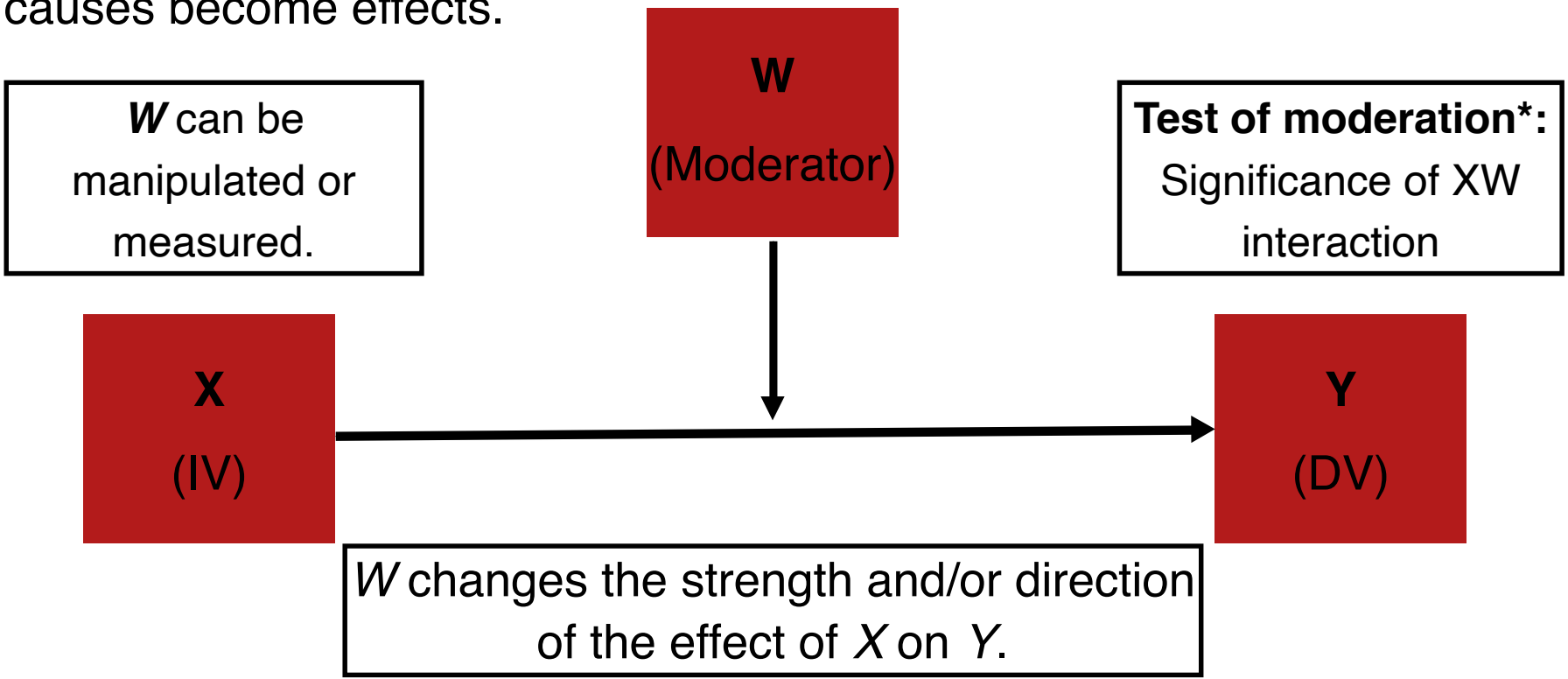

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- Can provide convincing *causal* process evidence (only when the moderator is manipulated).
- Manipulated moderators can leverage random assignment and control of temporal order to rule out plausible alternative theories.
- Does not (usually) rely on fancier stats than an ANOVA or regression.
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- Often provide confirmatory and disconfirmatory evidence at the same time.

