



Exploring Deep Savings:

A Toolkit for Assessing Behavior-Based Energy Interventions

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Is Feedback Effective?

- 100+ studies conducted since 1976
- Total $n = 256,536$ (mean 119/study)
- Mean r -effect size = $.1174$ ($p < .001$)
- Average energy savings: 9%

Significant variability in effects
(from **negative** effects to **over 20%** savings)



Is Feedback Effective?

It depends...

Moderators identified in meta-analysis

- Study population (**WHO?**)
- Study duration (**HOW LONG?**)
- Frequency of feedback (**HOW OFTEN?**)
- Feedback medium (**WHAT TYPE?**)
- Disaggregation (**WHAT LEVEL?**)
- Comparison (**WHAT MESSAGE?**)

Karlin, Ford & Zinger. (In Press). The Effects of Feedback on Energy Conservation: A Preliminary Theory and Meta-Analysis. *Psychological Bulletin*.



Methodological Limitations

1. Not naturalistic

- Participants generally recruited to participate
- May be different from “active adopters”

2. Not comparative

- Most studies tests one type of feedback (vs. control)
- Very few studies isolating or combining variables

3. Not testing mediation

- DV is energy use, but studies rarely test possible mediators to explain effectiveness



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If you build it,



Will they come?

Does it work?

Program x



Outcome
y

Does program x lead to outcome y?



Questions remain...

Program x

What is going on here?



Outcome
y

What is the program?

How do we measure outcomes?

Does program x lead to outcome y?



A theoretical approach

Program x

Clearly defined and
operationalized

Hypothesis / Theory



Outcome
y

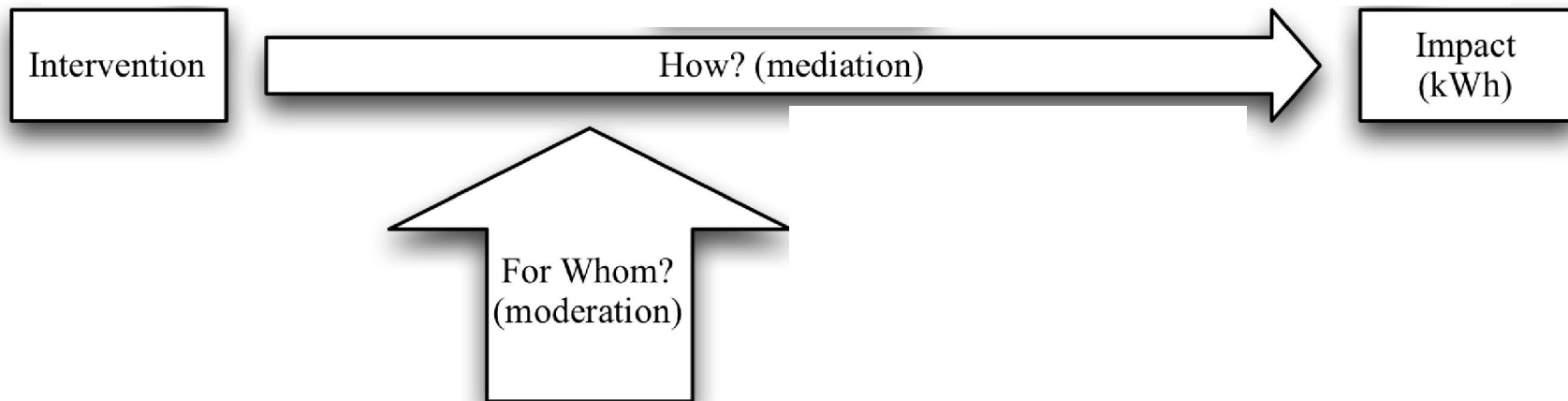
Metrics tested for
reliability & validity

~~Does program x lead to outcome y?~~

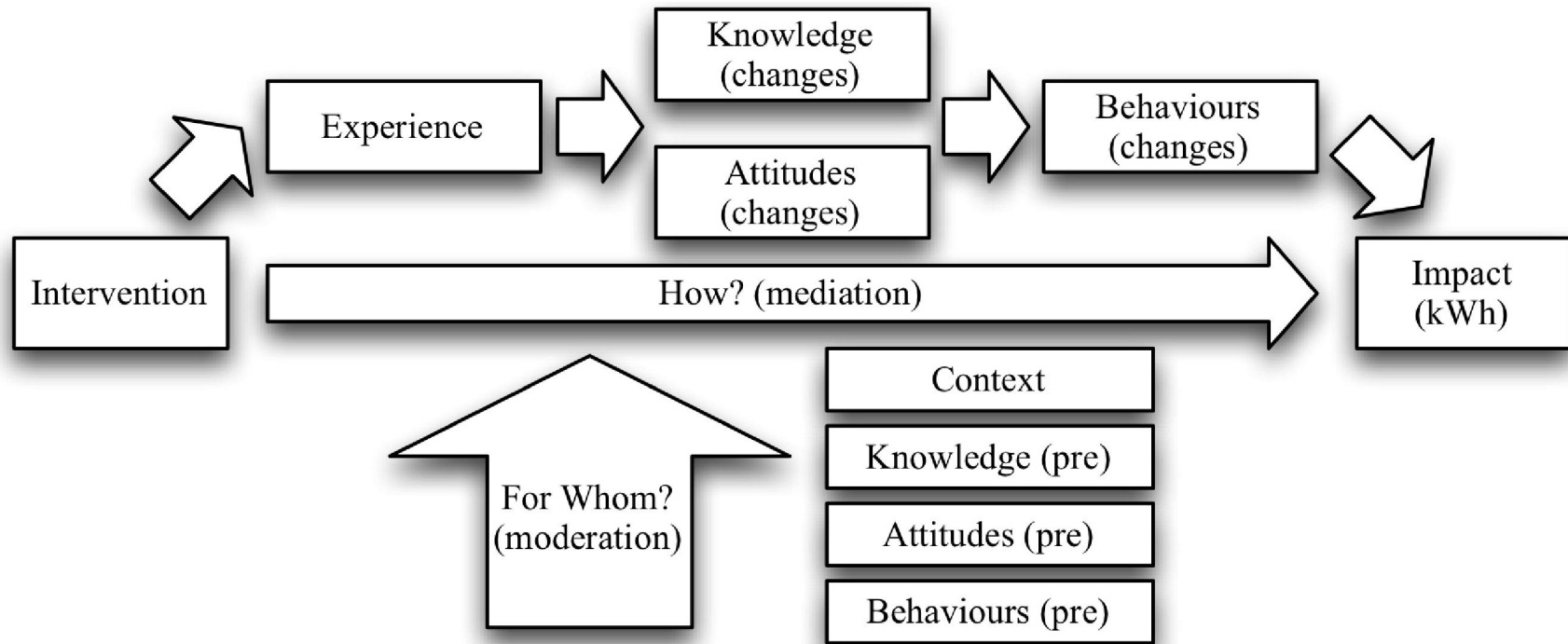
How and **for whom** does program x lead to outcome y?



