Objecting to Experiments that Compare Two Unobjectionable Policies or Treatments:

Implications for Comparative Effectiveness and Other Pragmatic Trials

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Why A/B tests?
(a.k.a. field experiments, pRCTs)

- Increase quality and safety
- Decrease waste/lower costs
- Reduce inequity and injustice (Faden et al., 2011; Faden et al. 2013)

Health systems (& other organizations with captive audiences, e.g., businesses, schools, governments) control the means of randomization. They often have an ethical obligation to experiment in order to determine the effects of their policies and practices on stakeholders.
Equipoise

Not preference sensitive

(Temporary) inequality acceptable

Preference-sensitive decision

Lumpectomy

Total mastectomy

A

B

No equipoise

A

B

No equipoise

A

B

Preference-sensitive decision

A

B

Potentially inferior—but uniform—policy preferred to unequal treatment/outcomes

• Equipoise
• Not preference sensitive
• (Temporary) inequality acceptable
Embedding Research-Inspired Innovations in EdTech: A Randomized Controlled Trial of Social-Psychological Interventions, at Scale

In Event: Paper Session: Innovations in Instructional Design

Tue, April 17, 8:15 to 9:45am, Millennium Broadway New York Times Square, Floor: Seventh Floor, Room 7.01

Abstract

Social-Psychological interventions have been used to produce significant gains in learner outcomes (see Lazowski & Hulleman, 2015). The current research project embedded two types of messaging (one based on growth mindset research, the other a novel anchoring of effort message) into a commercial educational technology used by thousands of introductory programming students each semester. Results indicate increased persistence in the growth mindset condition, and a decrease in persistence for the anchoring condition, relative to control. Randomized control trials like this, at scale and embedded into widely-used commercial products, are a valuable approach for improving learner outcomes in a rigorous and iterative way, while also contributing to the burgeoning literature on Social-Psychological interventions.

Authors

Daniel M. Belenky, Pearson Education, Inc.

Yun Jin Rho, Pearson

Mikolaj Bogucki, Pearson Education, Inc.

Malgorzata Schmidt, Pearson Education, Inc.
# A Recent Example

## Nudge

<table>
<thead>
<tr>
<th>Nudge</th>
<th>Problems attempted</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Status quo:</strong> No encouragement</td>
<td>212</td>
</tr>
<tr>
<td><strong>B. Anchoring of effort:</strong> “Some students tried this question 26 times! Don't worry if it takes you a few tries to get it right.”</td>
<td>156</td>
</tr>
<tr>
<td><strong>C. Growth mindset:</strong> “No one is born a great programmer. Success takes hours and hours of practice.”</td>
<td>174</td>
</tr>
</tbody>
</table>
Pearson conducts experiment on thousands of college students without their knowledge

Internet comments:
— “This would be funny if it were not also unethical and outrageous.”
— “[A] completely unethical and possibly illegal breach of scientific protocol by Nazi ‘researchers’ at Pearson.”

The release of the research prompted a fierce debate over issues of ethics, privacy, and consent during large-scale testing of such strategies using commercial software programs. Pearson's stock fell noticeably in response related to concerns, which the company described as unwarranted.

"It's concerning that forms of low-level psychological experimentation to trigger certain behaviors appears to be happening in the ed-tech sector, and students might not know those experiments are taking place," Williamson said.
The “A/B Effect”

Viewing an experiment designed to determine the comparative effects of existing or proposed practices (an “A/B test”) as more morally problematic than a universal implementation of either untested practice (A or B).

- IF either treatment A or treatment B would be acceptable if applied to all members of a group on its own,
- AND neither A nor B is objectively superior or subjectively preferred to the other,
- AND temporary inequality is morally acceptable
- THEN randomly assigning those same people to A or B would not impose an unacceptable treatment on anyone, and would have the advantage of generating knowledge about the effects of A and B.

MAIN RESEARCH QUESTION: Can we systematically observe the proposed A/B effect in a variety of domains and populations?

- If so, when and why?
- Are there ways to communicate A/B tests to stakeholders that don’t arouse the A/B effect? E.g., consent documents/processes, LHS notices, published/presented results of learning activities.
Objecting to experiments that compare two unobjectionable policies or treatments


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Edited by Dalton Conley, Princeton University, Princeton, NJ, and approved April 8, 2019 (received for review December 5, 2018)
General Method

• 16 online, between-subjects vignette experiments & replications (all but the first preregistered)

• Randomization to 1 of 3 (or 4) conditions, in which a well-intentioned agent thinks of 1 (or 2) policies and:
  • implements policy A
  • implements policy B
  • runs a randomized experiment comparing A and B

• DV: “How appropriate is the decision?” (1-5 Likert; neutral midpoint)

• Why? (free response: 28 codes, 2 coders, avg interrater reliability across 4 studies: $\kappa = .83$)

• Total $N = 5873$ unique participants (~100/condition)
Study 1
A: Some medical treatments require a doctor to insert a plastic tube into a large vein. These treatments can save lives, but they can also lead to deadly infections. A hospital director wants to reduce these infections, so he decides to give each doctor who performs this procedure a new ID badge with a list of standard safety precautions for the procedure printed on the back. All patients having this procedure will then be treated by doctors with this list attached to their clothing.