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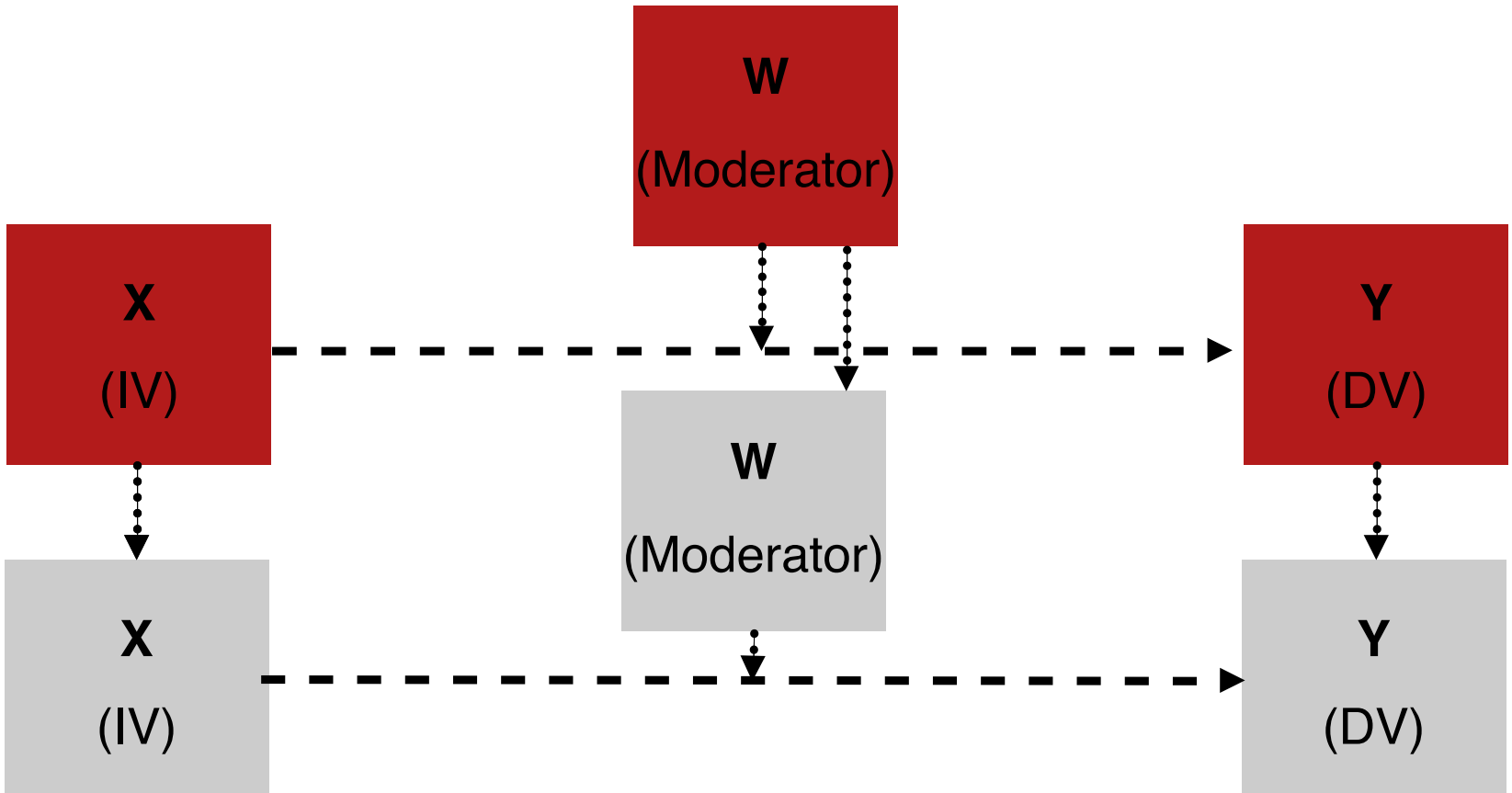
Weaknesses

- Many of the weaknesses of mediation also apply to measured moderator designs.
- Manipulated moderator designs often entail high participant resource demands (less efficient).
- Some moderators are not able to be (ethically) manipulated.
- Moderators are often more difficult to design (more abstracted from process).

Moderation: What could go wrong?



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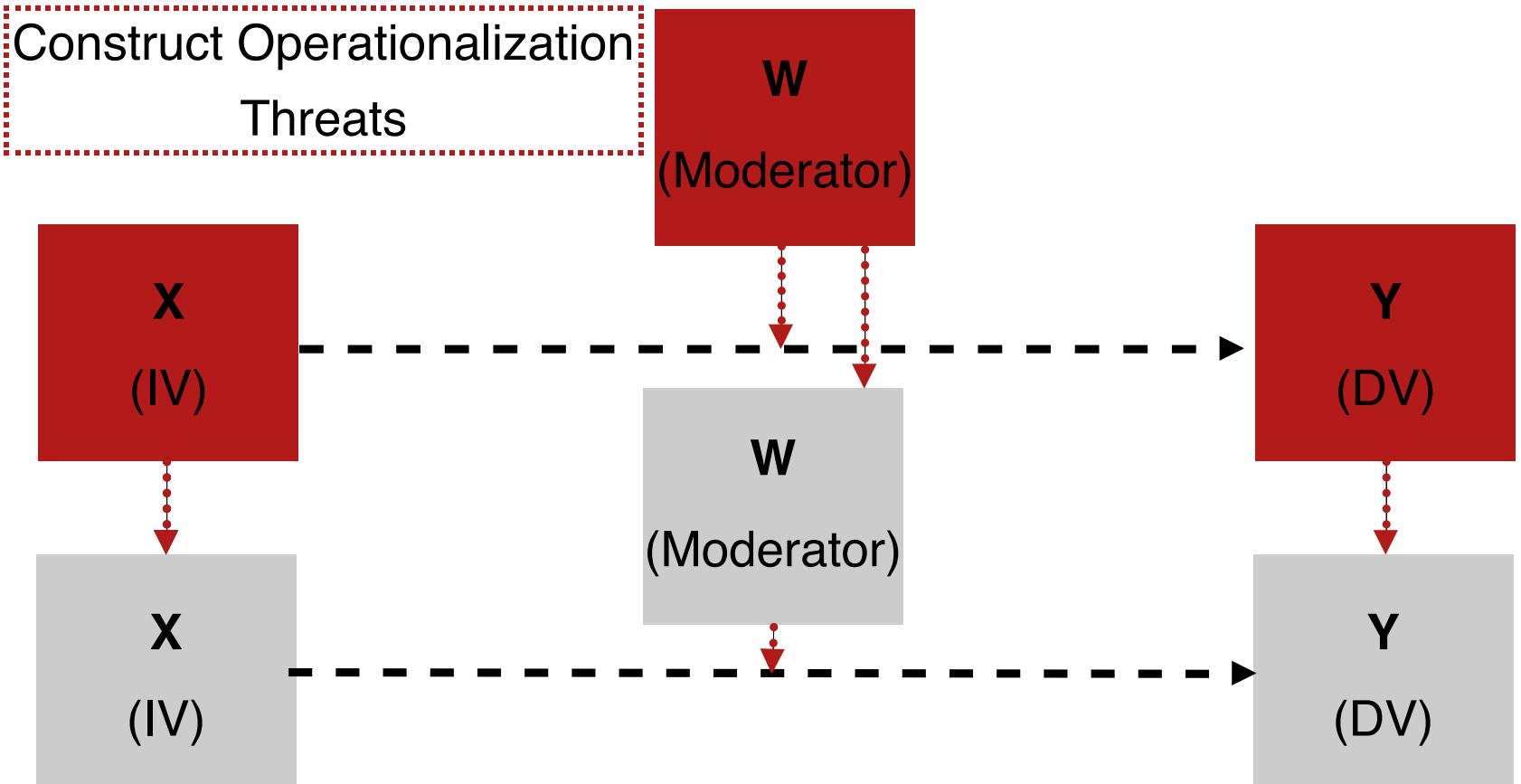