How and For Whom?



How and for Whom?



Toolkits in other fields

Stanford Binet Intelligence Scale

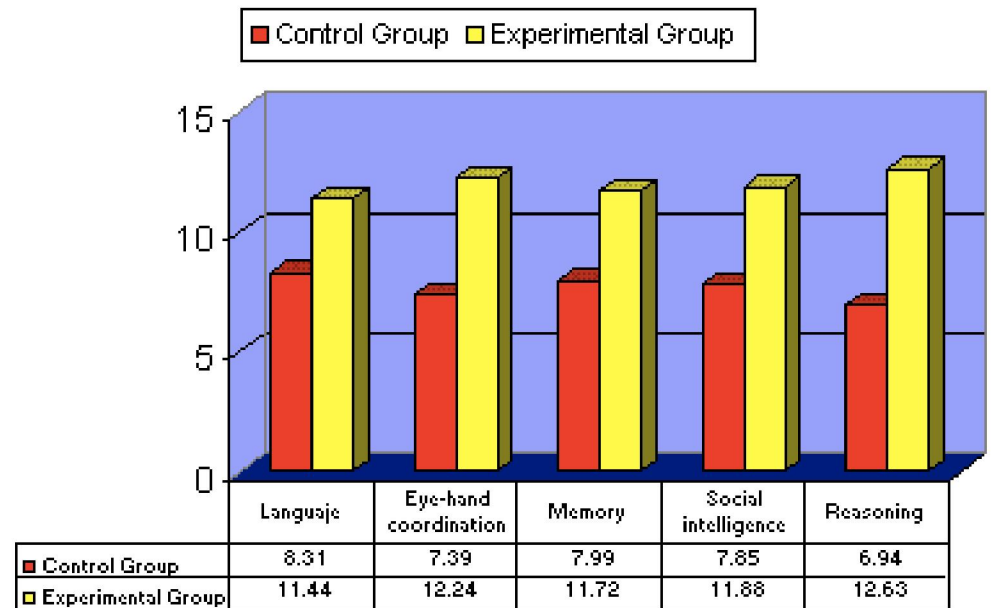
Genius	Over 140
Very Superior	120 - 139
Superior	110 - 119
Average	90 - 109
Dull	80 - 89
Borderline Deficiency	70 - 79
Moron	50 - 69
Imbecile	20 - 49
Idiot	Below 20



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Question Bias

How awesome is our blog content?

- ☐ Out of this world awesome
- ☐ Pretty awesome
- ☐ I enjoy it a lot
- ☐ I like it
- ☐ I don't like it



Question Bias

Closed Ended Question:

How much time do you spend studying?

A) 1- 8 hrs B) 9- 18 hrs C) > 18 hrs

Open Ended Question:

Tell me about your study habits....

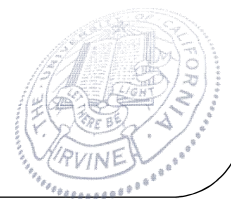


Question Bias

1	2	3	4	5
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or

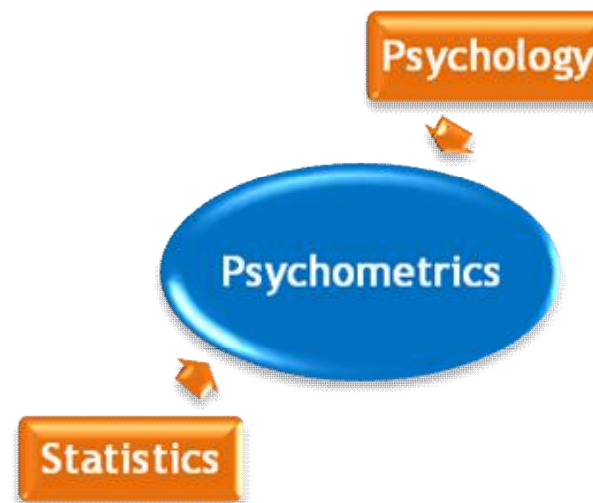
1	2	3	4	5	6	7
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Psychometrics

- Theory and technique of measurement: knowledge, abilities, attitudes, traits
- Construction and validation of instruments: questionnaires, tests, assessments

