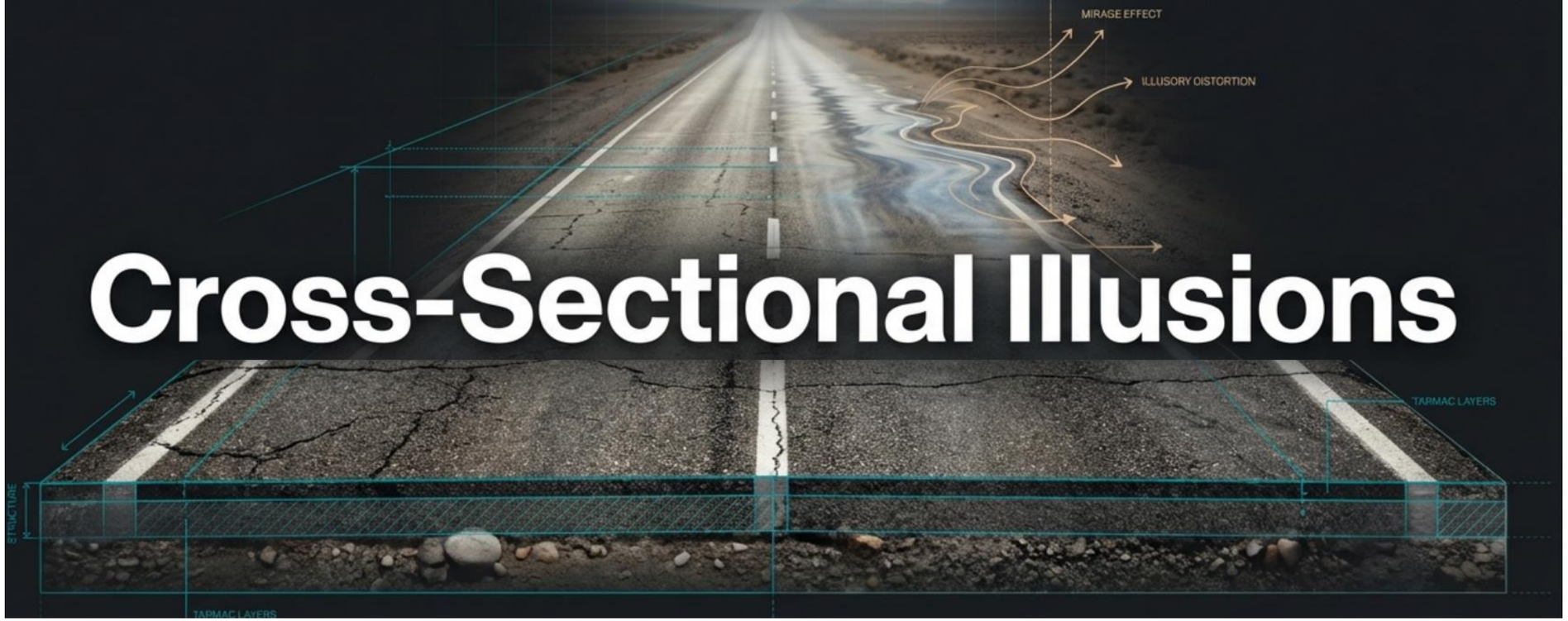

Title: Cross-sectional illusions: what we have learned about the attitude-behaviour relationship and its policy implications

Milad Mehdizadeh

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22/04/2026

UNIVERSITY OF LEEDS
Institute for Transport Studies

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TRANSPORT REVIEWS
https://doi.org/10.1080/01441647.2026.2618148

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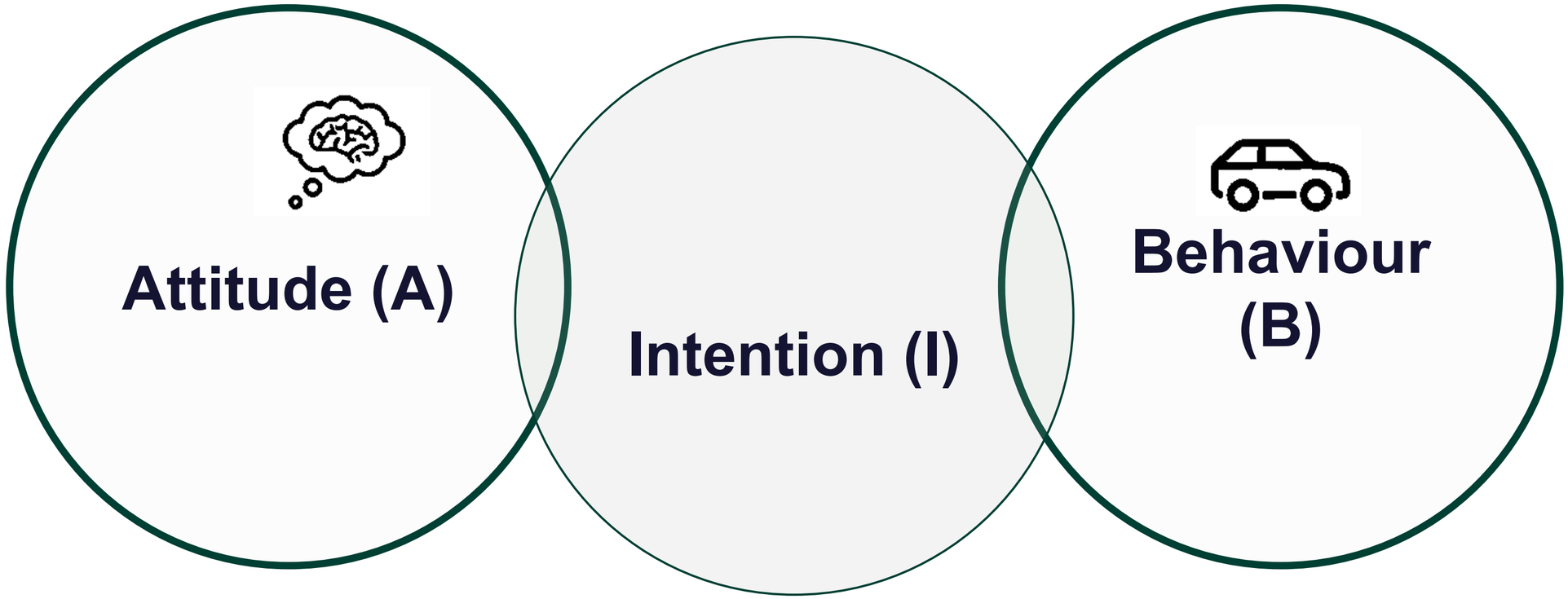
Cross-sectional illusions: what we have learned about the attitude-behaviour relationship and its policy implications

Milad Mehdizadeh, Greg Marsden and Jillian Anable

Institute for Transport Studies, University of Leeds, Leeds, UK

Contents

Initial definition of A, B, …



How we think about the Behaviour
+/- evaluations of the …

Why A-B relationship?

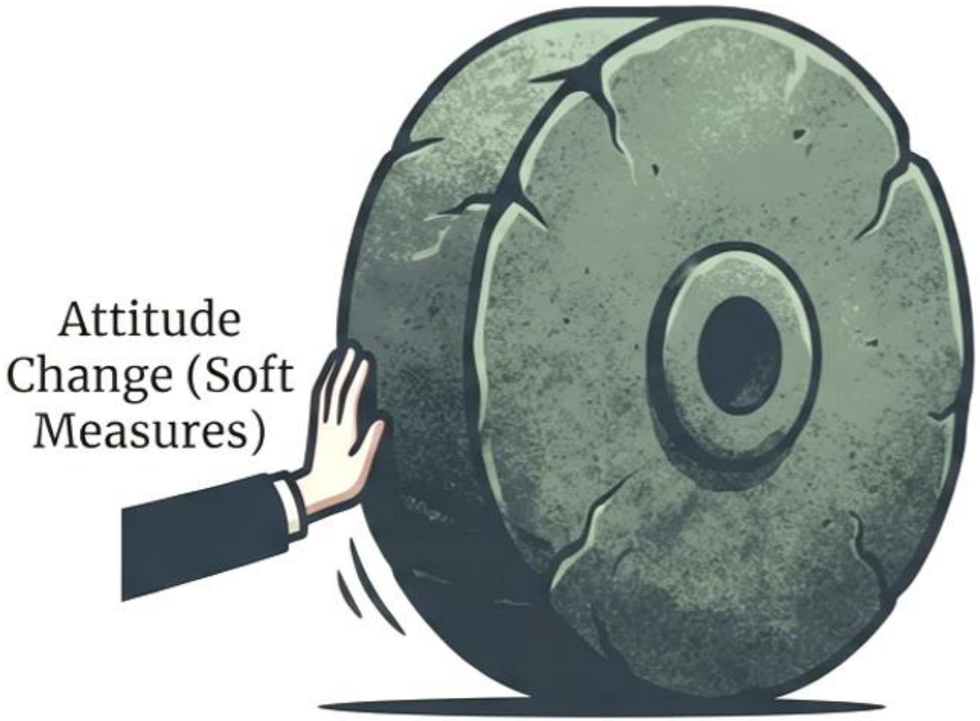
- Change your thoughts, and you change your world.
- We are what we think.
- Your mindset shapes your reality.
- Attitude is everything.
- The mind is everything; what you think, you become.
- A change in perspective changes everything.
- YouYou can’t make good decisions with a negative mindset.
- …

- Attitude is a key concept in social psychology (Gärling, 2026).

- Attitudes and values are generally considered to be central to an understanding of what motivates human behavior (Maio, 2016, Verplanken and Holland, 2002).

A-B and POLICY?

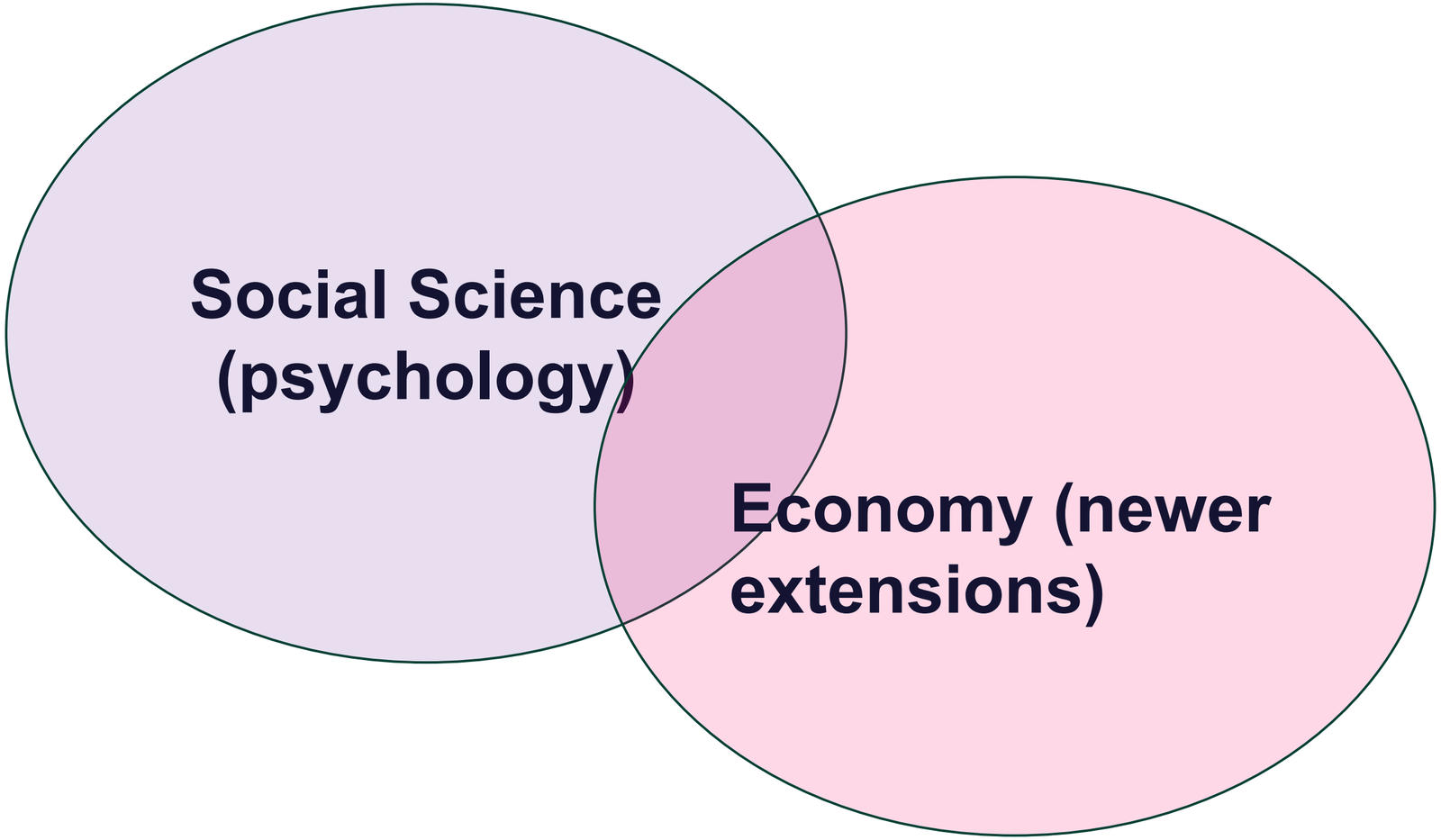
If **A** really affects **B**,
If **A** is related to **B**,
If **A** is associated with **B**,
If **A** is correlated with **B**,
it means….



As a *policy tool*, it has been used in many research disciplines….