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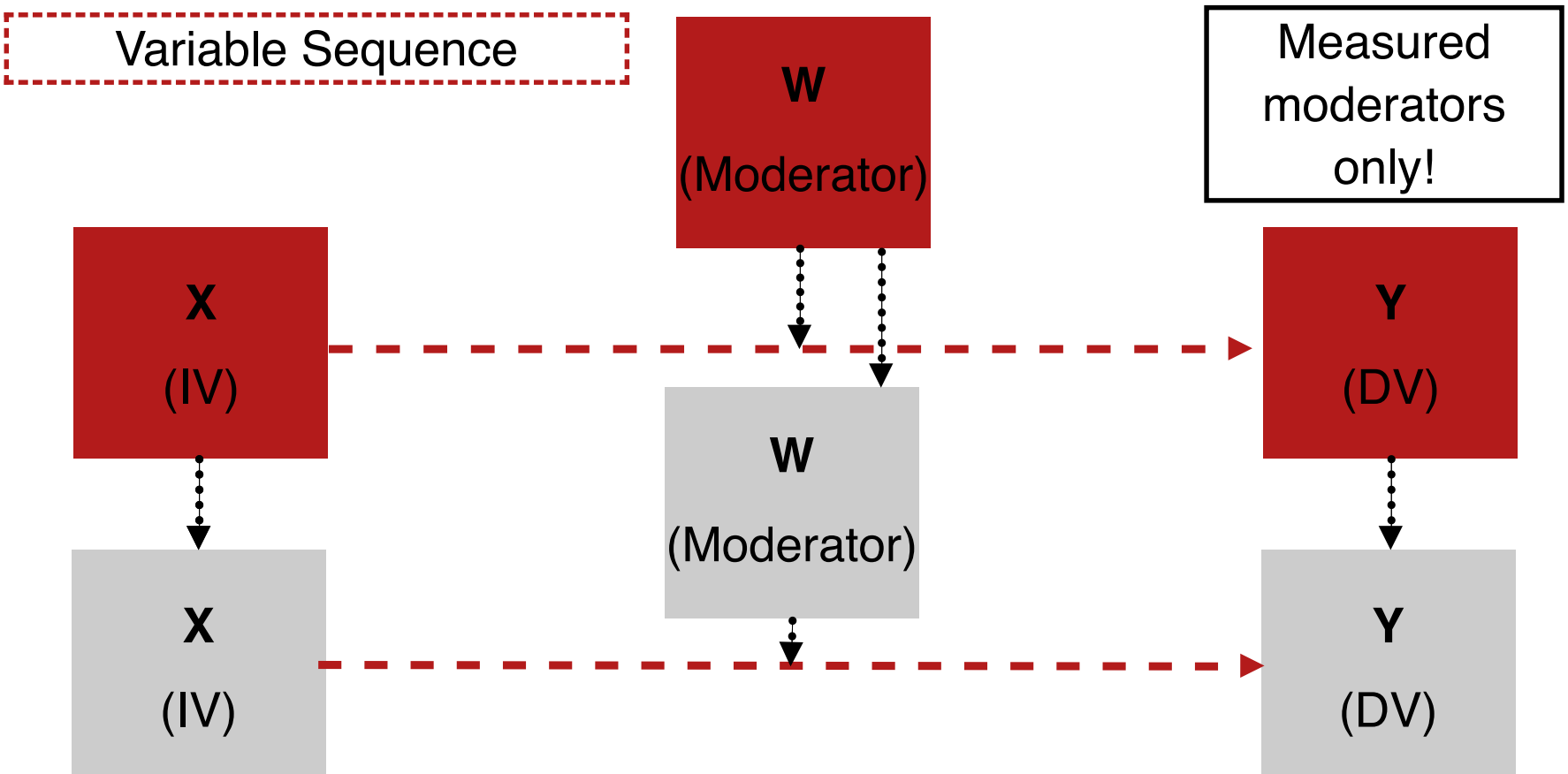

Moderation: Best Practices

Manipulated Moderators

- Manipulated moderators have fewer validity threats, but need well-specified theory.
- Manipulated moderators should only manipulate the construct of interest.