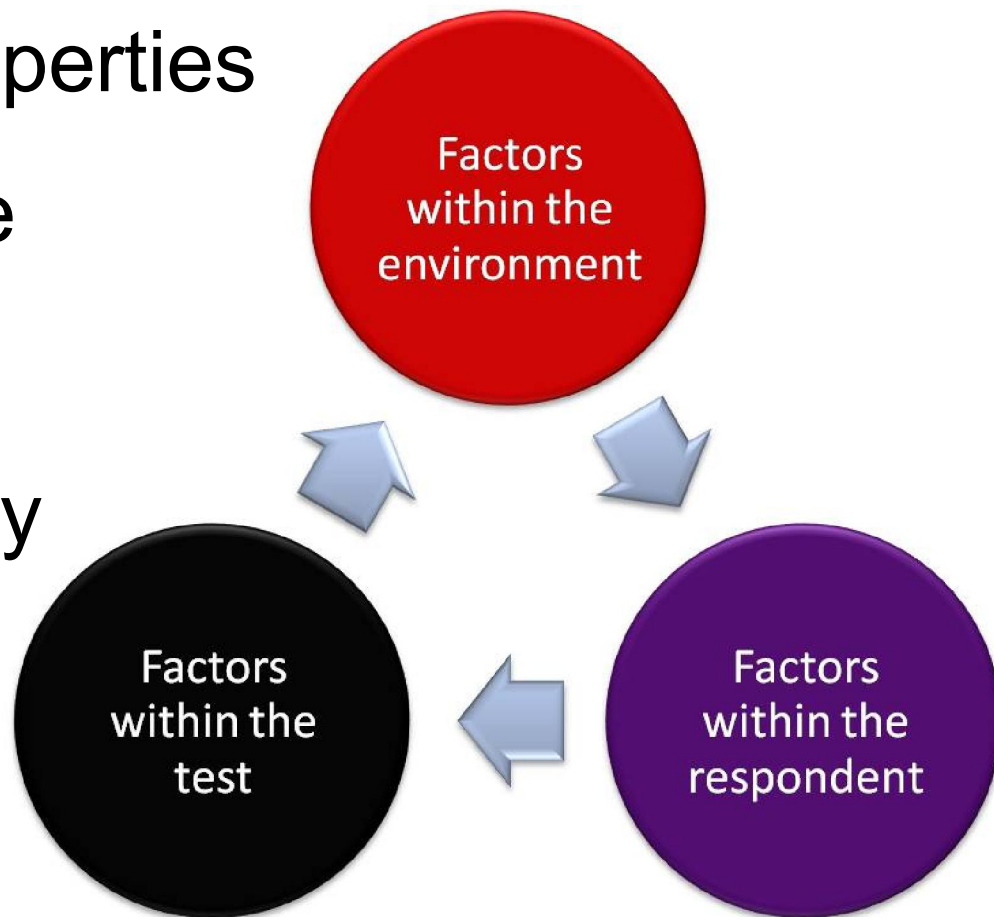
	Right Way	Wrong Way
Right Thing	X	
Wrong Thing		