Pull vs Push
Carrots vs Sticks
Soft vs Hard

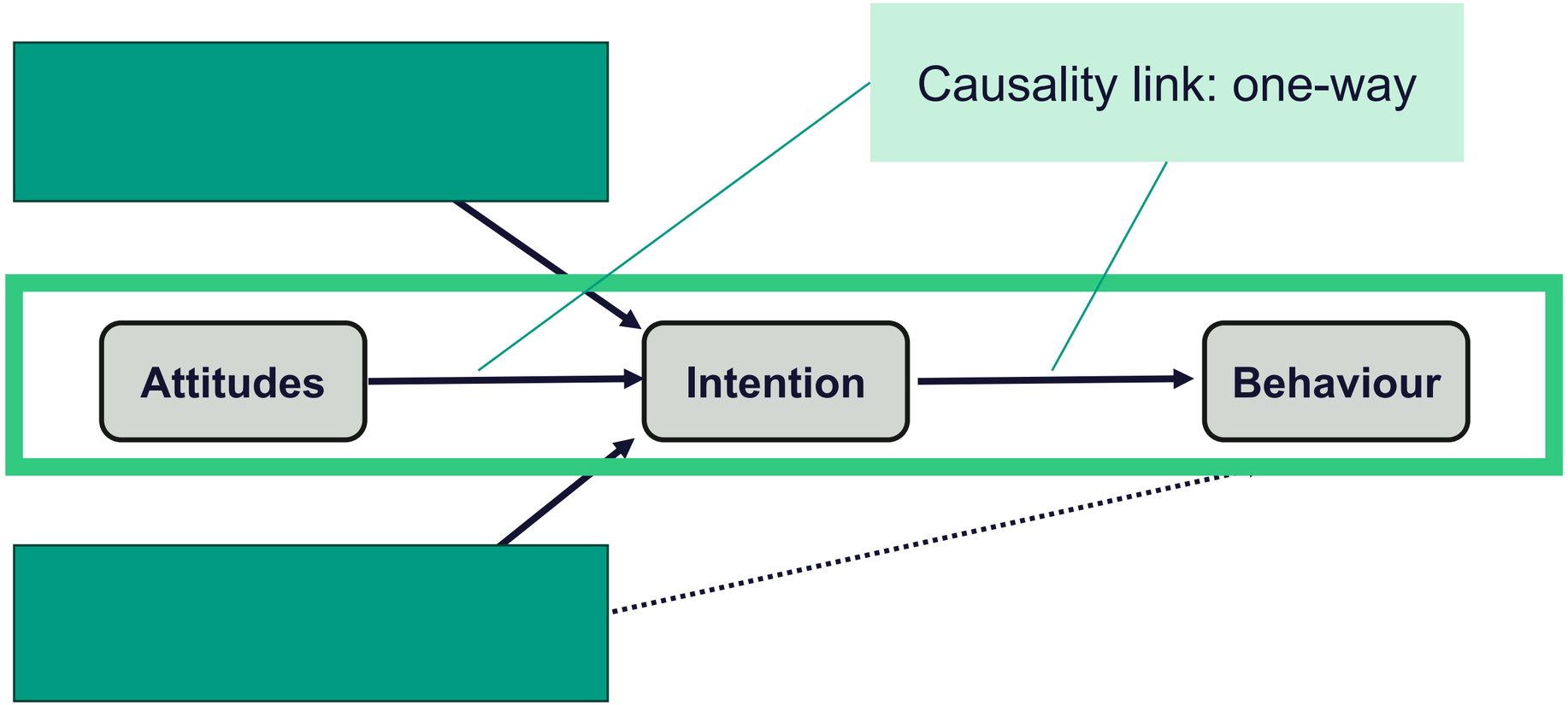
The origin of A-B relationship?



Theoretical background

Social Science (psychology)

From Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB)



Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, *50*(2), 179-211.

Cited by 175,000+

Theoretical background

Economic

Economic; Discrete Choice Modelling
Incorporating Latent Variables
Hybrid Choice Model (HCM) or ICLV!

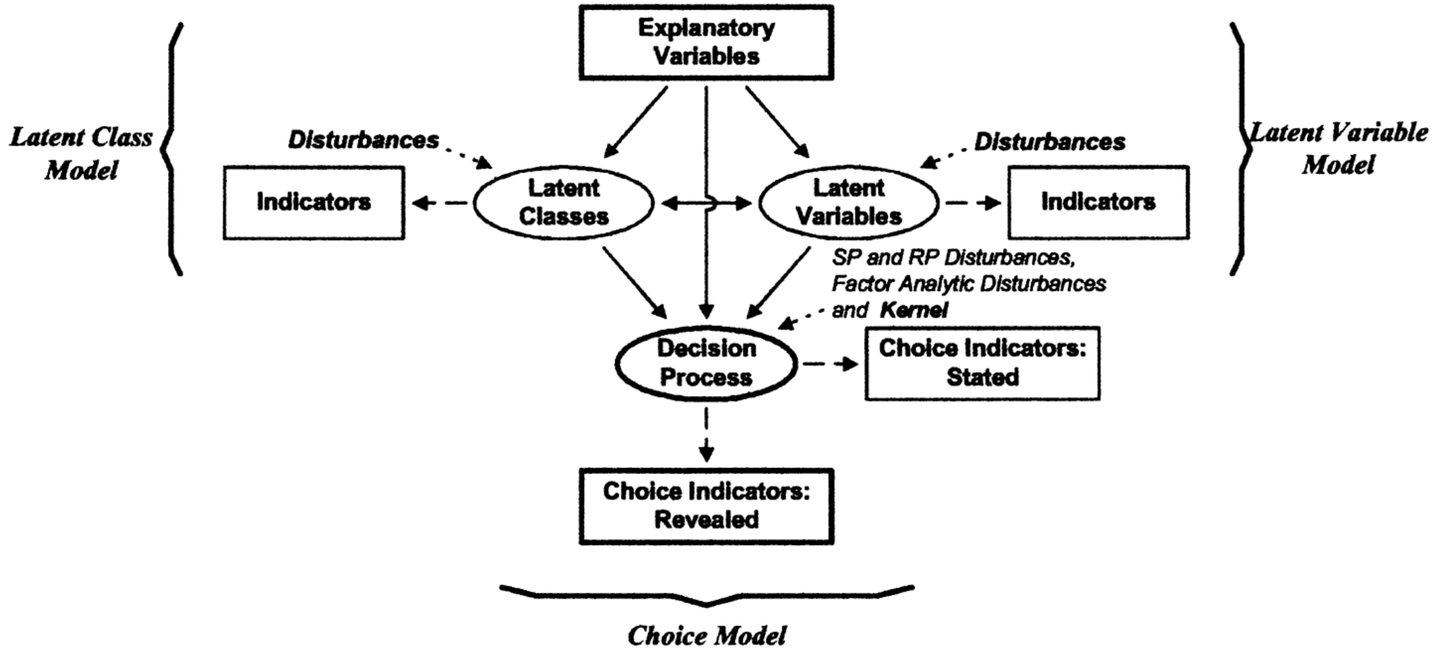


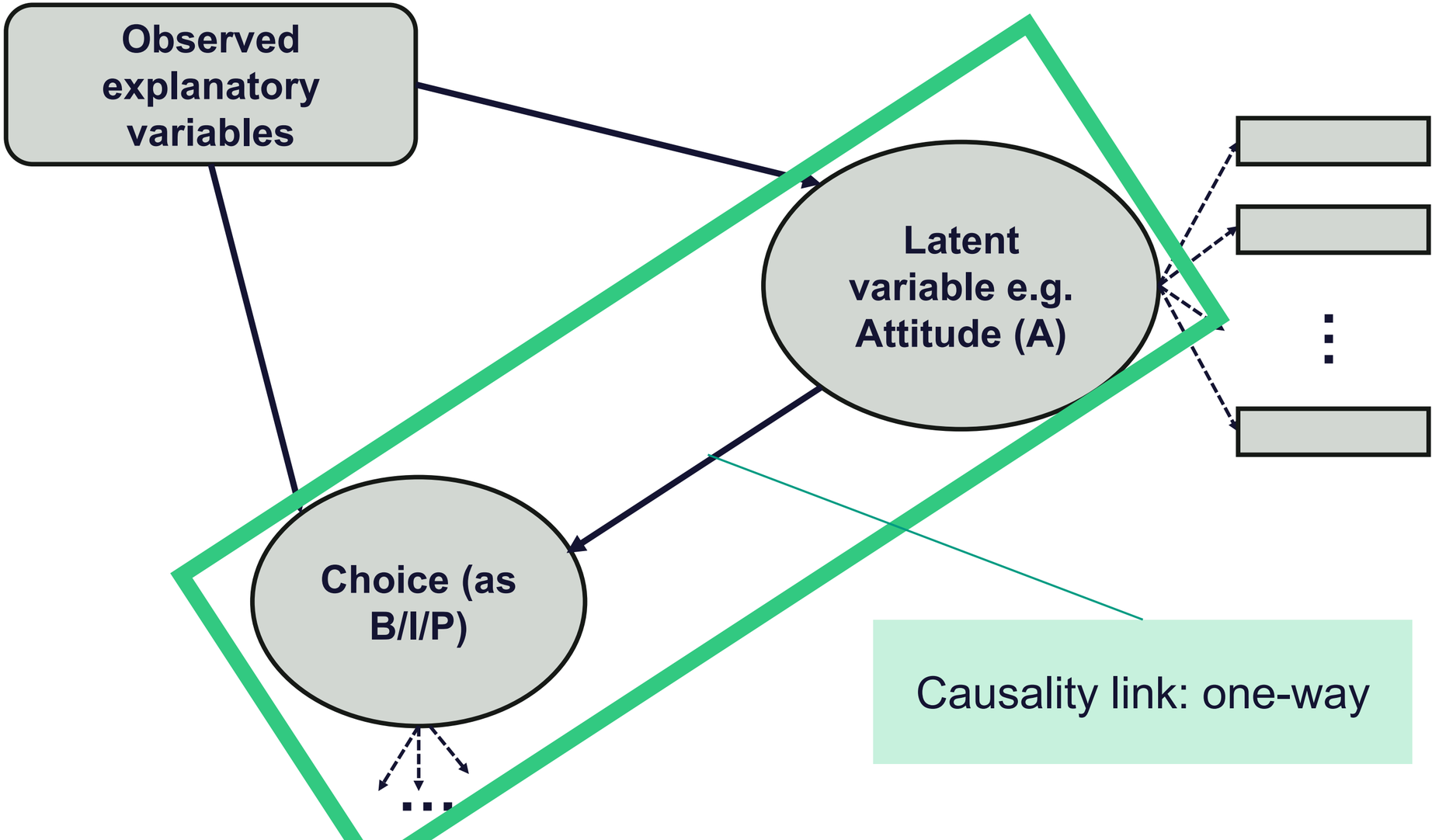
Figure 3. Hybrid Choice Model (Walker and Ben-Akiva 2001).

Ben-Akiva, M., McFadden, D., Train, K., Walker, J., Bhat, C., Bierlaire, M., ... & Munizaga, M. A. (2002). ***Hybrid choice models: Progress and challenges***. Marketing Letters, 13(3), 163-175.

Cited by 1,100+

Theoretical background

Economic + psychology



Causality

B

A

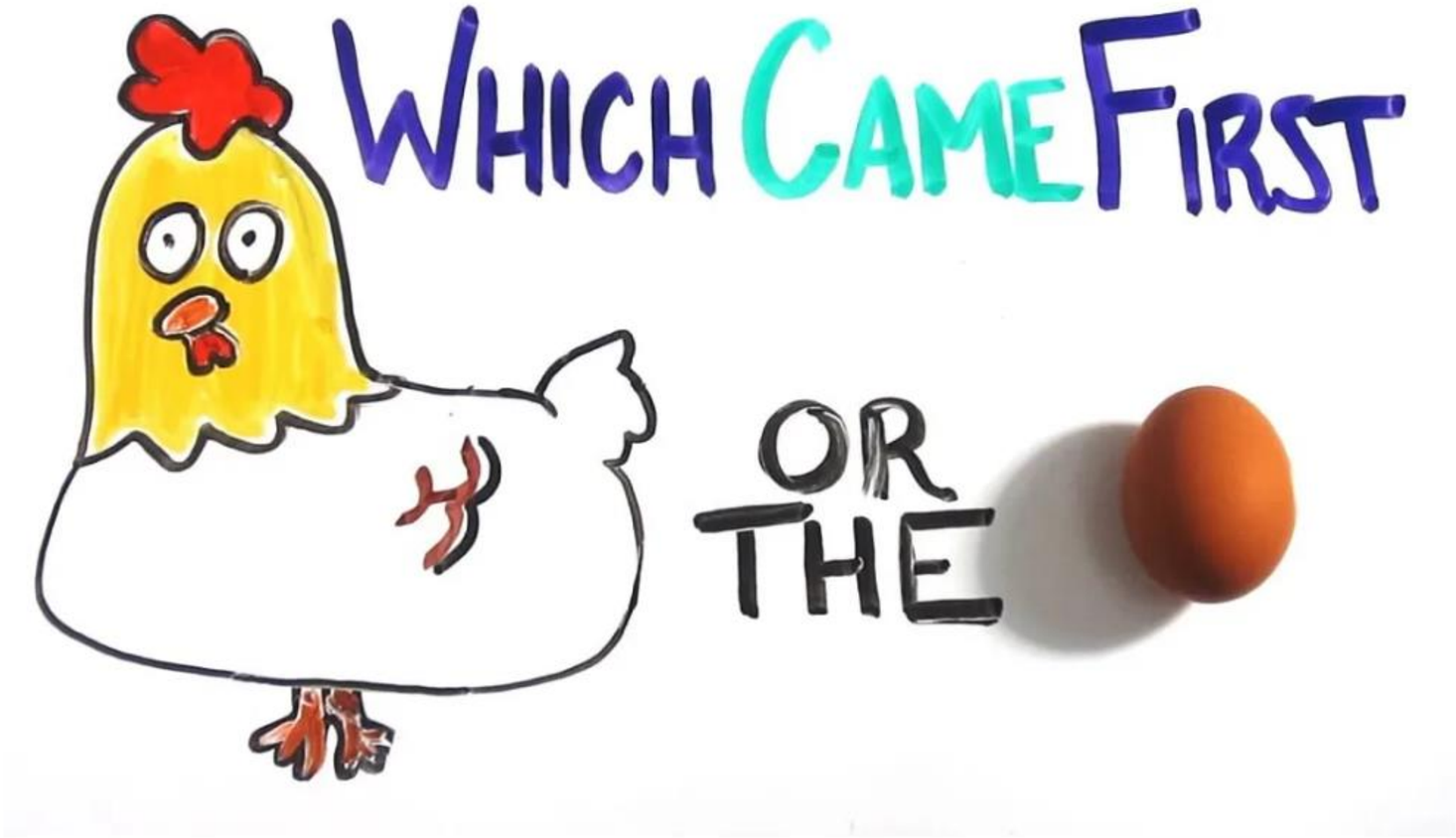
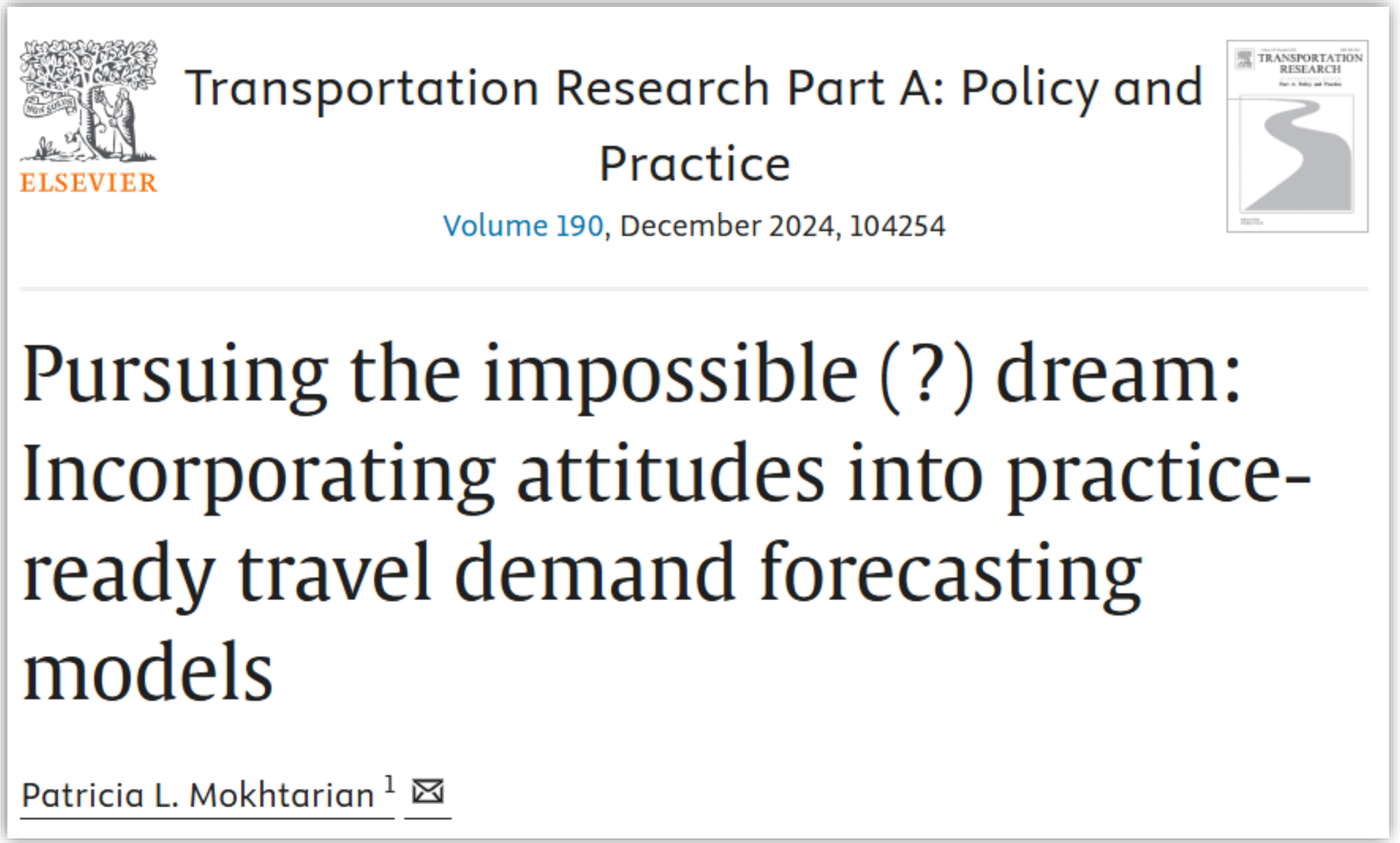