Measured Moderators

- Subject to variable sequence threats (like mediation).
- Measured moderators should not be affected by other manipulations or measures.

All Moderation Designs

- Moderator cleanly maps to construct.
- Interaction alone doesn't always mean process evidence.
- Consider costs of recruitment.

I-FoMO and Investment Amount

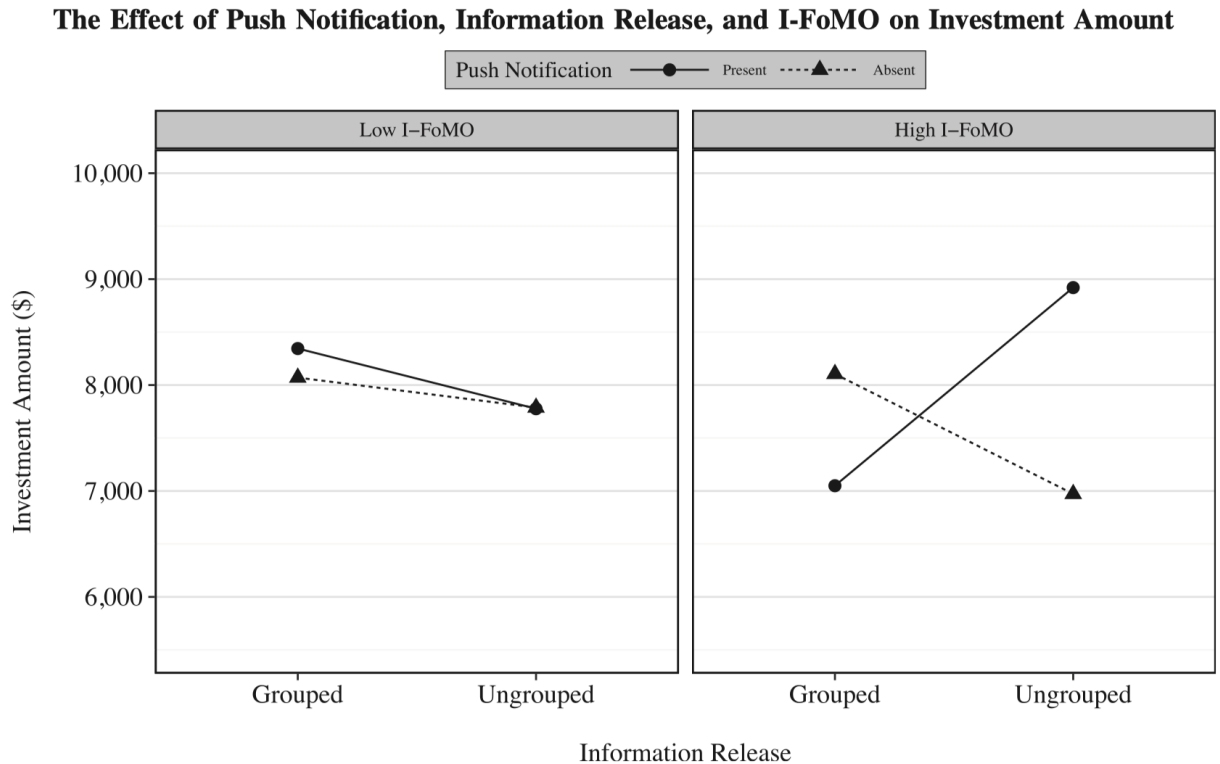

Figure 1 - Clor-Proell, Guggenmos, and Rennekamp (2020 TAR)

Multiple Sources

Increasing the quality, quantity, and/or diversity of process evidence can allow for stronger claims about process.

Multiple methods can help "rule out" that an effect is a methodological artifact.

Multiple experiments allow for strategic design.

- Breaking into smaller pieces (home in on process).
- Test the causal chain.
- Don't need to run cells that aren't useful.

Triangulation across studies can lead to richer inference over the lifetime of a research literature.