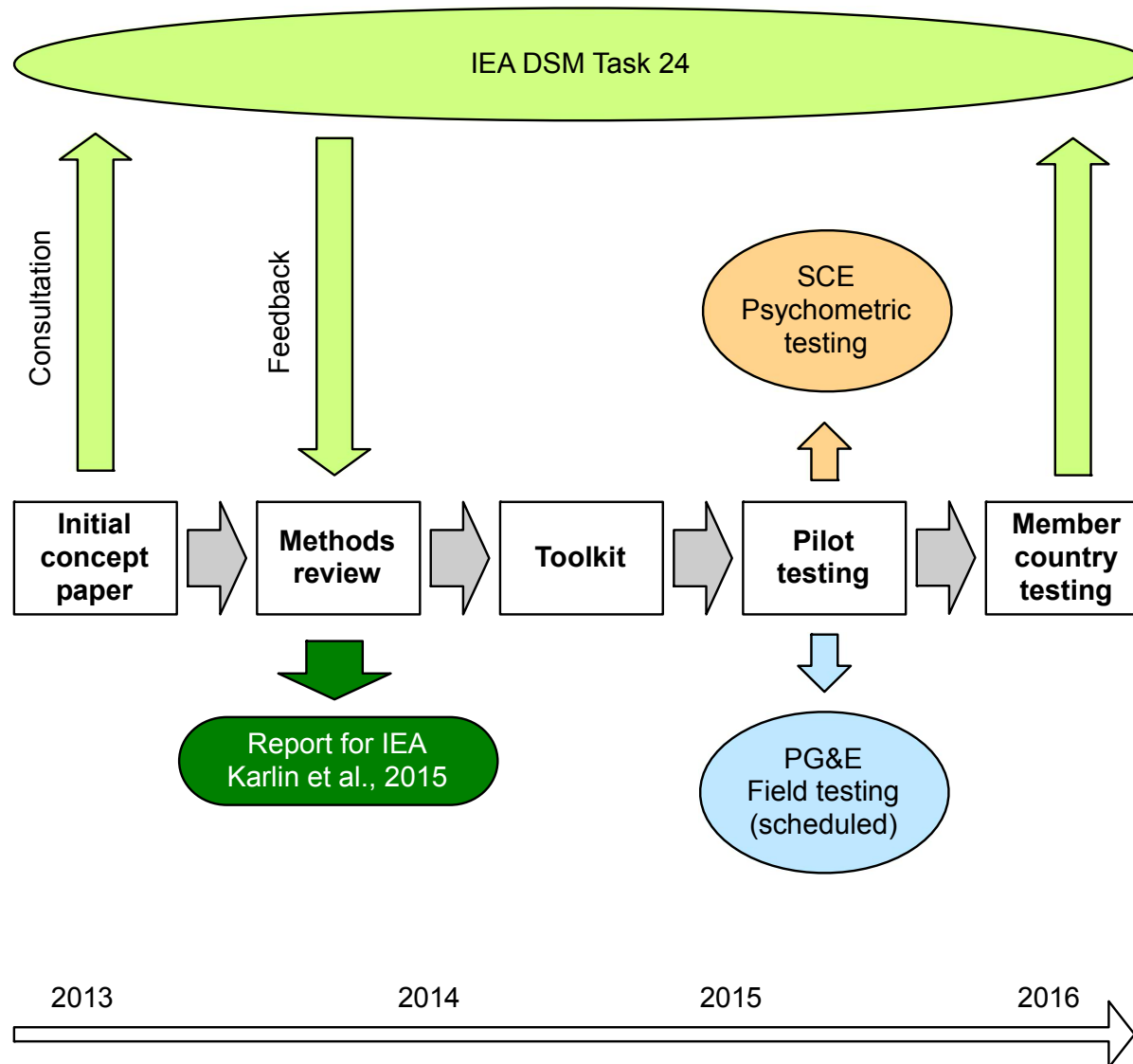
Psychometrics

Psychometric Properties

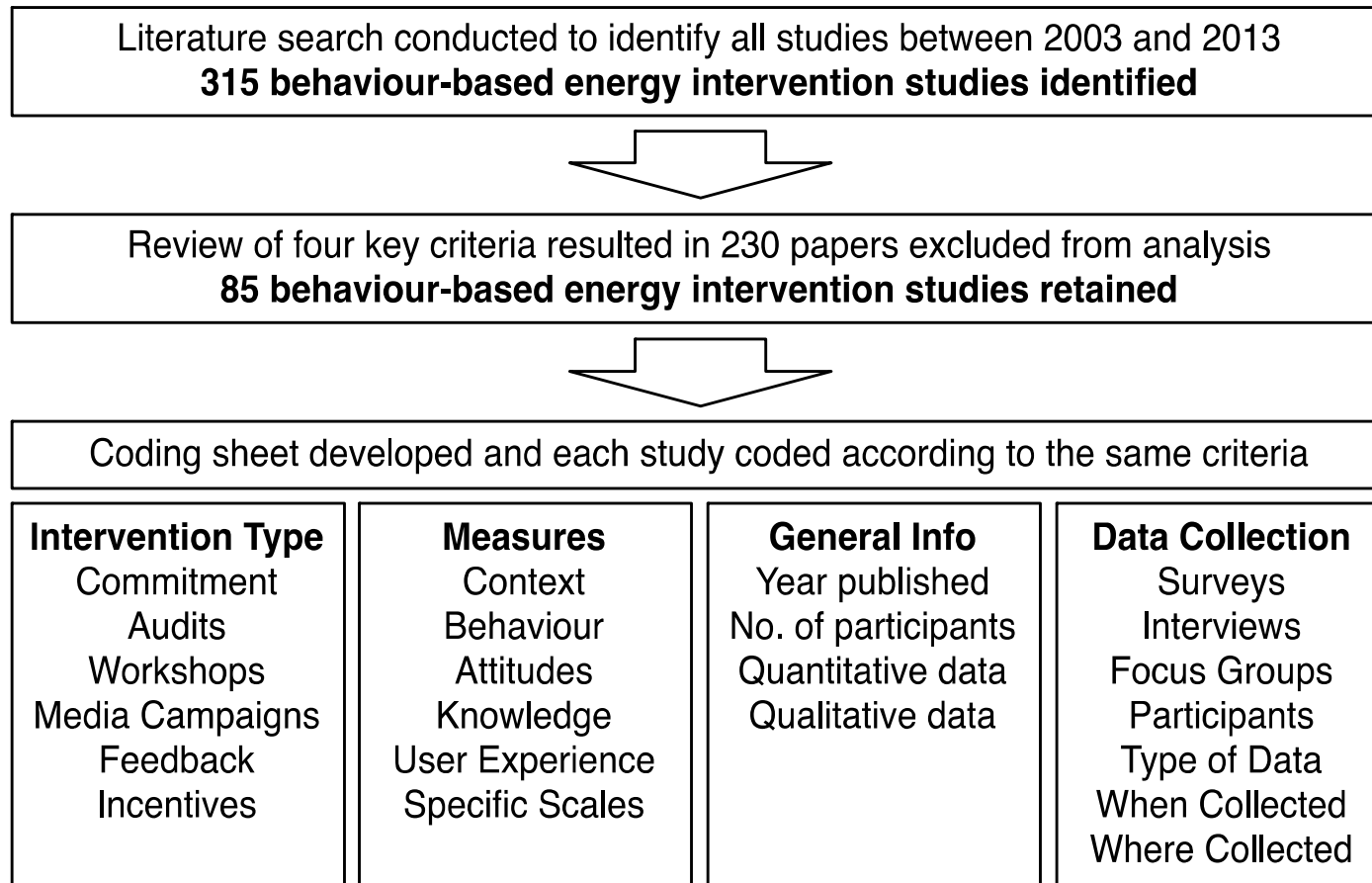
1. Factor Structure
2. Reliability
3. Criterion Validity
4. Sensitivity