Image from https://medium.com/

Causality

What behavioural scholars assumed: attitude ⇨ behaviour



ELSEVIER

Transportation Research Part A: Policy and Practice

Volume 190, December 2024, 104254

Pursuing the impossible (?) dream: Incorporating attitudes into practice-ready travel demand forecasting models

Patricia L. Mokhtarian [1] ✉

Causality

ECONOMIC CHOICES

Prize Lecture, December 8, 2000

by

DANIEL L. MCFADDEN*

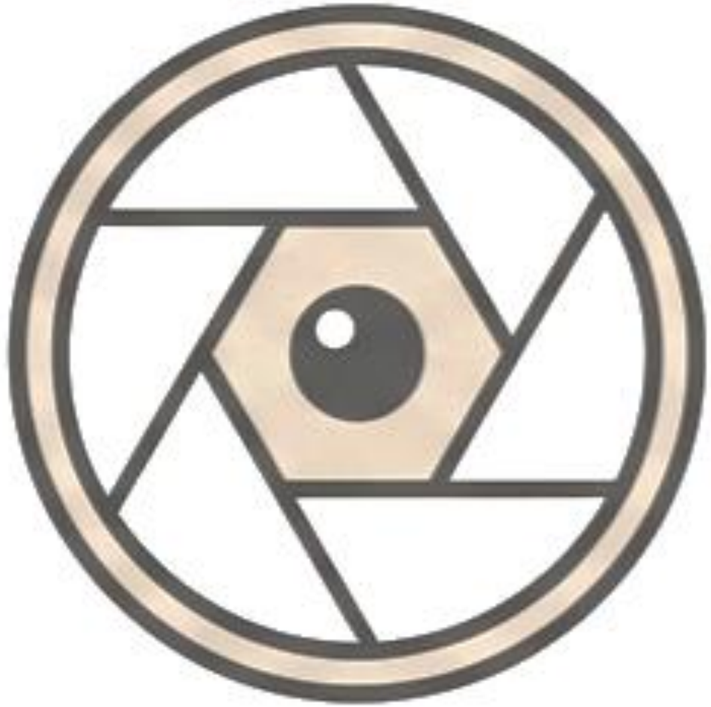
Department of Economics, University of California, Berkeley, CA 94720-3880, USA.

- In the Nobel Prize lecture of economist Daniel McFadden (2001), he presents a pictorial model of the choice process in which influences on choice include motivation/affect, attitudes, perceptions/beliefs, and preferences.
- “Because attitudes predict behavior, they are considered the crown jewel of social psychology”(Crano and Prislin, 2006)
- Horowitz (1991) states that “Since the early 1970s, it has been found that variables not included in conventional data sets, such as comfort, reliability, and safety, can have important influences on mode choice.”

What’ve been popular in past A-B research

What’ve been popular in past A-B research

Data

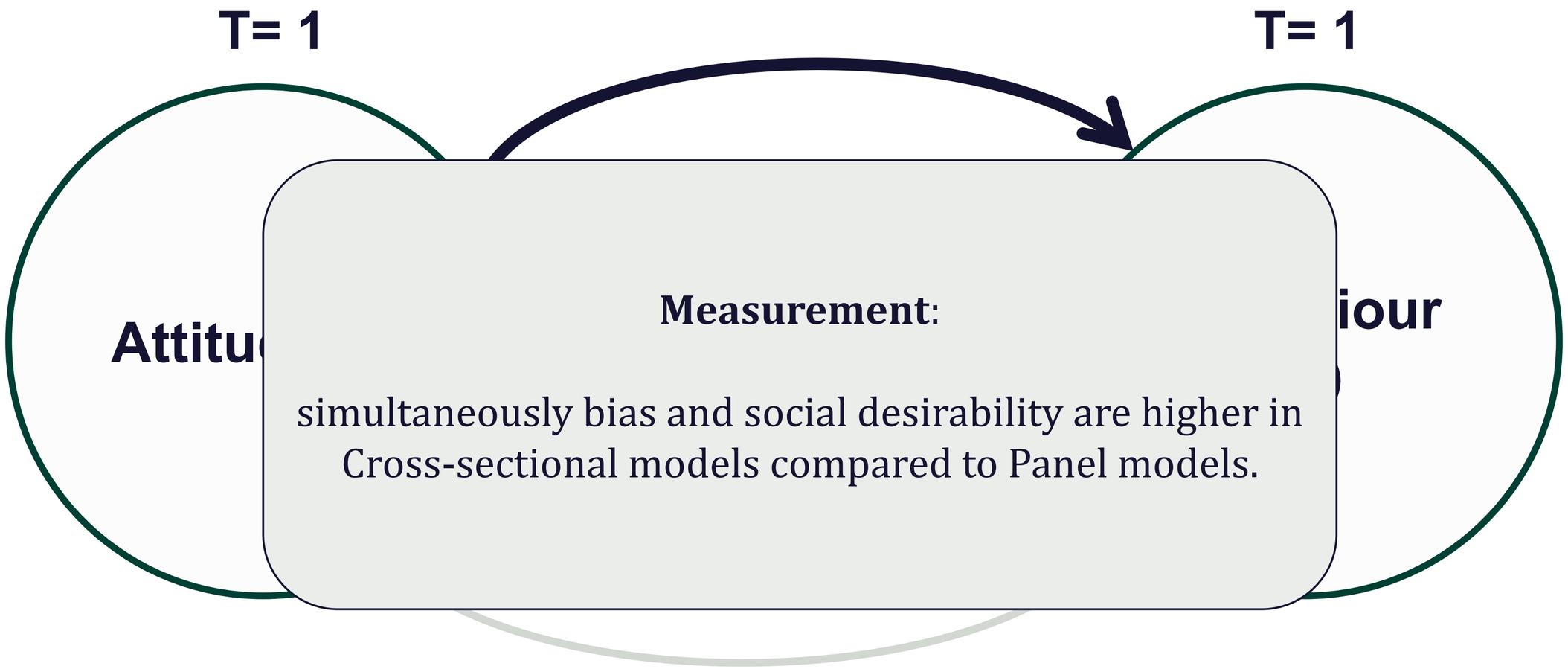


Cross-sectional data:
Single Snapshot of A and B at time point T

Panel data

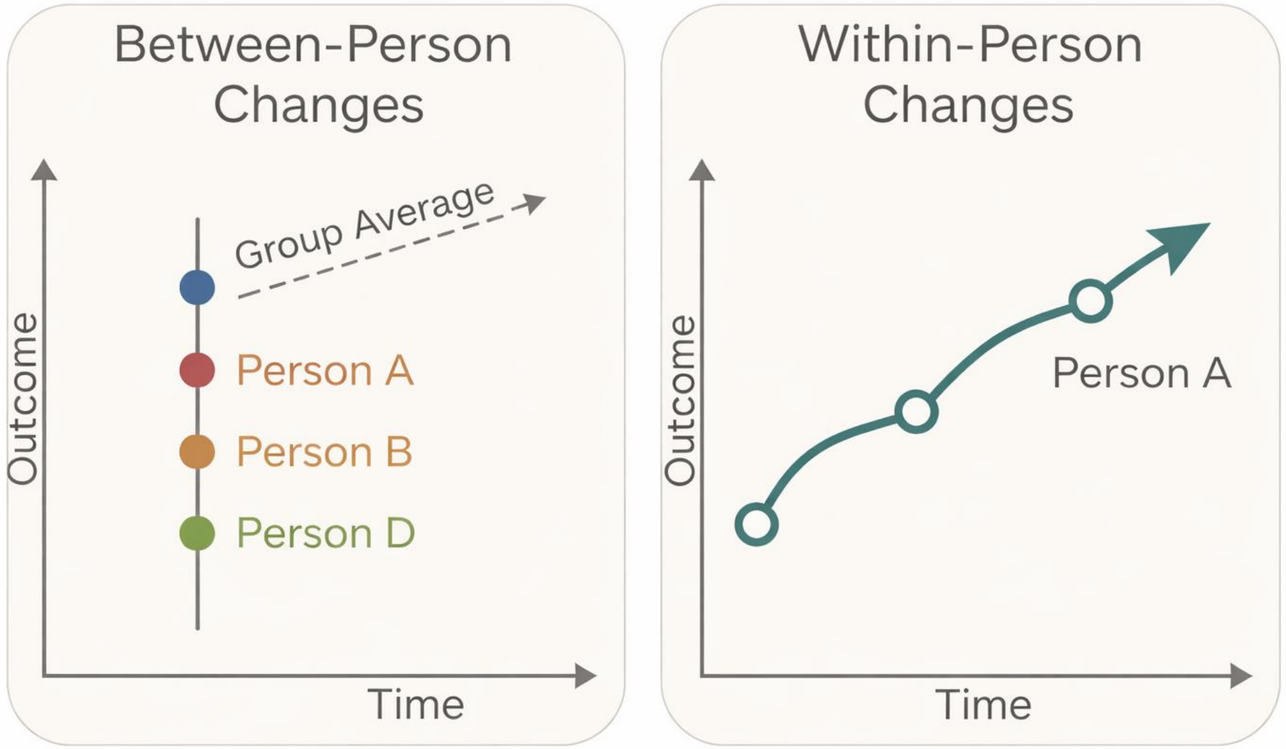
What’ve been popular in past A-B research

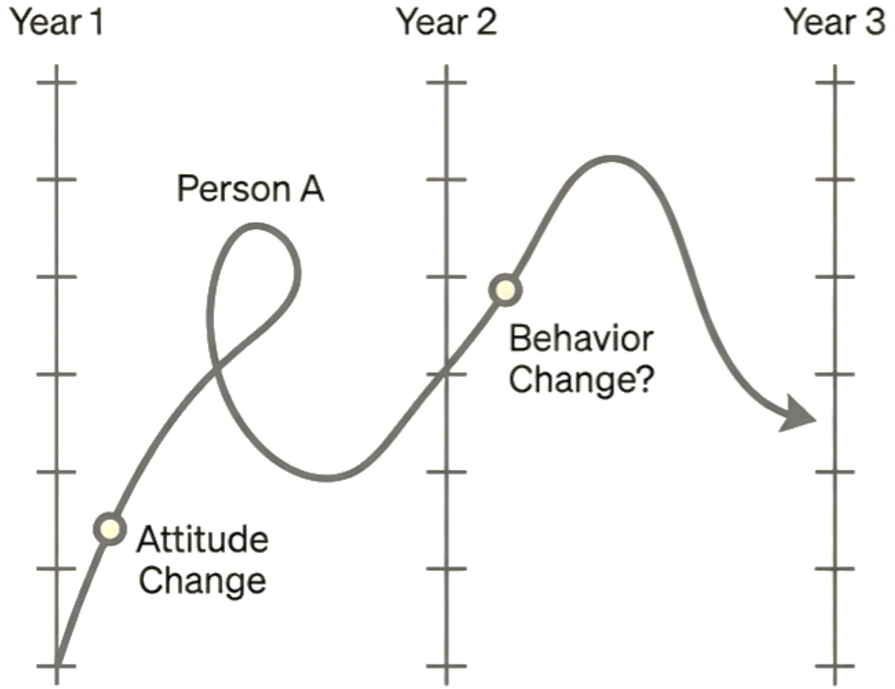
Endogeneity and directionality assumption



What’ve been popular in past A-B research

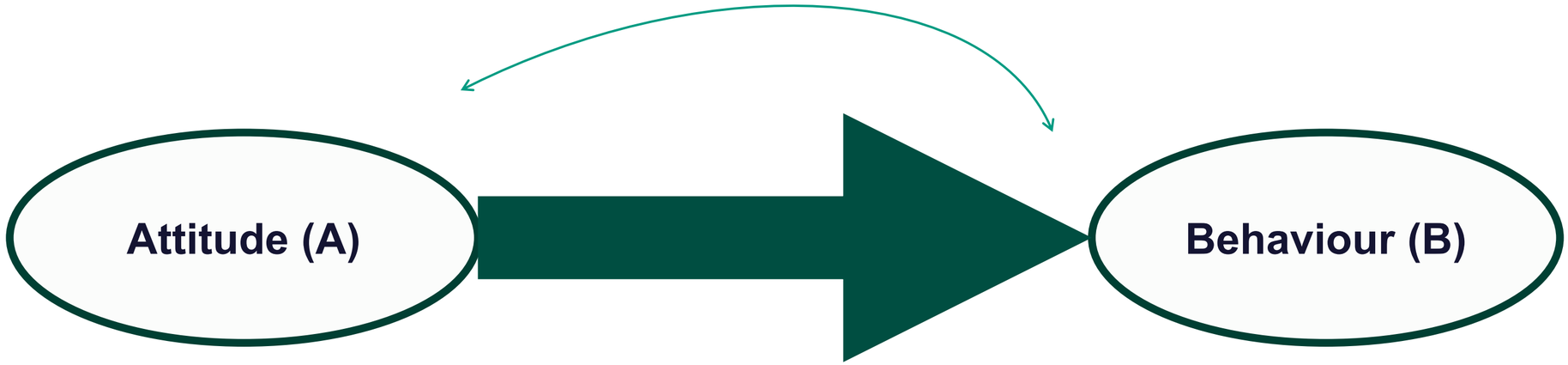
Between-person changes vs. Within-person changes