Trust in Algorithms

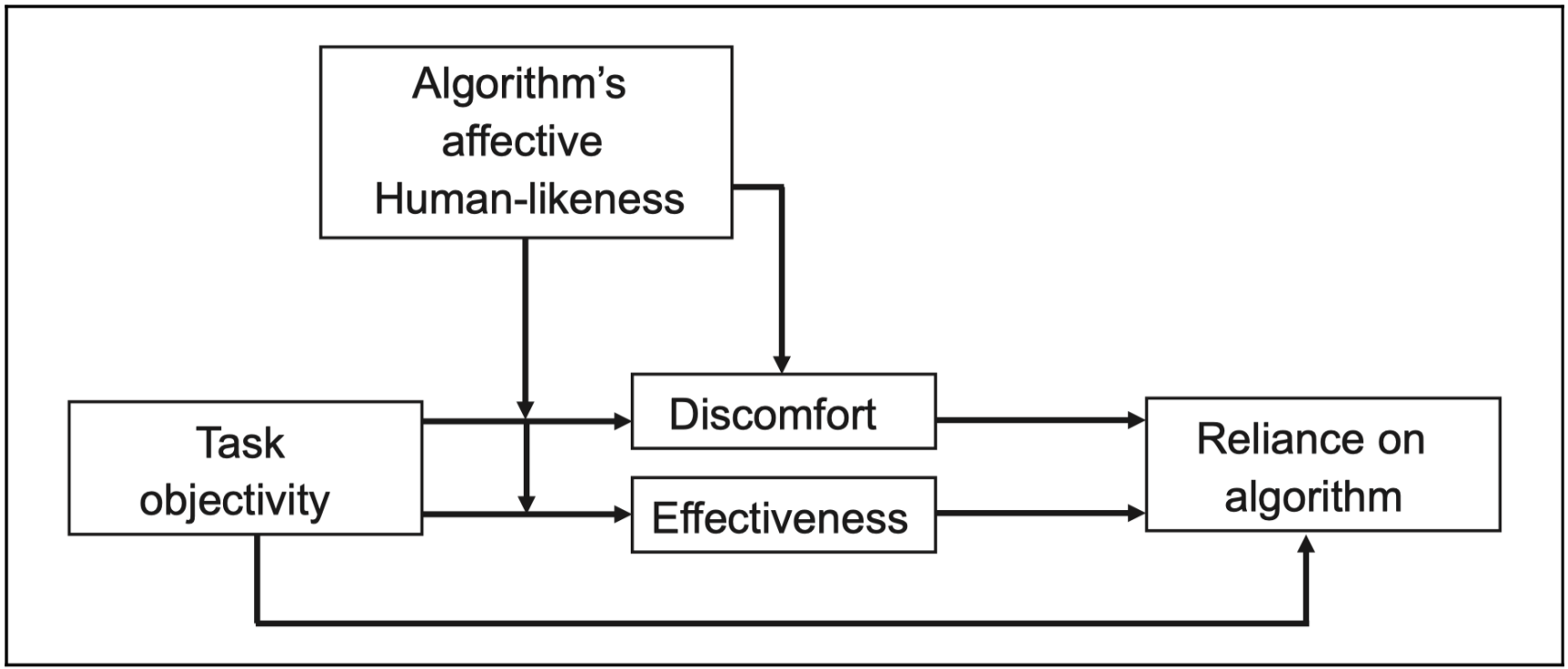

Figure 1 - Castelo, Bos, and Lehmann (2019 JMR)

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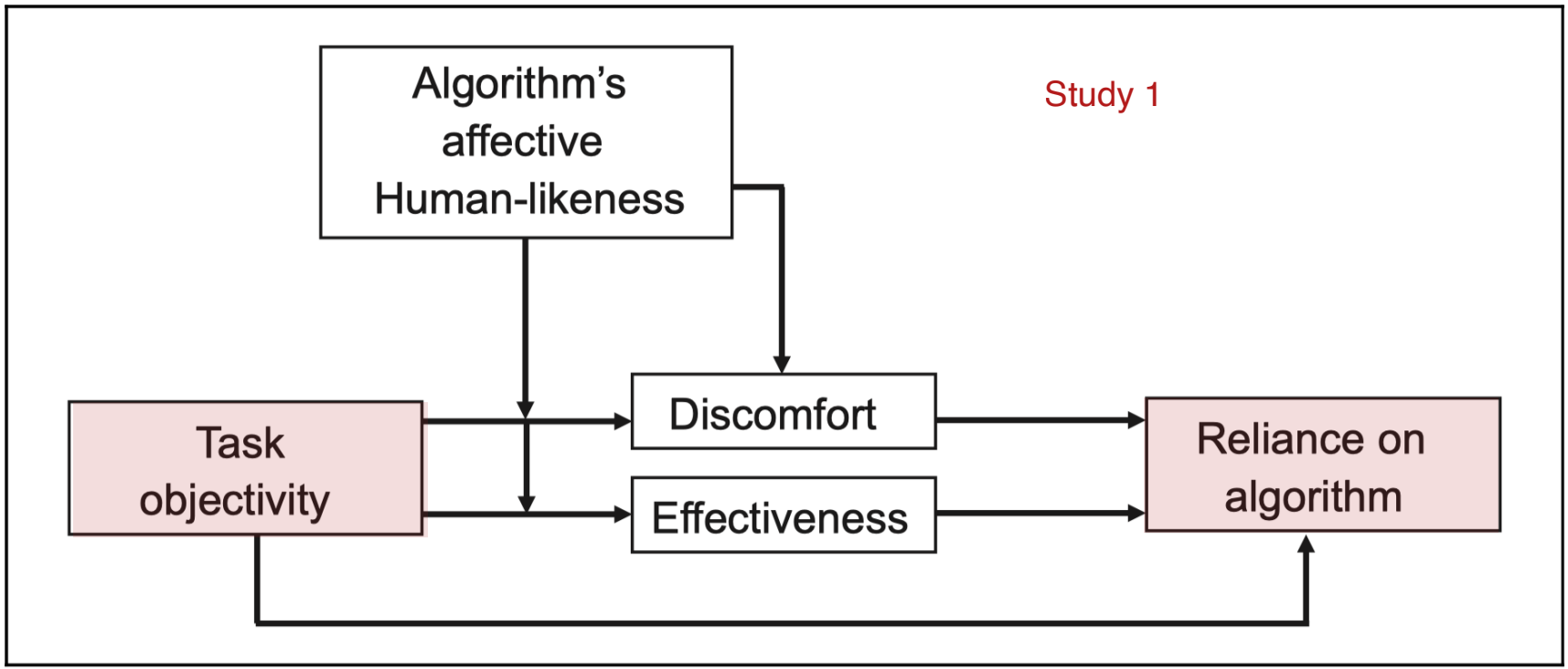