Our Project

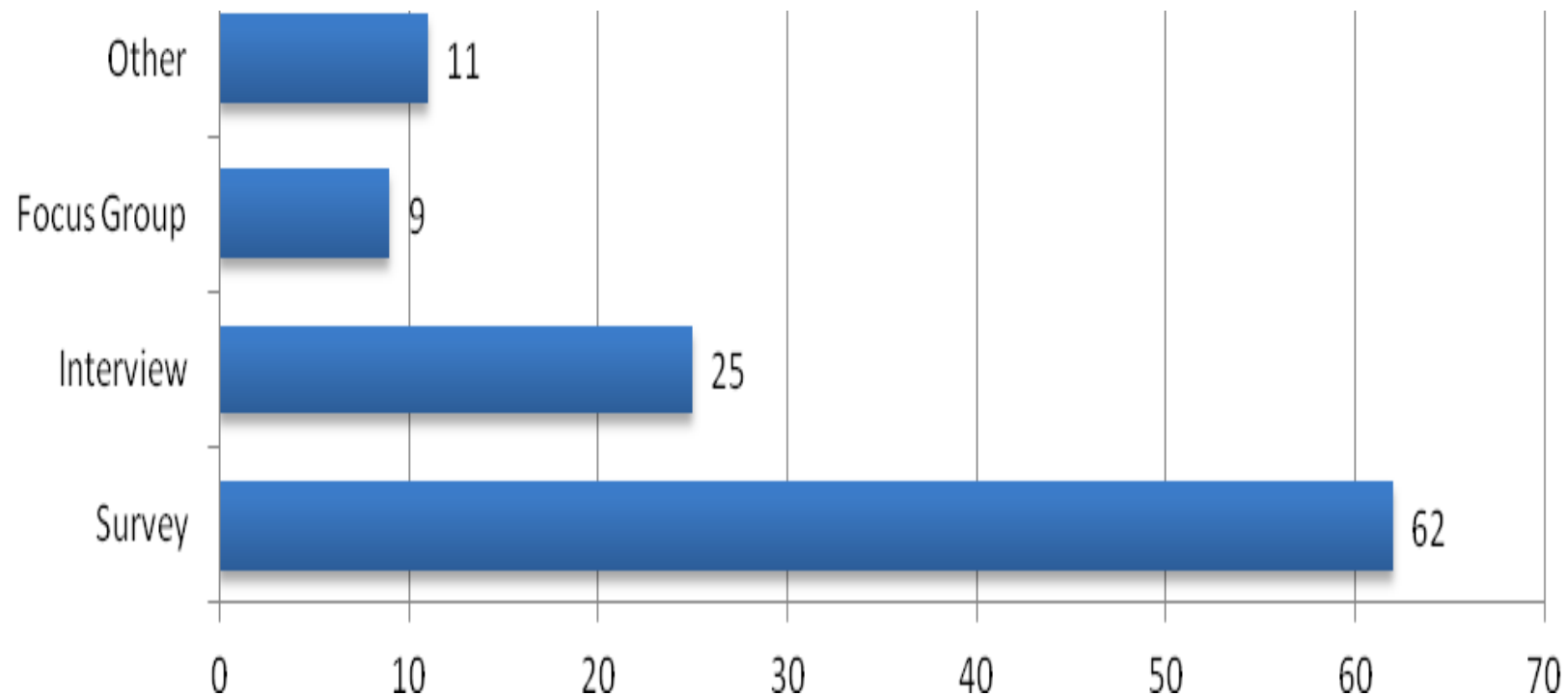


Methodological Review



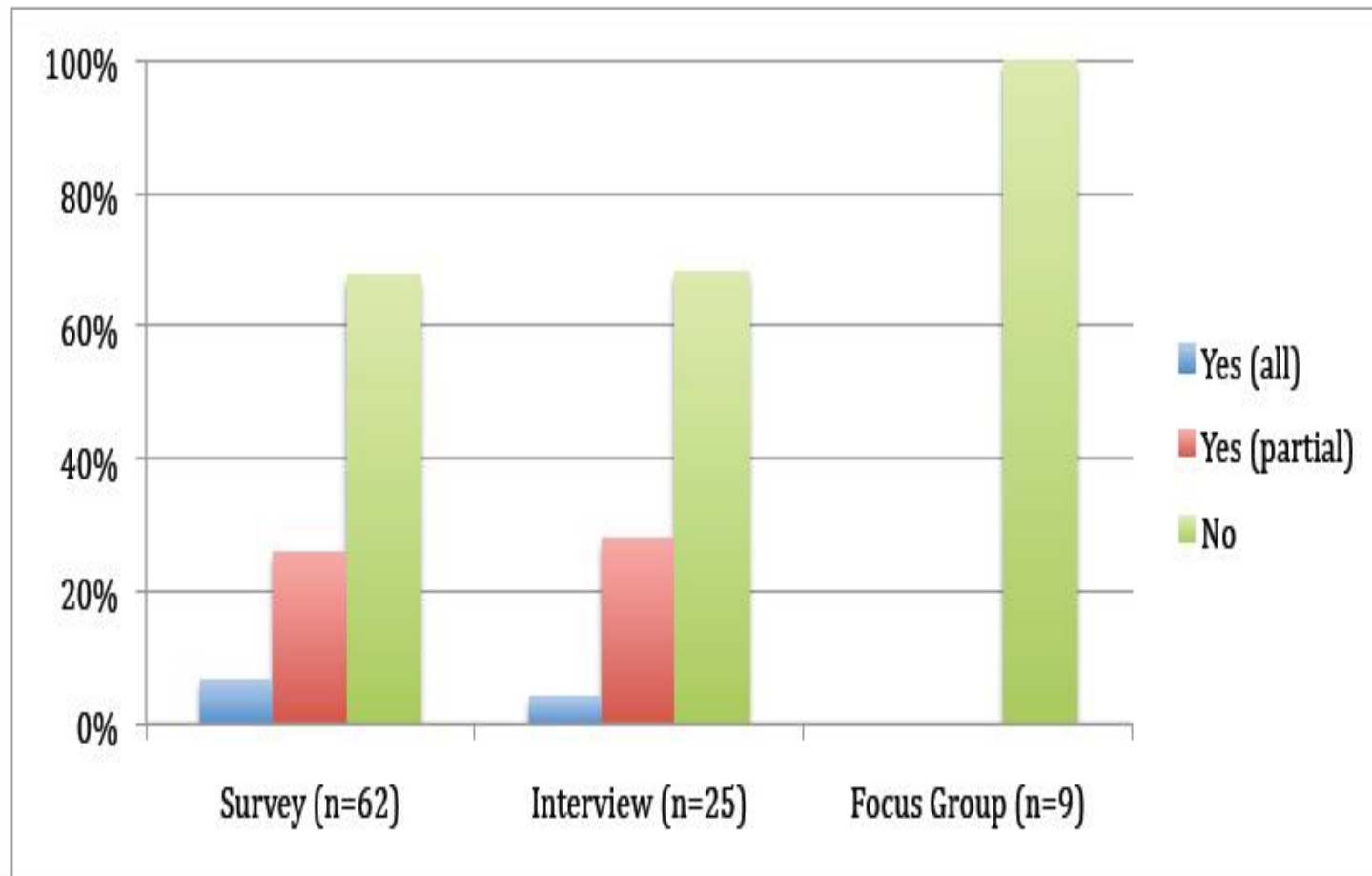
Karlin, Ford, Wu, & Nasser. (2015). What Do We Know About What We Know? A Review of Behaviour-Based Energy Efficiency Data Collection. IEA-DSM Task 24 Subtask 3 Report.