What’ve been popular in past A-B research

Typical Results and Conclusions from cross-sectional studies

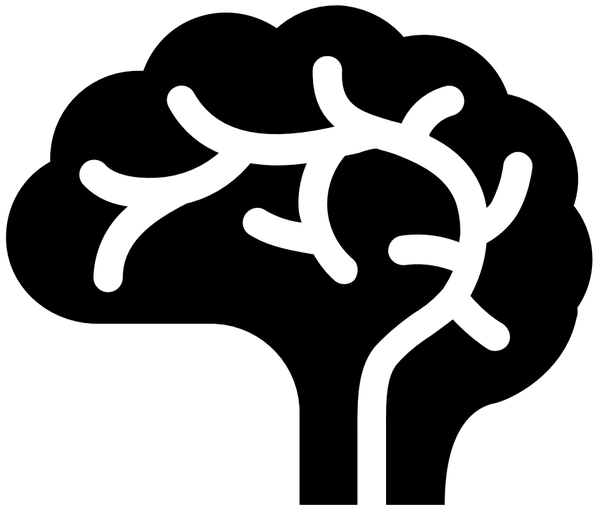


Policy conclusions:

More soft measures
Nudging
Attitudinal campaigns
Pull
Carrots

Biased to soft measure thinking

Critical Perspectives

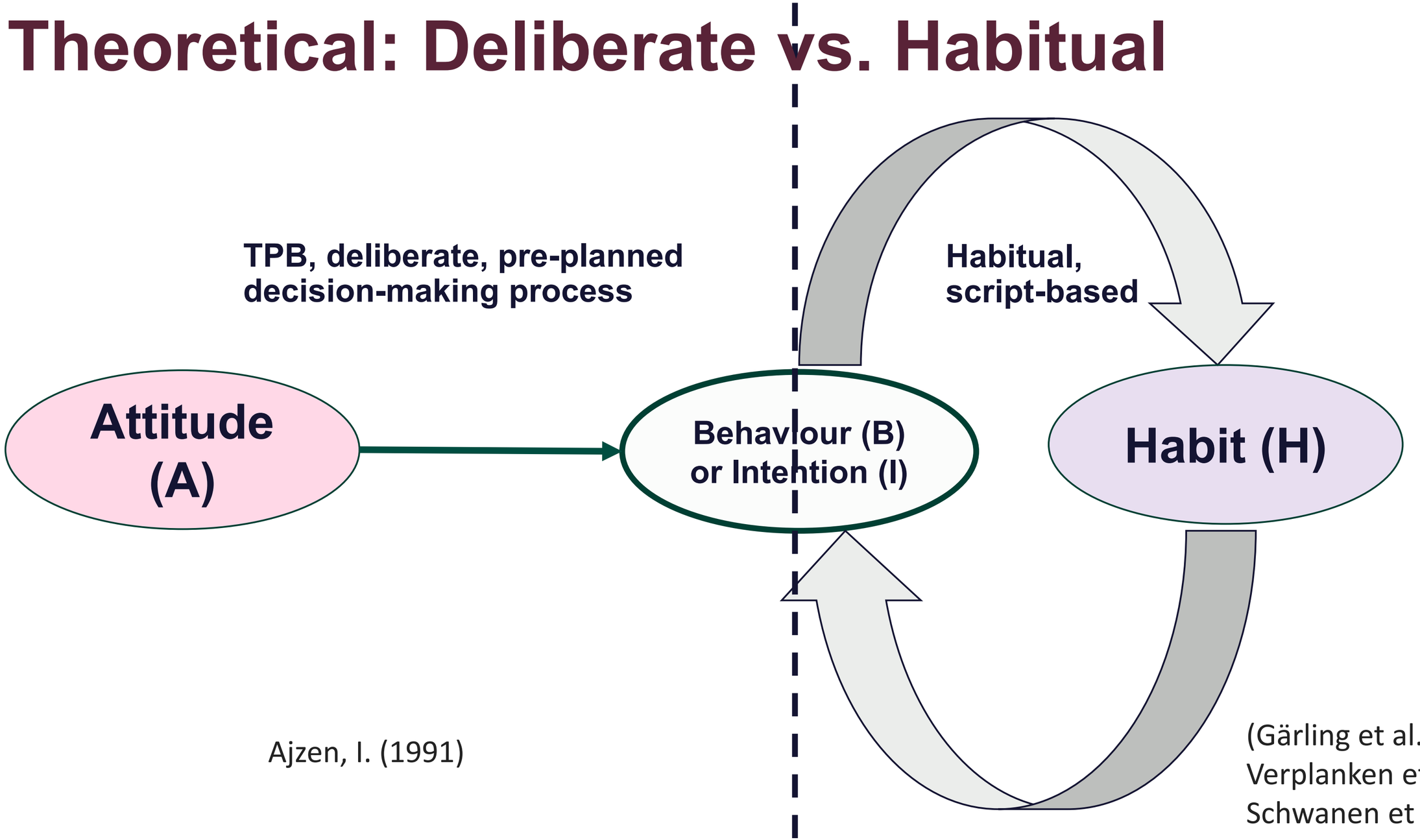


But a few studies criticize the directionality of A-B relationship:

Theoretically (e.g., Chorus & Kroesen, 2014; De Vos, 2022) or

When examined Longitudinally (Kroesen et al., 2017; Mehdizadeh & Anable, 2026; Mehdizadeh & Kroesen, 2025; Thøgersen, 2006).

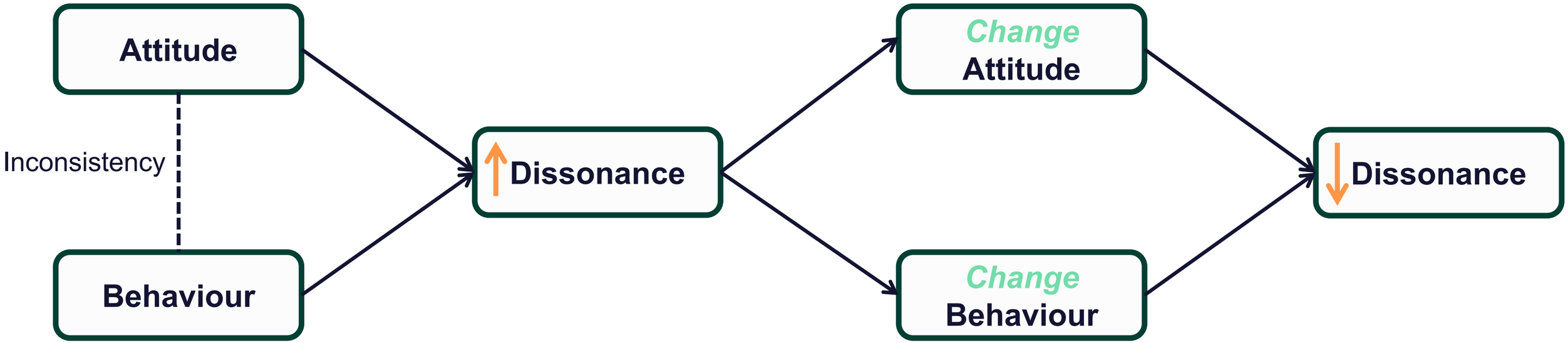
Theoretical: Deliberate vs. Habitual



Ajzen, I. (1991)

(Gärling et al., 2001; Verplanken et al., 1997; Schwanen et al., 2012)

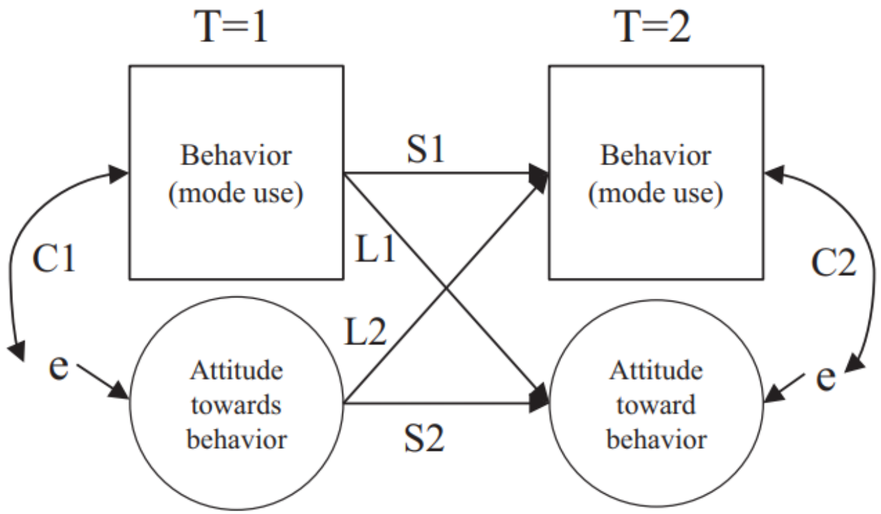
Theoretical: Theory of Cognitive dissonance



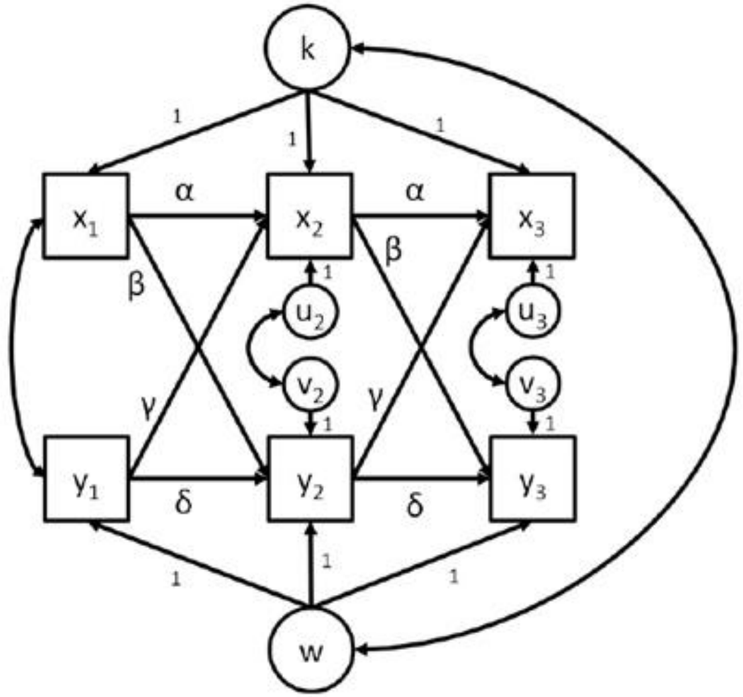
Festinger (1957)

De Vos, 2018; De Vos et al., 2022; De Vos & Singleton, 2020

Longitudinally: Panel data and models

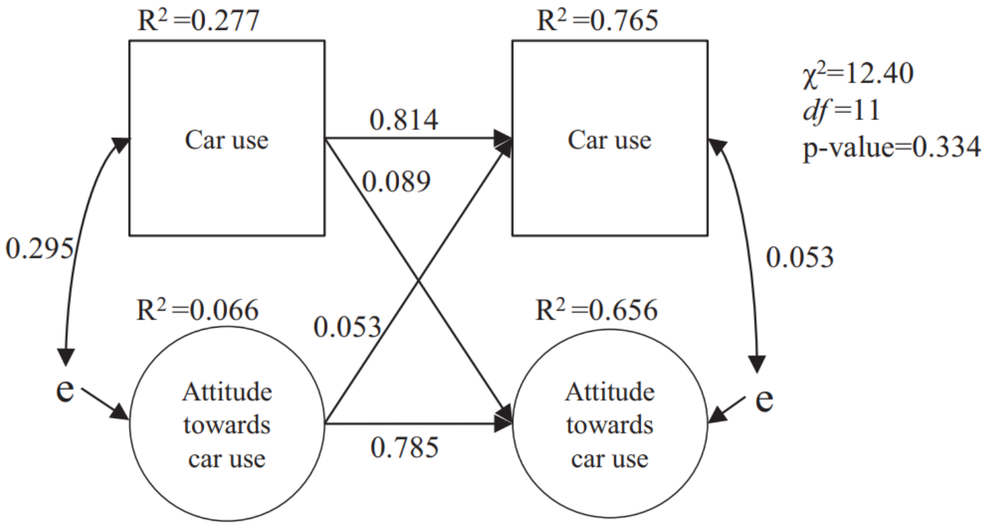


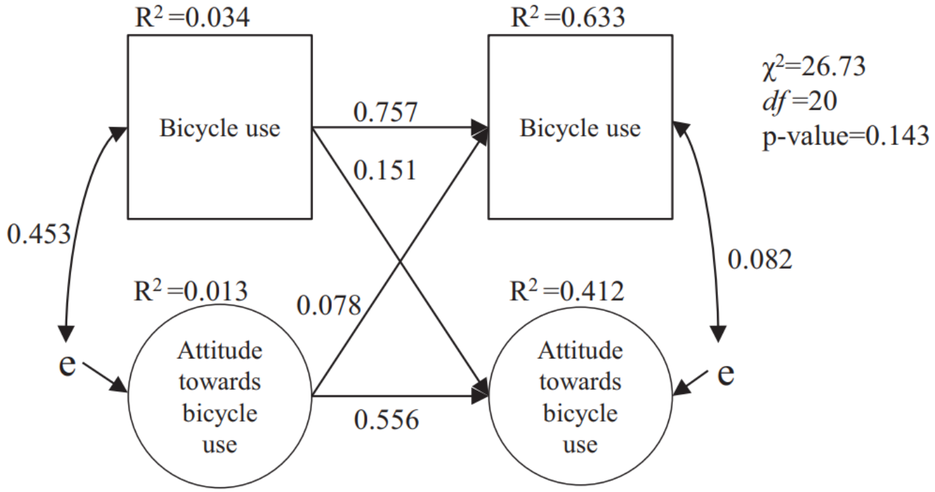
Latent variable
Observed variable
e Error term
C Correlation
S Stability relationship
L (cross-)lagged relationship

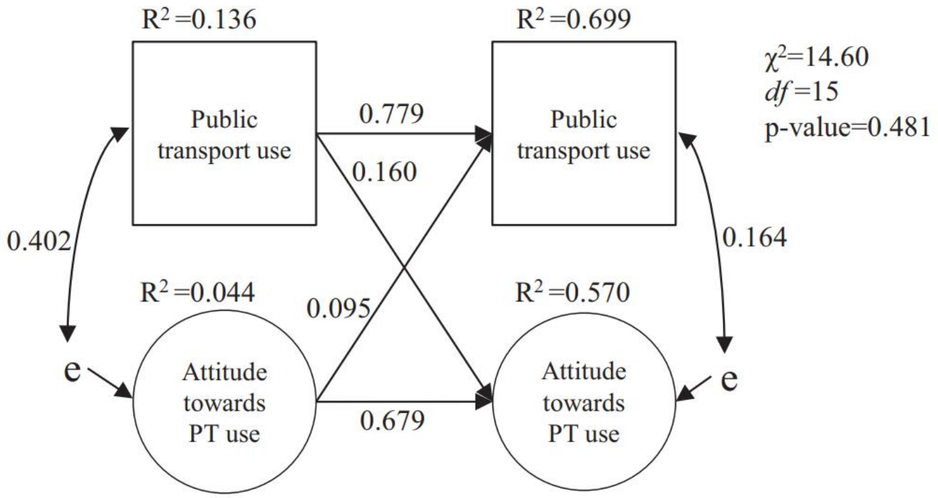


1. …to separate within and between-person effects
2. …control for time-constant variables
3. …reveal lagged / bidirectional effects
4. …study changes in discrete states
5. …?