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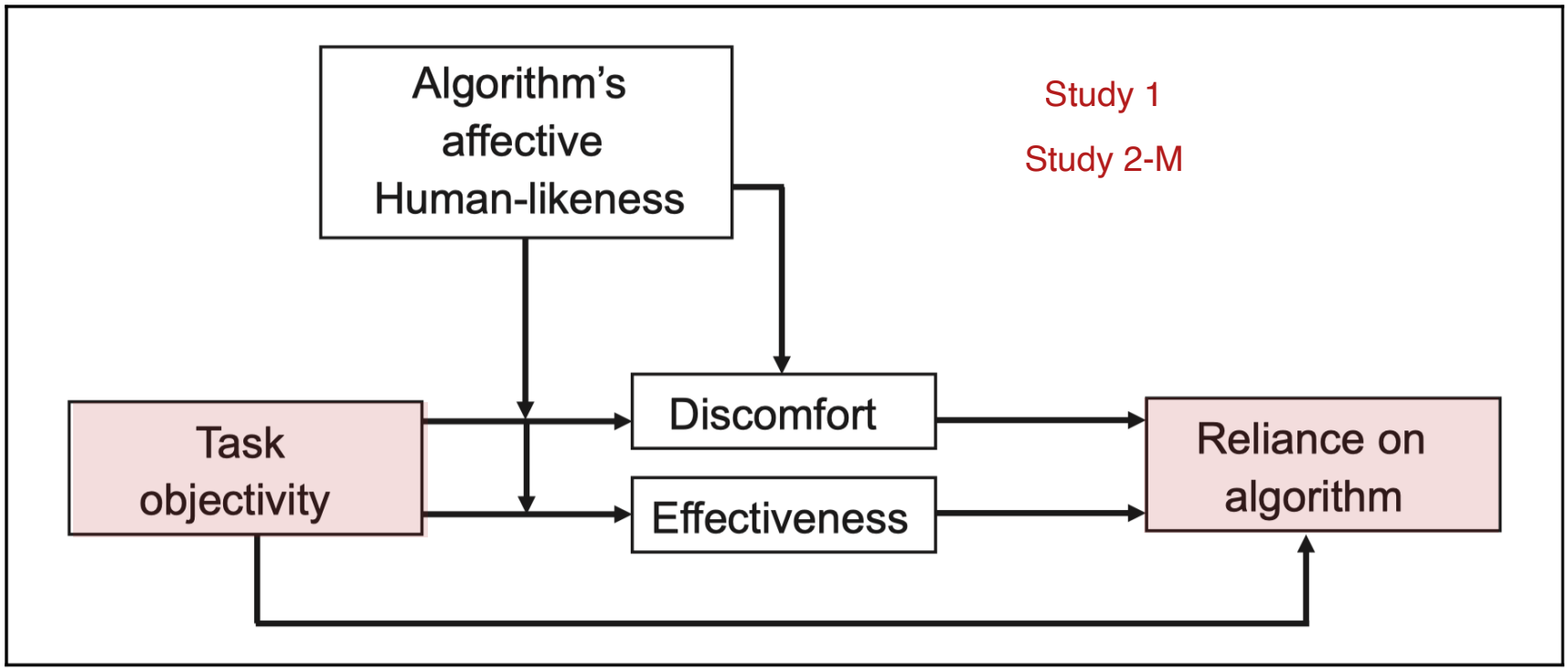