Data Collection Methods Used



Karlin, Ford, Wu, & Nasser. (2015). What Do We Know About What We Know? A Review of Behaviour-Based Energy Efficiency Data Collection. IEA-DSM Task 24 Subtask 3 Report.

Instruments Provided?

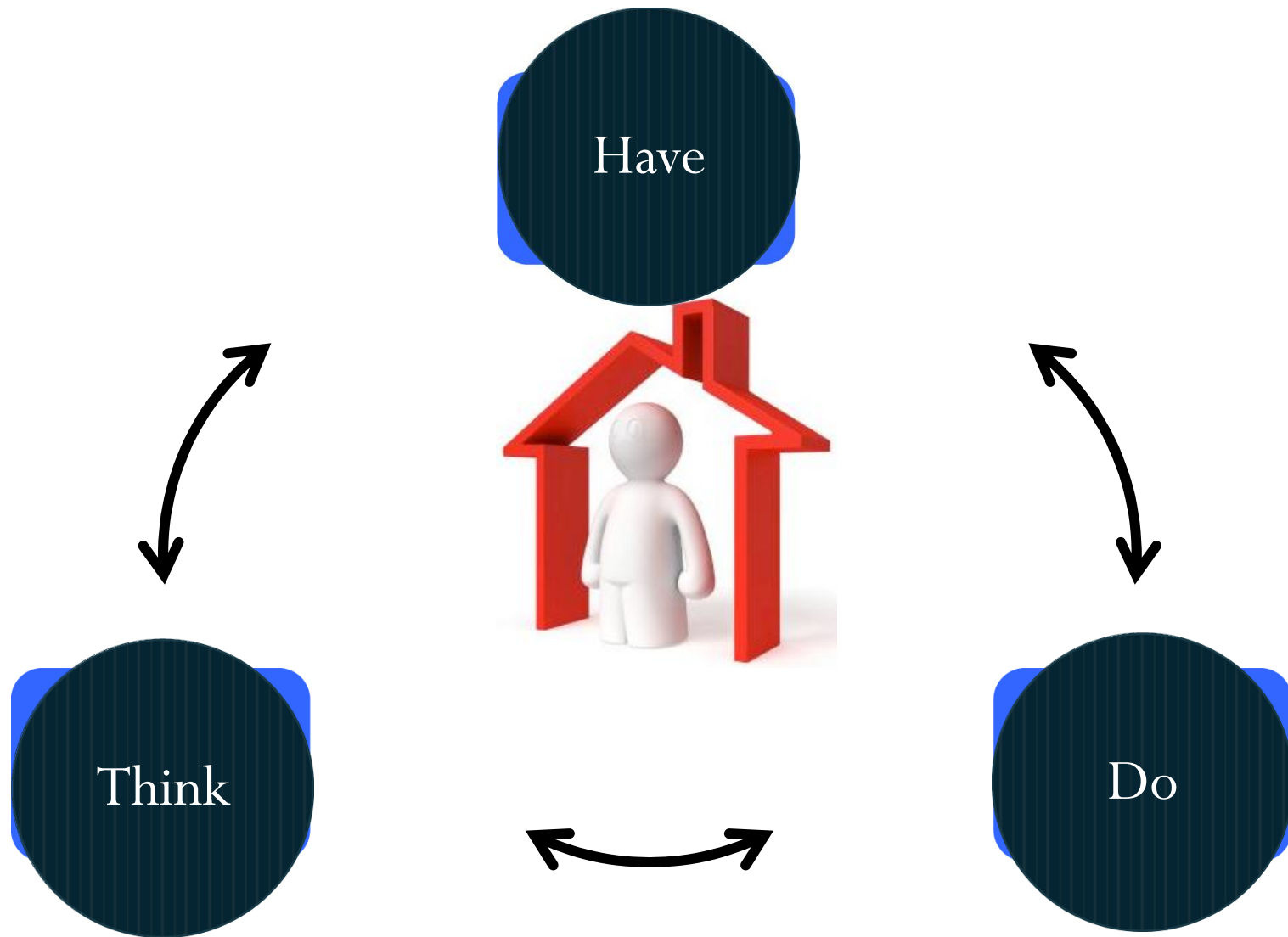


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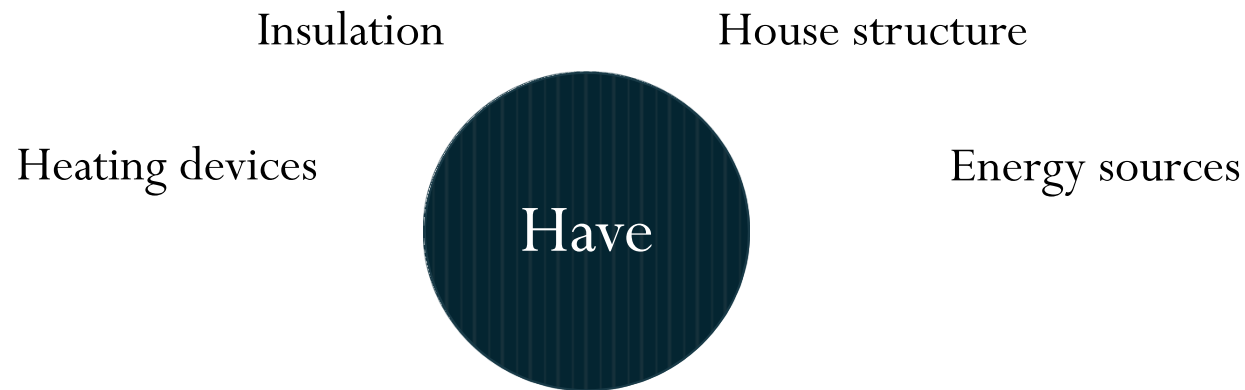
Toolkit Development



Energy Cultures Frameworks



Toolkit Development



Material Culture (Have)

- What type of dwelling do you live in?
- Which of the following appliances do you own? (Space heater, dishwasher, central AC, etc.)

Toolkit Development

Beliefs (Think)

Environmental Concern

- I consider myself to be an environmentalist

Norms (Personal and Social)

- I feel a strong personal obligation to conserve energy.
- Most people are not willing to make changes or sacrifices to protect the environment.

Efficacy (Performance and Response)

- I can think of at least one thing that I can do to decrease my energy usage.
- If I conserve, it will have a positive societal impact.

Motivation

- How much does each of the following factors affect your household energy use?
(Environmental impact, cost of energy bill, convenience, etc.)

Behavioral Intention

- During the next six months, I intend to (limit time in shower, turn of lights when not needed, etc.)