Using Netherlands Mobility Panel data, n = 1376

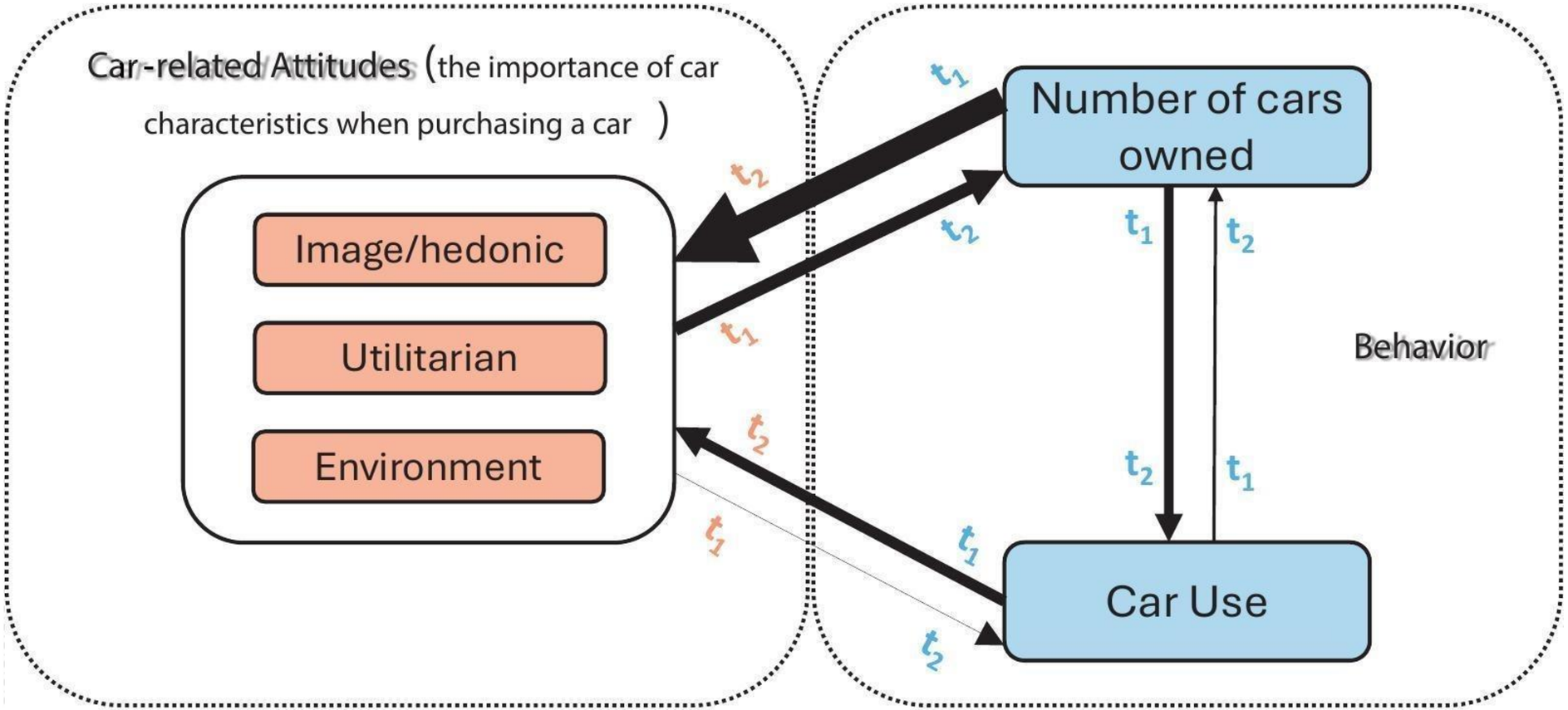






Kroesen et al., 2017

Using UKHLS Panel data, n = 17,000+



Directional effects between car-related attitudes and car consumption
(arrow thickness scaled by absolute standardized effects)

Mehdizadeh and Anable, 2026

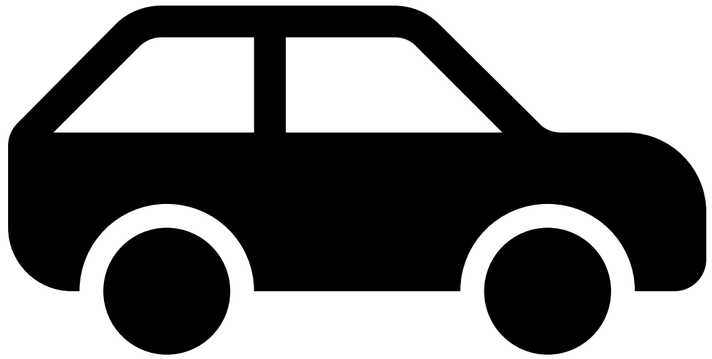
Our (conceptual/meta-analysis) review study

Review: A-B in car use/own

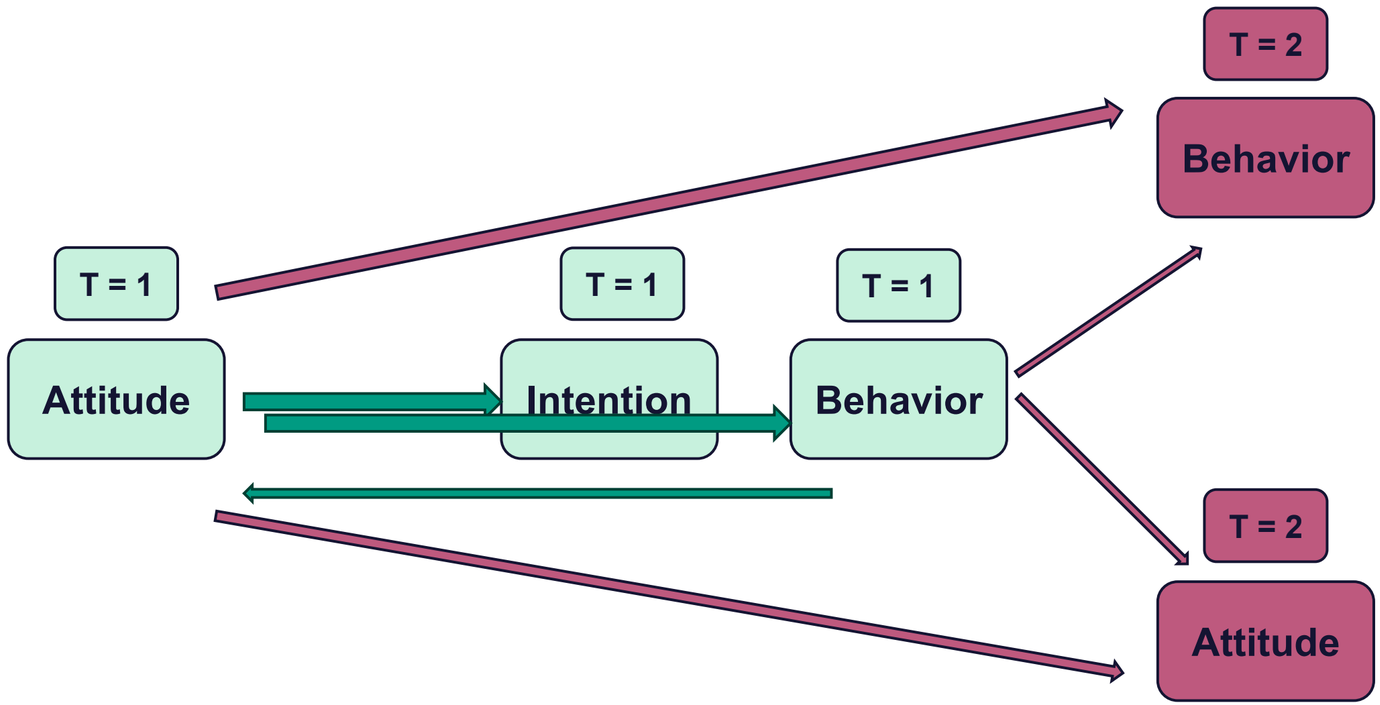
1. focus on car use or own studies. why?
2. trade-offs between carrots vs. sticks in car consumption reductions
3. for pt/cycling/walking, we need more provisions/encourage.

Credit: unknown (let me know if you know it)

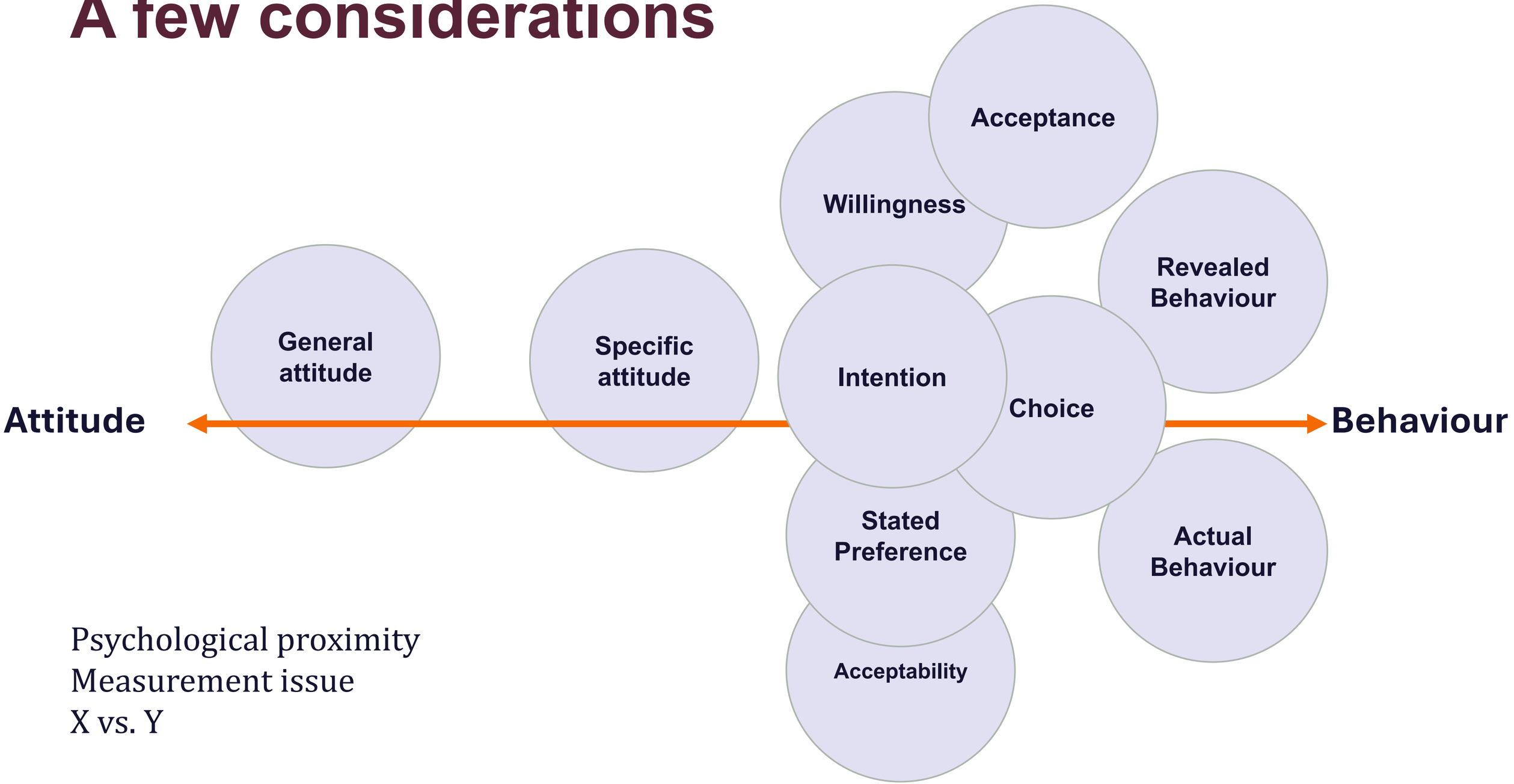
Image from https://medium.com/



Main research question



A few considerations



Psychological proximity
Measurement issue
X vs. Y

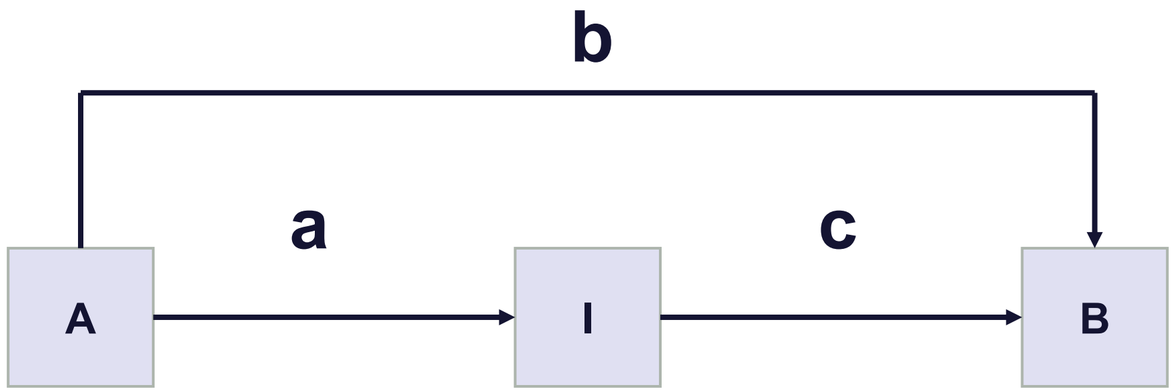
How do you measure attitude?