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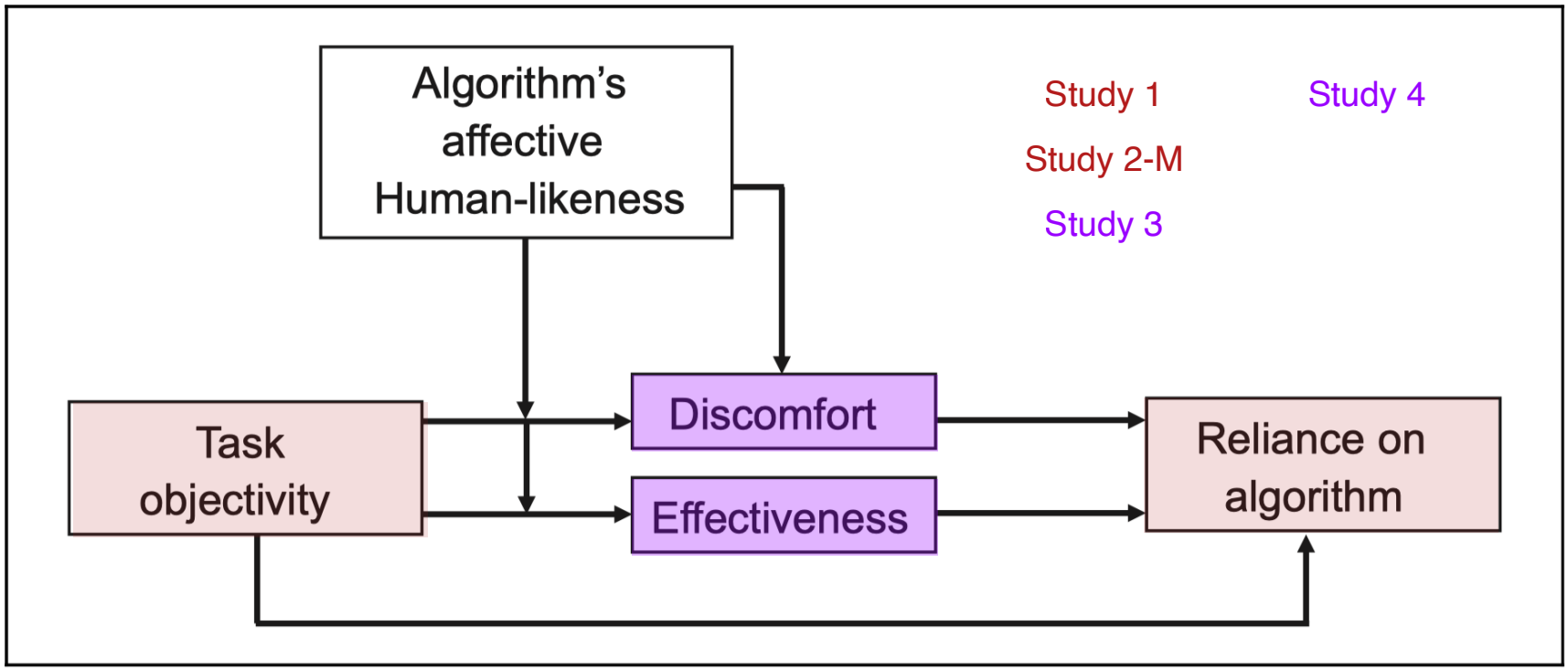

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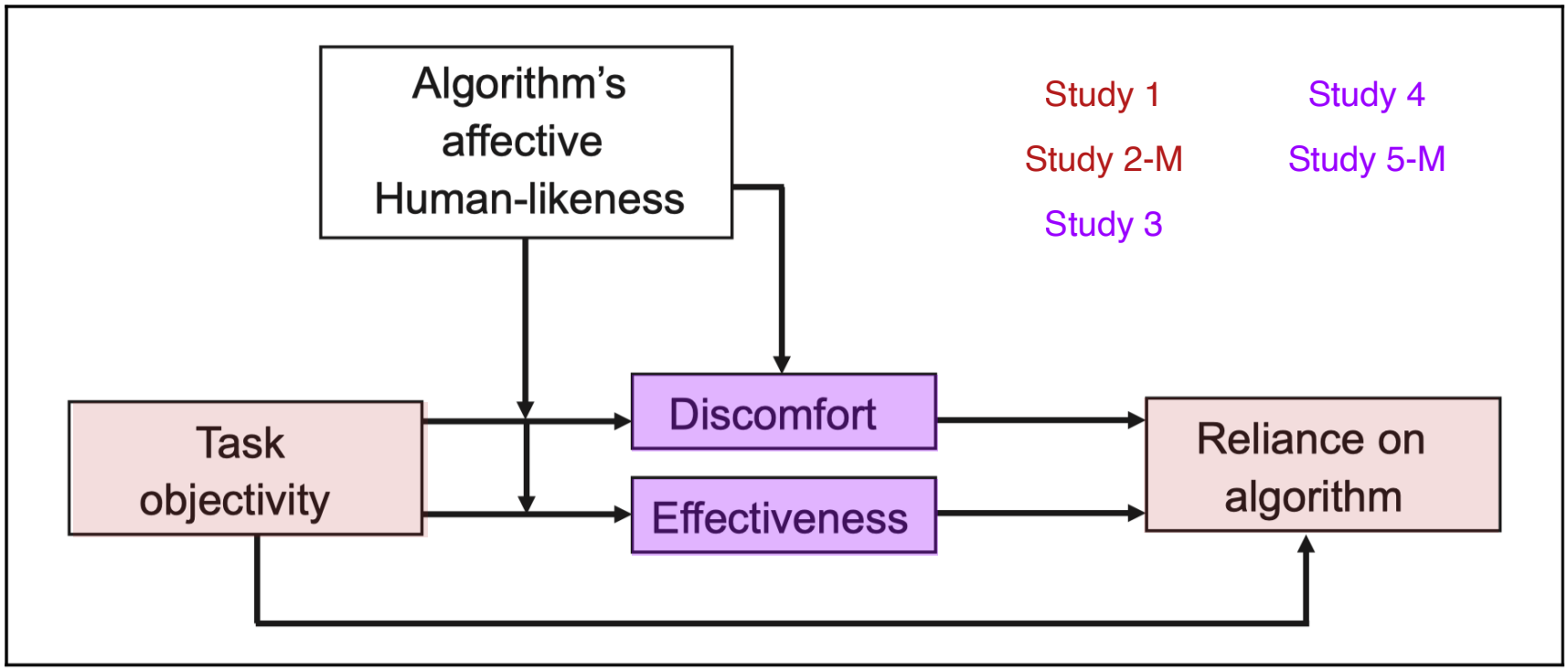