Expected warmth
levels

Maintaining
traditions

Social expectations and
aspirations

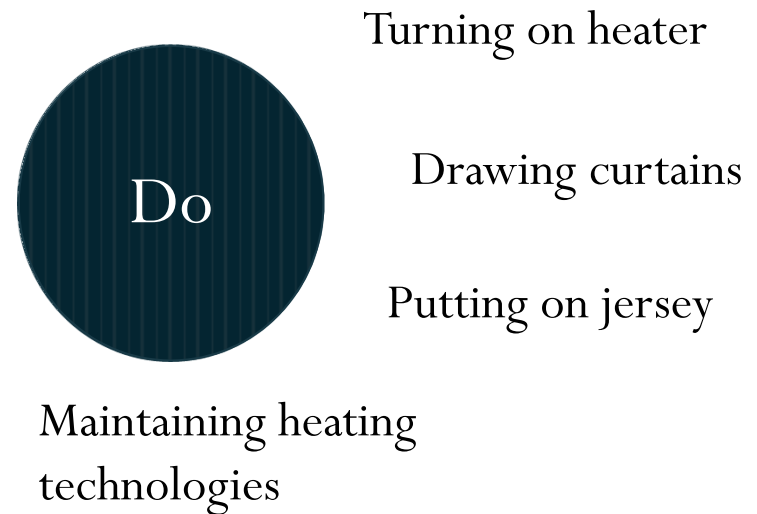


Environmental
concern

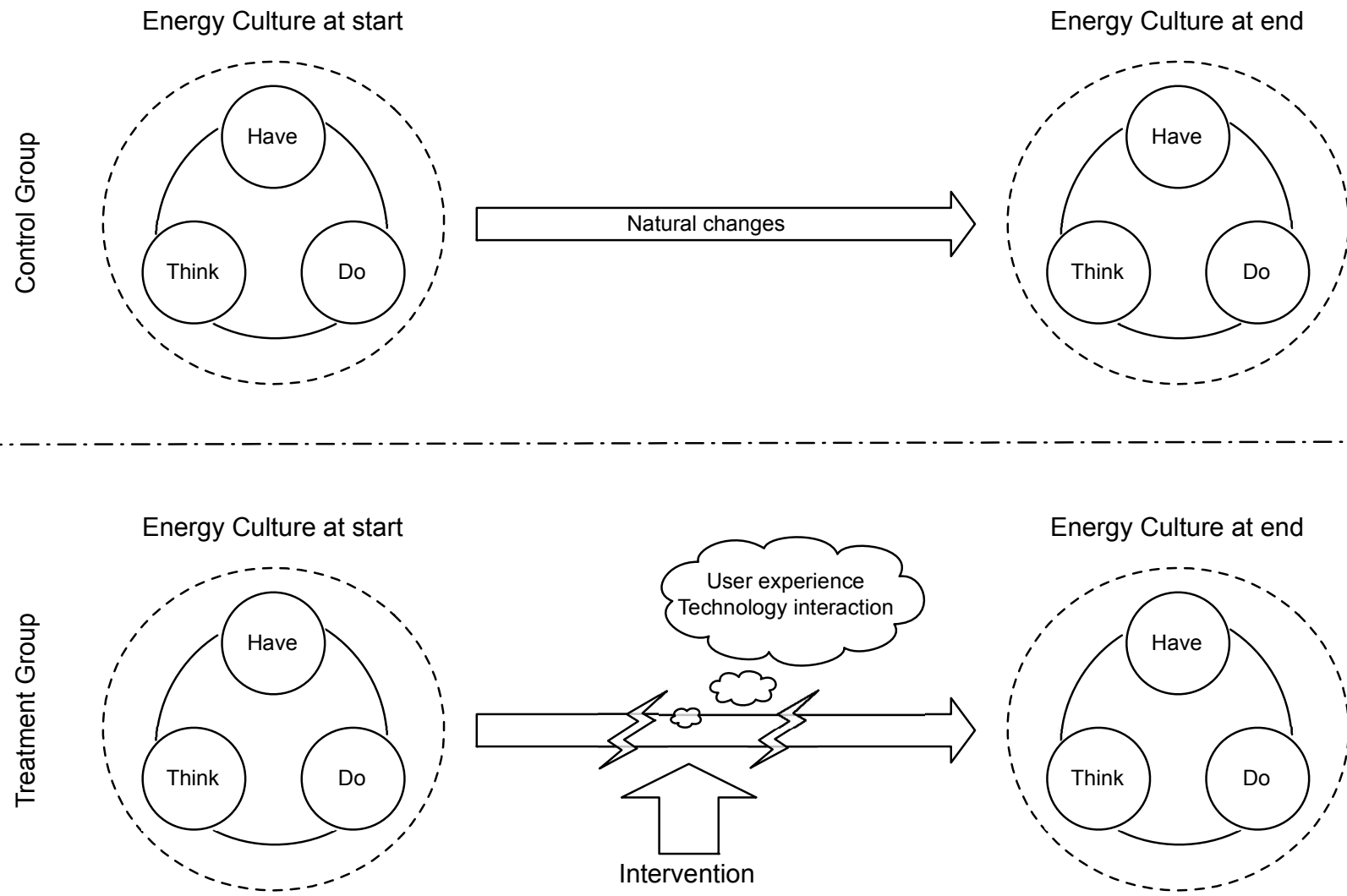
Toolkit Development

Behaviors (Do)

- How frequently do you: (Limit time in shower, turn off lights when not needed, etc.)



Toolkit Development



Toolkit Development

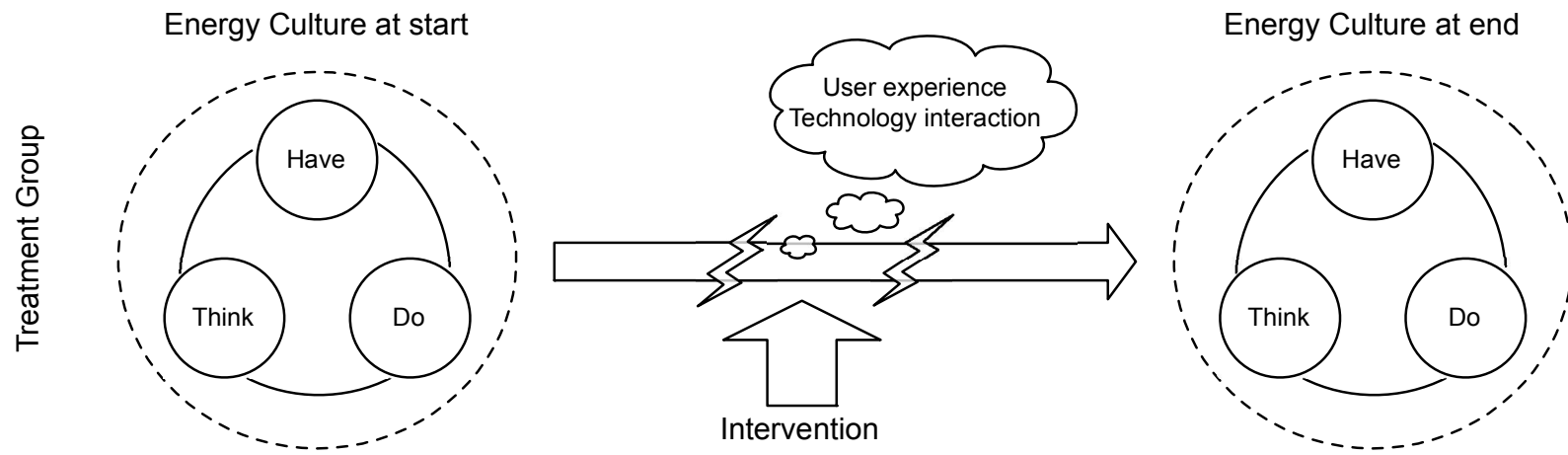
User Experience (UPscale)

Ease of Use

- I feel very confident interpreting the information provided to me.
- A person would need to learn a lot in order to understand this _____.

Engagement

- I do not find this _____ to be useful.
- I think that I would like to use this _____ frequently.



Next Steps

1. Psychometric testing (SCE)
2. Local field testing (PG&E / SCE)
3. Member country review
4. Global field testing
5. Wide scale adoption? 😊





Thank you!

(comments and suggestions welcome)

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