Image from wigs101.com

Your expectations? Effect sizes?

A1: I think, climate change is happening.
A2: Traffic fumes are the major contributor to the environmental problems
A3: Cars are convenient
A4: I like to drive a car
A5: My car allows me to travel faster

I: I plan to continue using my car.
B: Revealed driving frequency or mileage
Or car as a choice among alternatives.



Let’s move to the Methodology

Review Method

(1) A recent review paper in Transport Reviews:

TRANSPORT REVIEWS
2024, VOL. 44, NO. 3, 591–611
https://doi.org/10.1080/01441647.2023.2278445

Routledge
Taylor & Francis Group

OPEN ACCESS Check for updates

The role of personal motives in determining car ownership and use: a literature review

Jaime Soza-Parra [a,b] and Oded Cats [b]

[a]Department of Human Geography and Spatial Planning, Utrecht University, Utrecht, Netherlands;
[b]Transportation & Planning Department, Delft University of Technology, Delft, The Netherlands

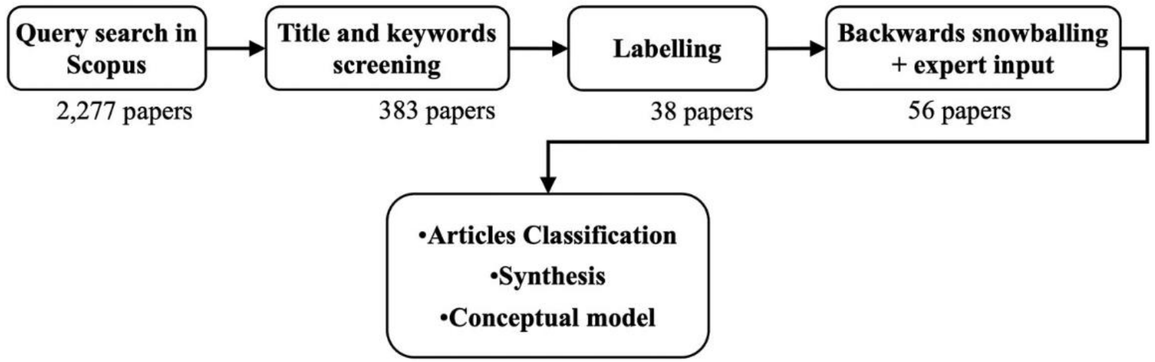
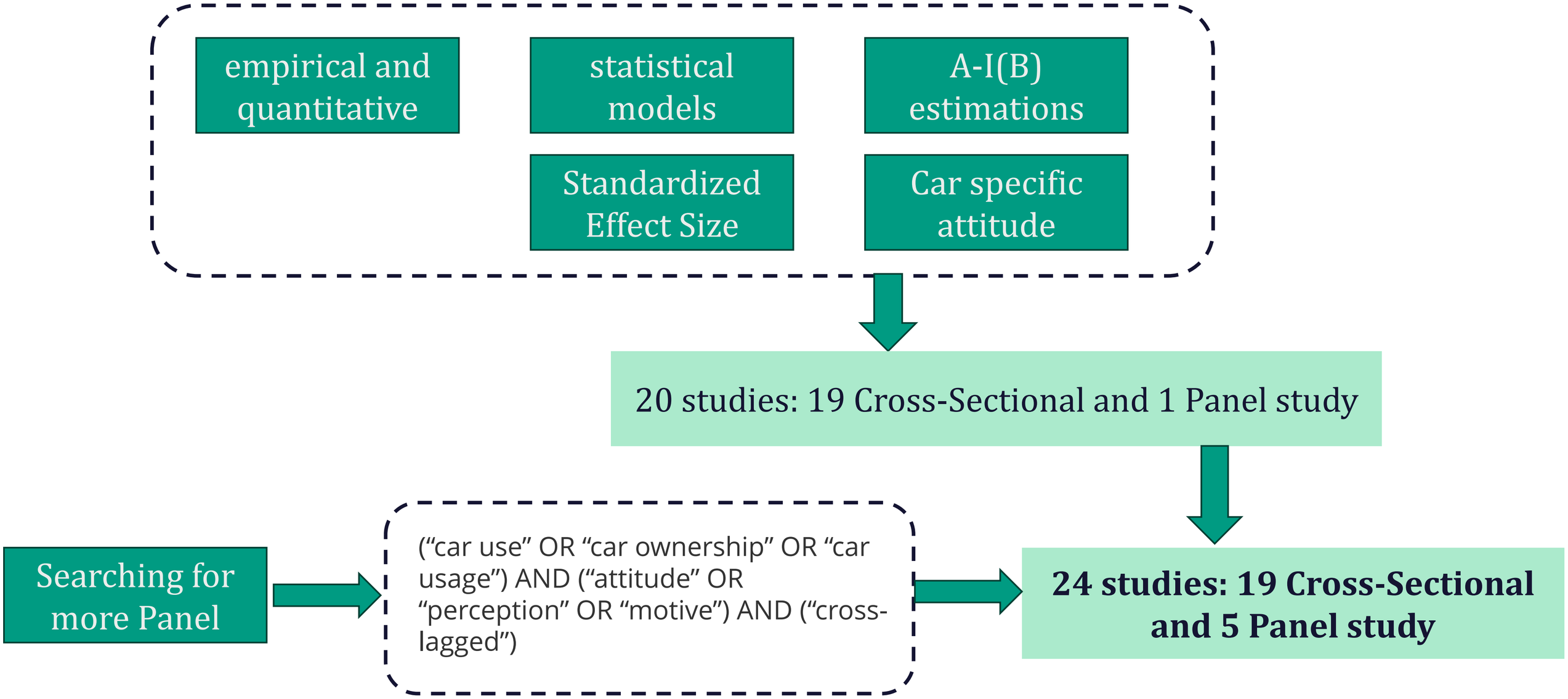
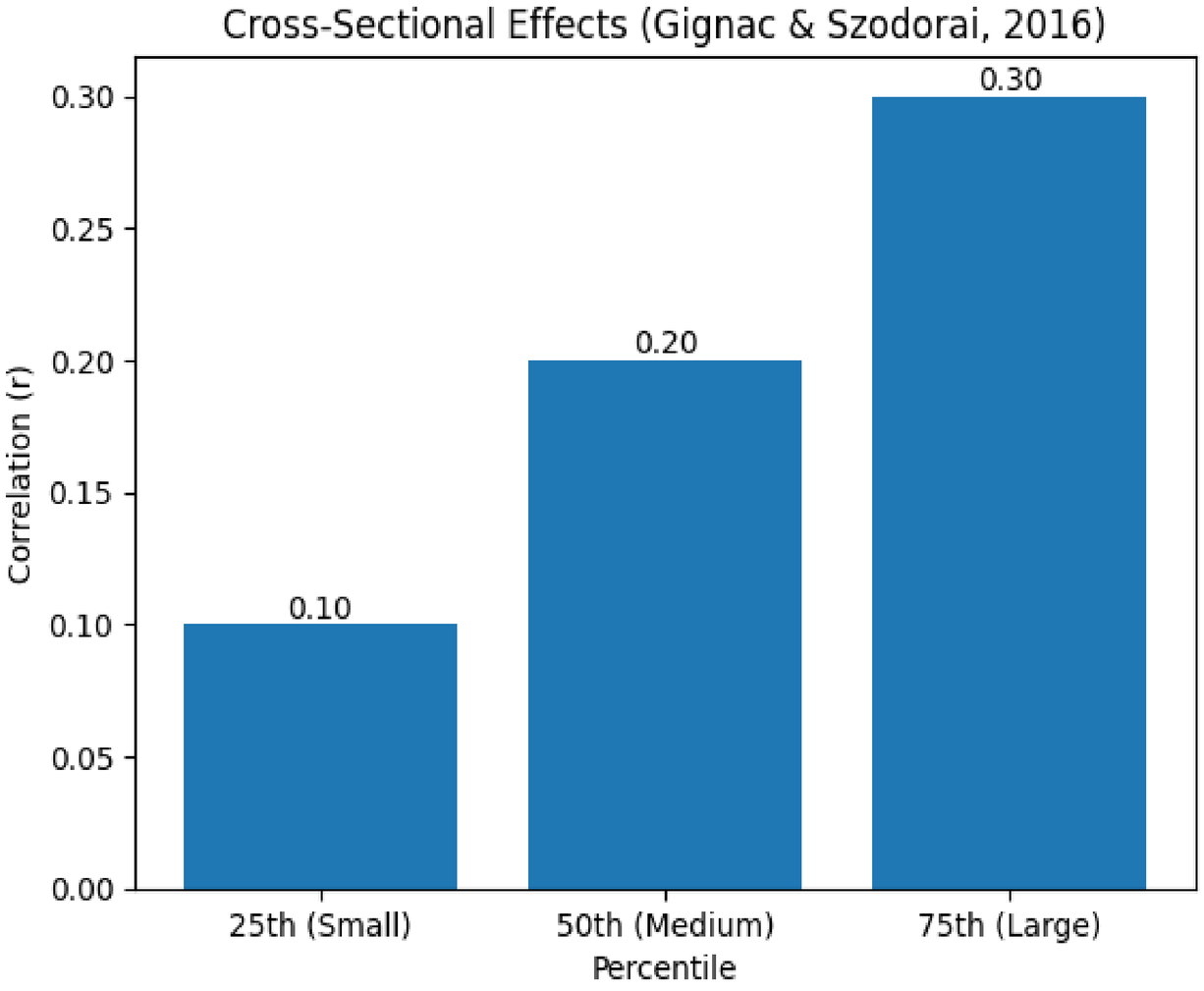


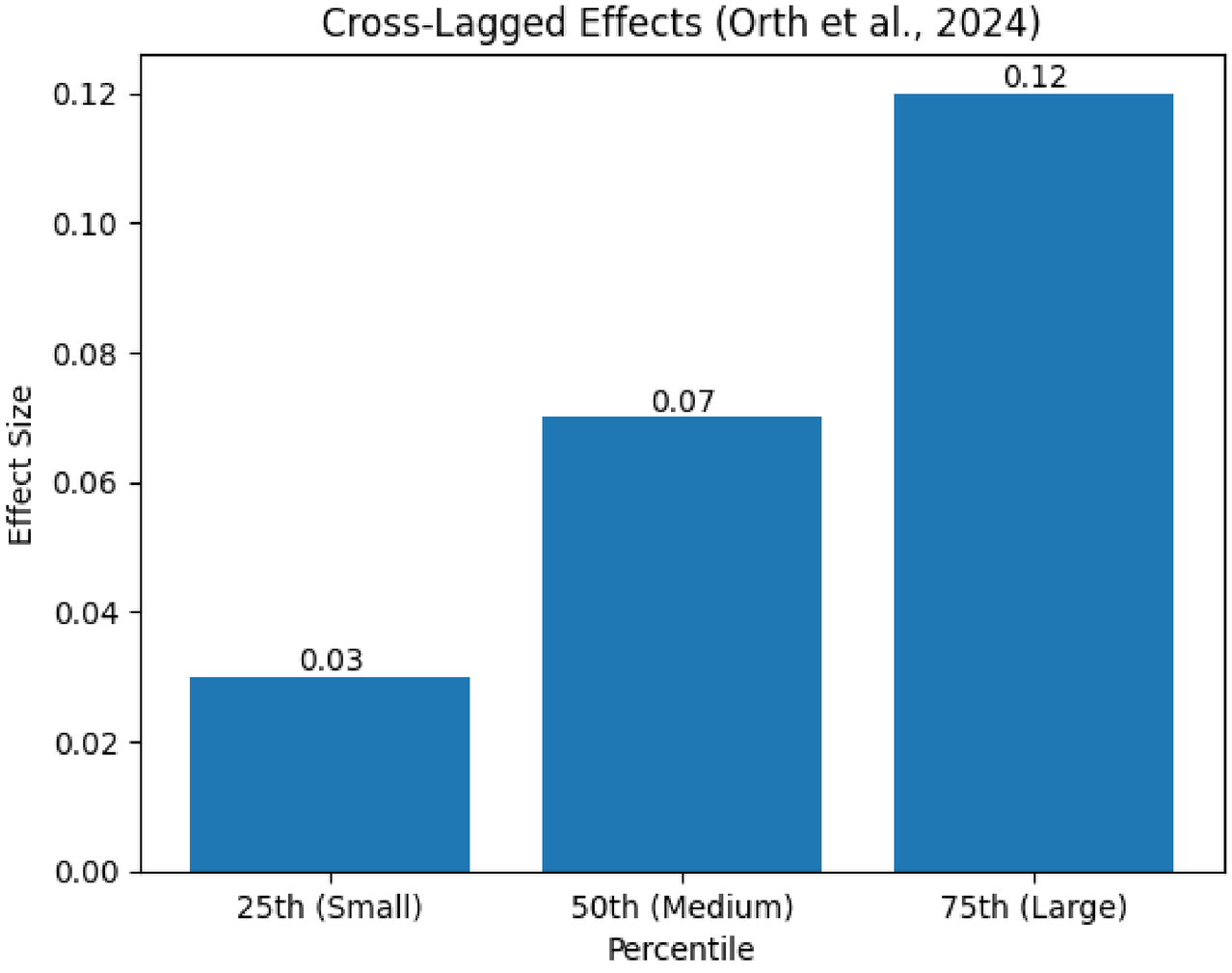
Figure 1. Literature review research method summarised.