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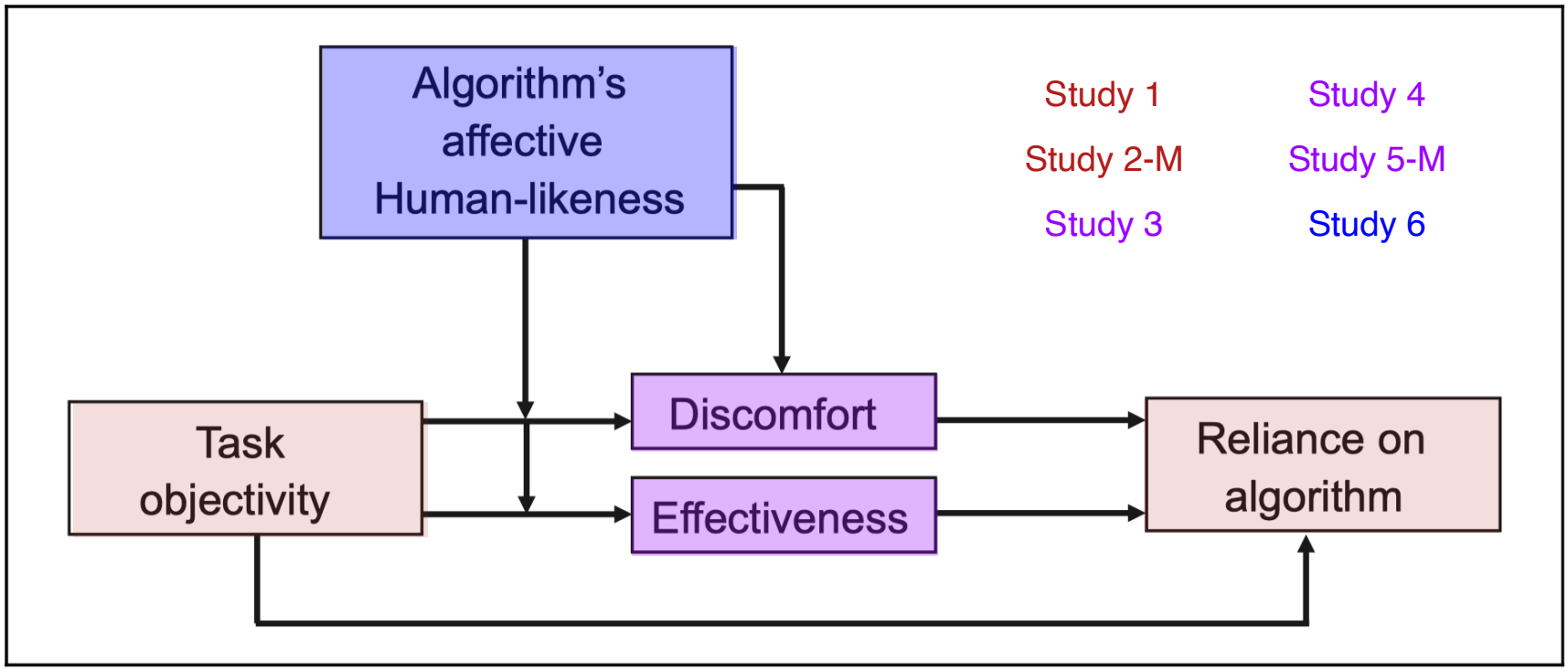
Trust in Algorithms



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Process testing (and design, more generally) is a game of tradeoffs. Be mindful and make these choices intentionally.

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But when we want to speak to process, approach providing process evidence with rigor commensurate with how much the contribution hinges on understanding process.

Process testing (and design, more generally) is a game of tradeoffs. Be mindful and make these choices intentionally.

Choose the right tool for the job. Whether mediation vs. moderation, measurement vs. manipulation, or choosing between one or multiple studies - match the theory, to the hypothesis, to the method, to the analysis.

More Resources and References

For more resources related to statistics and research design:

https://rdg222.github.io/Resources/

Primary Reference:

Asay, H. S., R. Guggenmos, K. Kadous, L. Koonce, and R. Libby. 2021.“Theory Testing and Process Evidence in Accounting Experiments.” Working Paper (SSRN)

Thank you!