Review Method



Analysis


Cross-Sectional Effects (Gignac & Szodorai, 2016)
Correlation (r)
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.10
0.20
0.30
25th (Small)
50th (Medium)
75th (Large)
Percentile


Cross-Lagged Effects (Orth et al., 2024)
Effect Size
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.03
0.07
0.12
25th (Small)
50th (Medium)
75th (Large)
Percentile

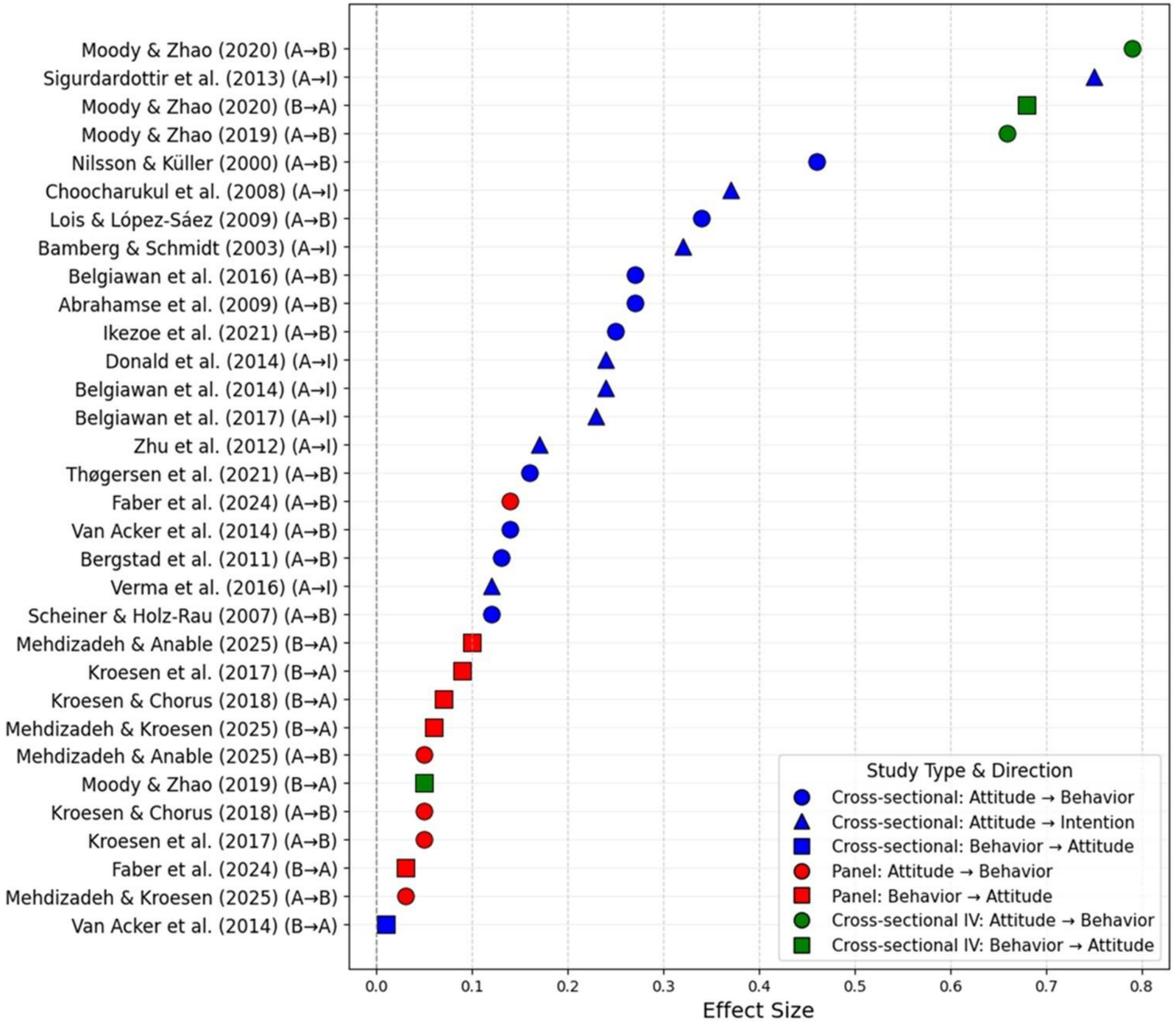
RESULTS

Results

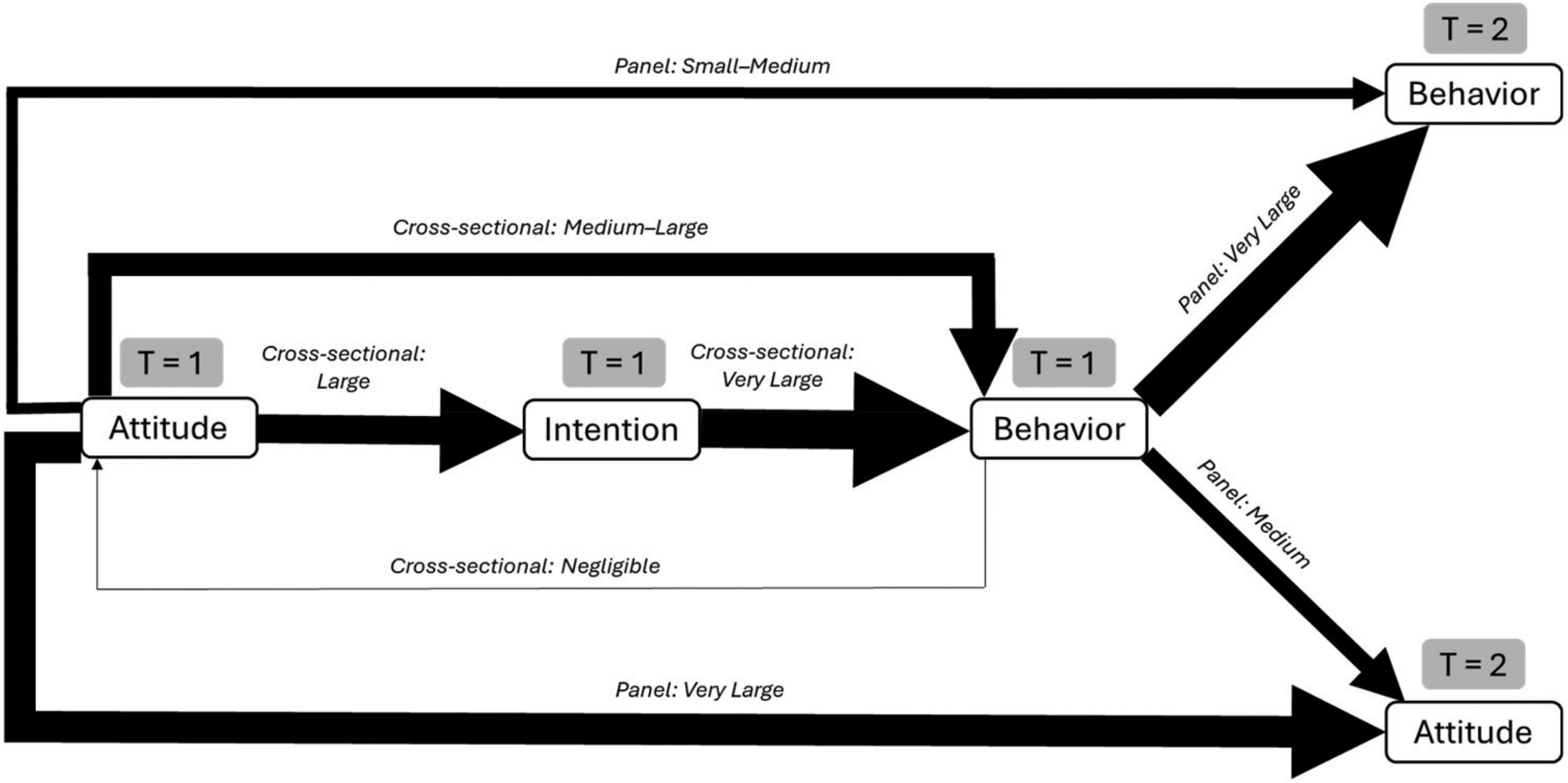
Table 1. Detailed information about the selected studies.

Id	Authors	Year	Type of design	Study focus	Attitude ⇨ Behavior	Attitude ⇨ Intention	Behavior ⇨ Attitude	Intention ⇨ Behavior	Attitude ⇨ Attitude	Behavior ⇨ Behavior	Nature of outcome
1	Nilsson & Küller	2000	Cross-sectional	Car use	0.46	n.a	n.a	n.a	n.a	n.a	Behavior
2	Bamberg & Schmidt	2003	Cross-sectional	Car use	n.a	0.32	n.a	0.60	n.a	n.a	Intention
3	Scheiner & Holz-Rau	2007	Cross-sectional	Car ownership and use	0.12	n.a	n.a	n.a	n.a	n.a	Behavior
4	Choocharukul et al.	2008	Cross-sectional	Car use	n.a	0.37	n.a	n.a	n.a	n.a	Intention
5	Abrahamse et al.	2009	Cross-sectional	Car use	0.27	n.a	n.a	n.a	n.a	n.a	Behavior
6	Lois & López-Sáez	2009	Cross-sectional	Car use	0.34	n.a	n.a	n.a	n.a	n.a	Behavior
7	Bergstad et al.	2011	Cross-sectional	Car use	0.13	n.a	n.a	n.a	n.a	n.a	Behavior
8	Zhu et al.	2012	Cross-sectional	Car ownership	n.a	0.17	n.a	n.a	n.a	n.a	Intention
9	Sigurdardottir et al.	2013	Cross-sectional	Car ownership	n.a	0.75	n.a	n.a	n.a	n.a	Intention
10	Belgiawan et al.	2014	Cross-sectional	Car ownership	n.a	0.24	n.a	n.a	n.a	n.a	Intention
11	Donald et al.	2014	Cross-sectional	Car use	n.a	0.24	n.a	0.75	n.a	n.a	Intention
12	Van Acker et al.	2014	Cross-sectional	Car ownership	0.14	n.a	0.01	n.a	n.a	n.a	Behavior
13	Belgiawan et al.	2016	Cross-sectional	Car ownership	0.27	n.a	n.a	n.a	n.a	n.a	Behavior
14	Verma et al.	2016	Cross-sectional	Car ownership	n.a	0.12	n.a	n.a	n.a	n.a	Intention
15	Belgiawan et al.	2017	Cross-sectional	Car ownership	n.a	0.23	n.a	n.a	n.a	n.a	Intention
16	Kroesen et al.	2017	Panel	Car use	0.05	n.a	0.09	n.a	0.78	0.81	Behavior
17	Kroesen & Chorus	2018	Panel	Car use	0.05	n.a	0.07	n.a	0.64	0.76	Behavior
18	Moody & Zhao	2019	Cross-sectional with IV	Car ownership	0.66	n.a	0.05	n.a	n.a	n.a	Behavior
19	Moody & Zhao	2020	Cross-sectional with IV	Car ownership and use	0.79	n.a	0.68	n.a	n.a	n.a	Behavior
20	Ikezoe et al.	2021	Cross-sectional	Car ownership	0.25	n.a	n.a	n.a	n.a	n.a	Behavior
21	Thøgersen et al.	2021	Cross-sectional	Car ownership and use	0.16	n.a	n.a	n.a	n.a	n.a	Behavior
22	Faber et al	2024	Panel	Car use	0.14	n.a	0.03	n.a	0.28	0.59	Behavior
23	Mehdizadeh and Kroesen	2025	Panel	Car use	0.03	n.a	0.06	n.a	0.34	0.65	Behavior
24	Mehdizadeh & Anable	2025	Panel	Car ownership and use	0.05	n.a	0.1	n.a	0.40	0.47	Behavior

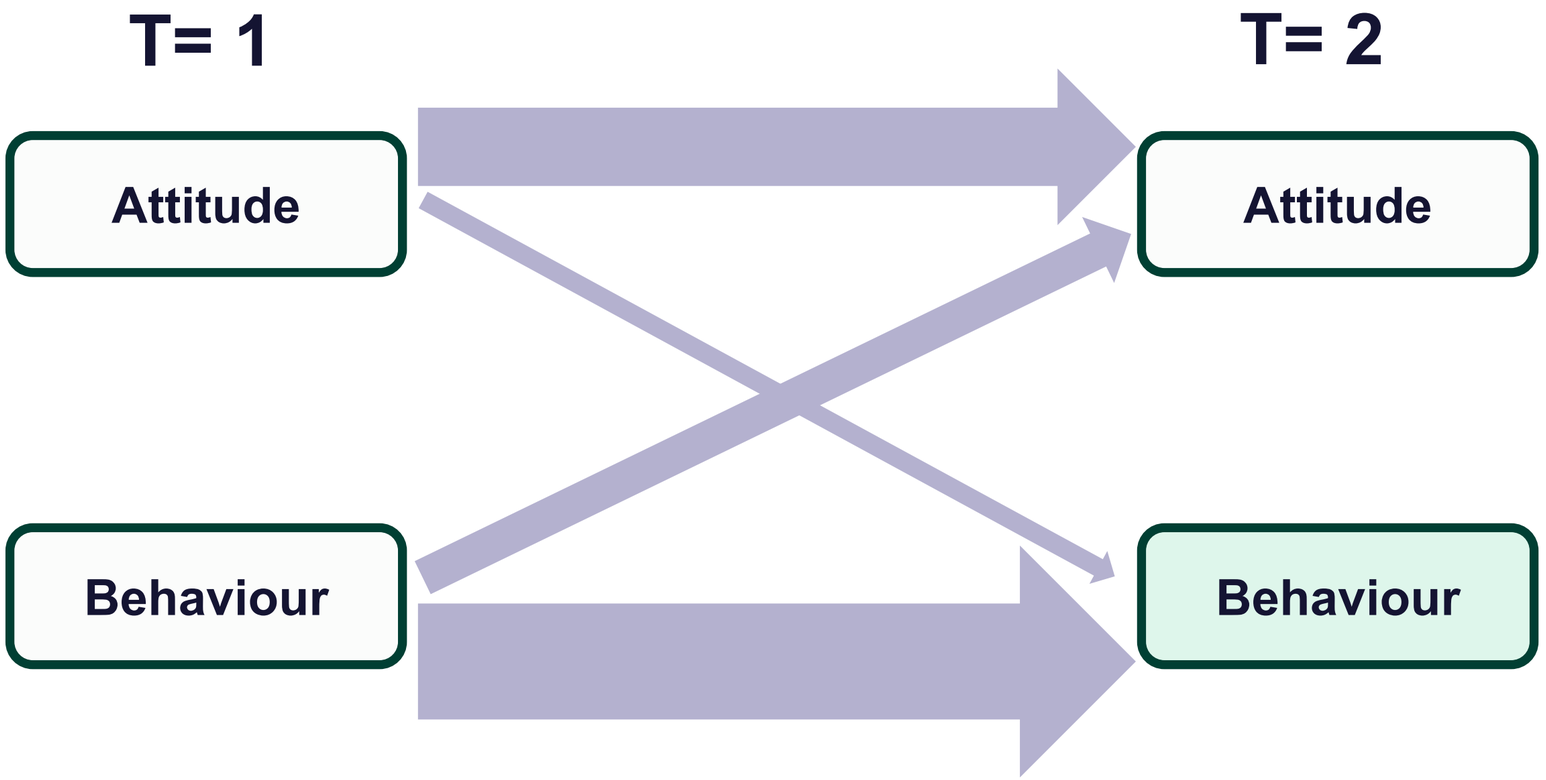
General Insights



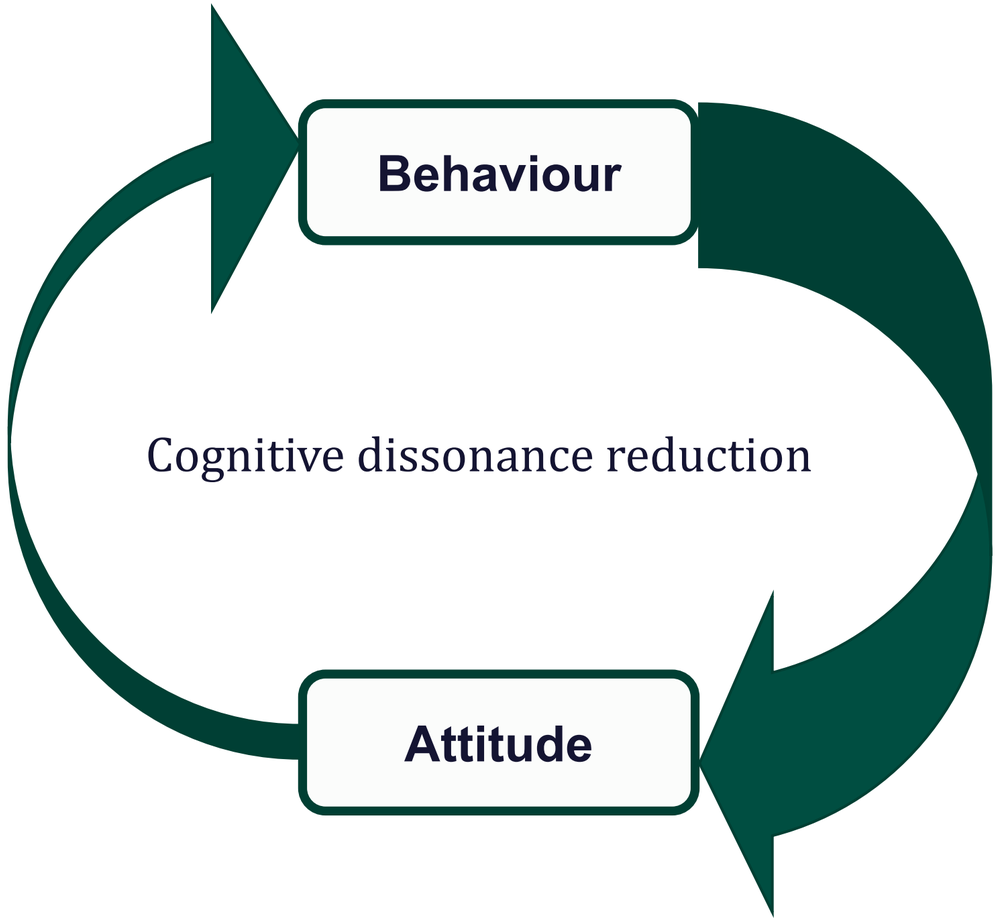
More detailed insights

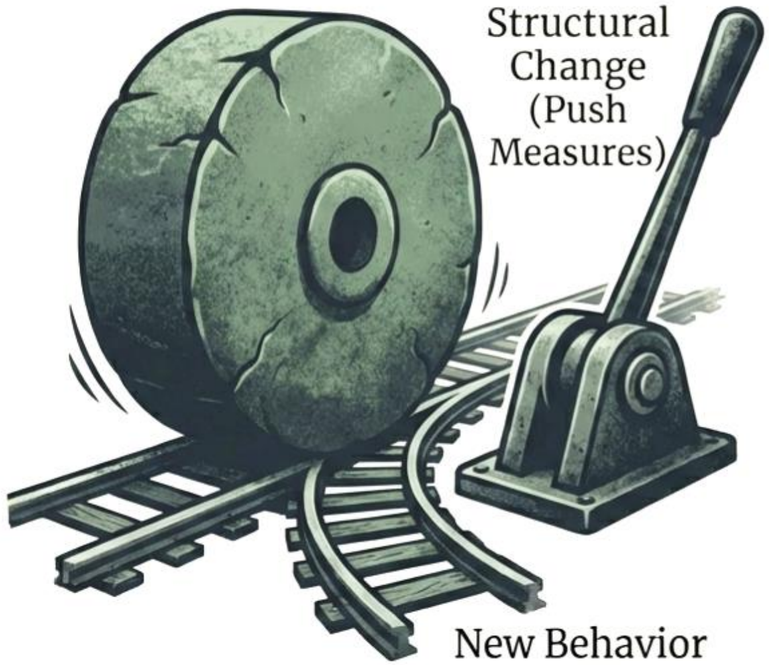


More detailed insights



We justify what we do





The arrow goes both ways. If I drive every day, I develop an attitude that justifies driving to reduce psychological conflict.

The London 2012 Olympic

To reduce pressure on the transport system during the Games, Transport for London encouraged commuters to **reduce**, **re-time**, **re-route**, or **re-mode** their travel (Parkes et al., 2016).

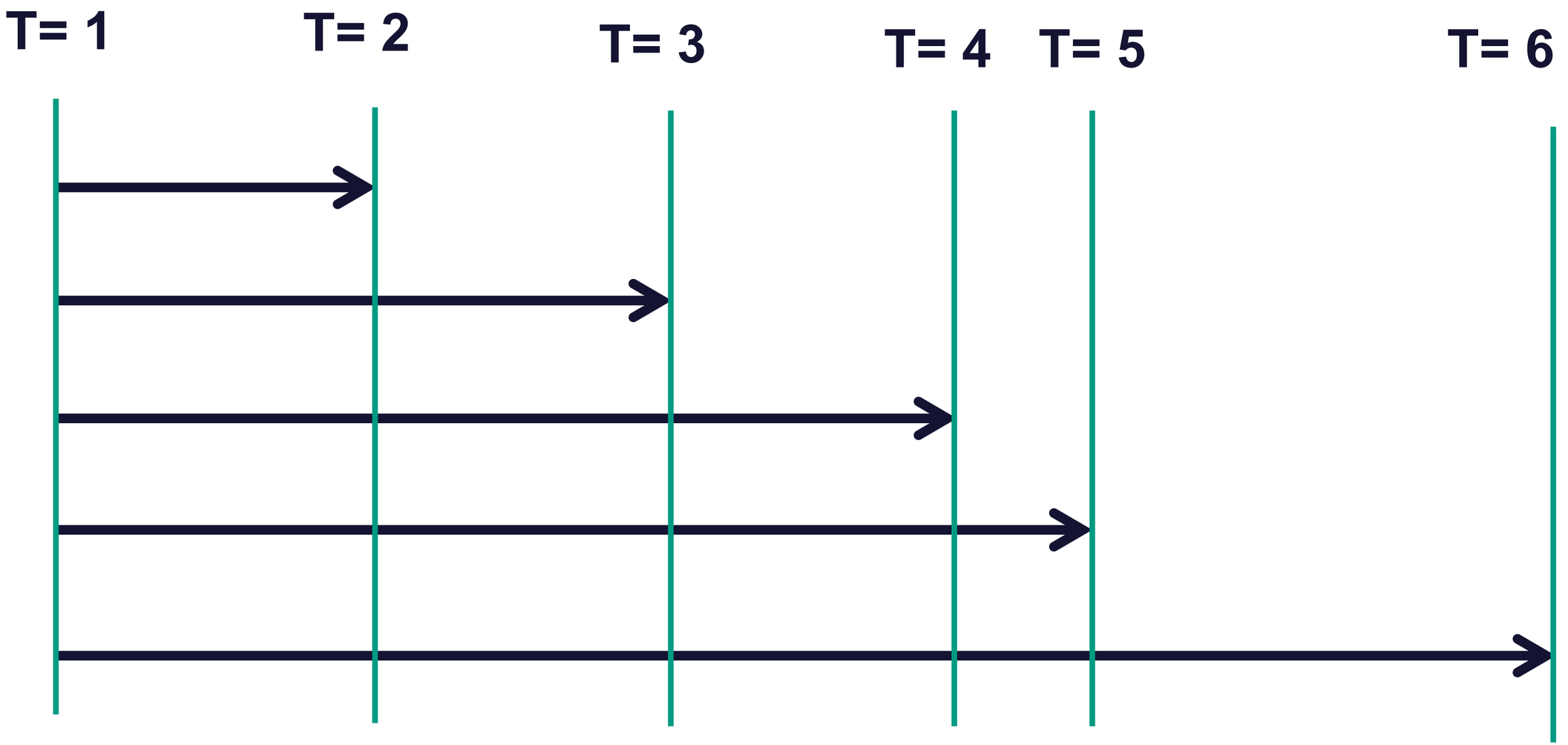
54% made at least one change during the event, but only **6%** continued those changes afterward.

Many who had no prior **intention** to change still *modified* their **behaviour** temporarily.

This suggests that **external disruptions** can prompt *short-term change* even without **internal motivation**.

Future Research

Time sensitivity of A→B or B→A relationships



Travel mode choice cycle

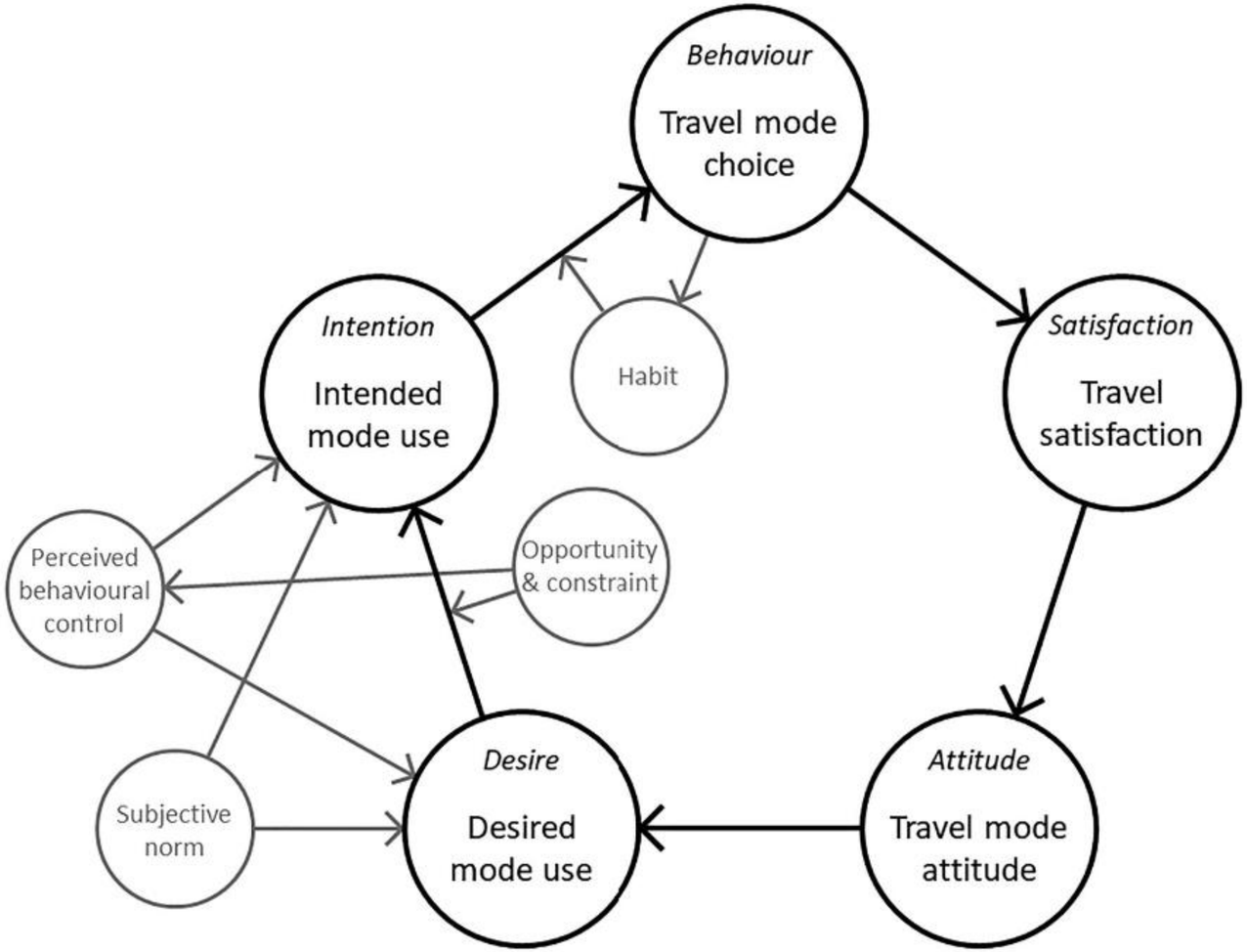
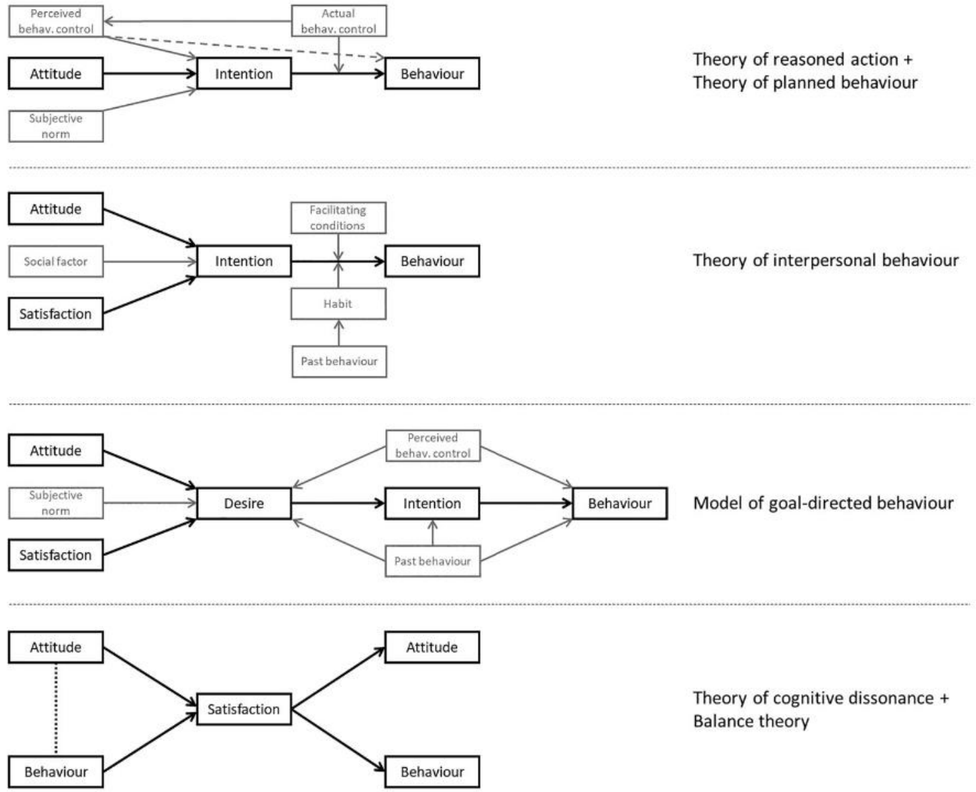


Figure 2. The travel mode choice cycle, linking attitude, desire, intention, behaviour, and satisfaction (other constructs influencing the primary constructs are shown in grey).



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Cross-lagged Panel Choice Models? CLPCM?