B: . . . A hospital director wants to reduce these infections, so he decides to hang a poster with a list of standard safety precautions for this procedure in all procedure rooms. All patients having this procedure will then be treated in rooms with this list posted on the wall.

A/B: . . . A hospital director thinks of two different ways to reduce these infections, so he decides to run an experiment by randomly assigning patients to one of two test conditions. Half of patients will be treated by doctors who have received a new ID badge with a list of standard safety precautions for the procedure printed on the back. The other half will be treated in rooms with a poster listing the same precautions hanging on the wall.

A/B Learn: . . . After a year, the director will have all patients treated in whichever way turns out to have the highest survival rate.
Study 1: Catheter Checklist ($N = 338$)

$d = 1.08$
Study 2: Catheter Checklist Replications

Original Checklist (AMT)

$N = 338; d = 1.08$

Exact Replication (AMT)

$N = 387; d = 0.89$

Mobile Replication (Pollfish)

$N = 825; d = 0.57$
Study 3: Other Domains ($N = 2312$)

DTC Genetic Testing
$d = 0.56$

Autonomous Vehicles
$d = 0.45$

Global Health Assistant Recruitment
$d = 0.40$

Employee Retirement Plans
$d = 0.40$

Global Extreme Poverty*
$d = 0.42$

Teacher Well-Being*
$d = 0.38$
Why Might We Object to A/B Tests of Two Unobjectionable Treatments?

1. Intuitions (possibly dangerously incorrect) about comparative effectiveness of A and B when jointly evaluated
2. Aversion to unequal treatment
3. Aversion to random treatment
Study 5: Best Drug

Mobile Replication (Pollfish)

- Drug A:
  - N = 307; d = 0.64

- Drug B:
  - N = 720; d = 0.15
Why Might We Object to A/B Tests of Two Unobjectionable Treatments?

1. Intuitions (possibly dangerously incorrect) about comparative effectiveness of A and B when jointly evaluated
2. Aversion to unequal treatment
3. Aversion to random treatment
4. Low science literacy
Interviews (n = 41) with Geisinger leadership found unanimous support for “the general concept and goals” of the learning healthcare system and for “enhancing learning across the institution.”
Evidence supports the claim that a learning health system is necessary to provide safe, effective, and beneficial patient-centered care at lower cost.

- 98% (n = 126; 64% response rate) of respondents (most of whom were clinicians) agreed
- 53% strongly agreed
Study 6: Healthcare Providers Sample

Checklist \( (N = 226) \)

Best Drug: Walk-In \( (N = 231) \)

\[ d = 0.86 \]

\[ d = 0.87 \]
Why Might We Object to A/B Tests of Two Unobjectionable Treatments?

1. Intuitions (possibly dangerously incorrect) about comparative effectiveness of A and B when jointly evaluated
2. Aversion to unequal treatment
3. Aversion to random treatment
4. Low science literacy
5. Low educational attainment
6. Other sociodemographic variables
Why Might We Object to A/B Tests of Two Unobjectionable Treatments?

1. Intuitions (possibly dangerously incorrect) about comparative effectiveness of A and B when jointly evaluated
2. Aversion to unequal treatment
3. Aversion to random treatment
4. Low science literacy
5. Low educational attainment
6. Other sociodemographic variables
7. Lack of consent
   • 18% of participants in A/B conditions vs. 0.3% in policy conditions
8. “Experiment” aversion
   • 24% of participants in A/B conditions vs. 0.1% in policy conditions
9. Illusion of knowledge
   • Best Drug: 21% of participants who approve policy & 19% of those who object to an A/B test
Conclusions (so far)

• We can observe the “A/B effect” in several domains (e.g., health care, addressing global poverty, autonomous vehicle design, retirement nudges)

• Educational attainment, science literacy, and other demographic variables explain essentially none of the variance among participants

• After controlling for inequality and randomization (Best Drug: Walk-in), several remaining explanations (consent, experiment aversion, illusion of knowledge) appear to contribute to the effect, but none dominates

• “A/B effect” may reflect a heuristic about the ethics of experiments that sometimes leads us astray

• More research needed: causal mechanisms, boundary conditions, debiasing strategies

• Decisionmakers may face less backlash if they implement untested policies/treatments on everyone instead of randomly evaluating them to determine comparative effectiveness
In progress work
(with Chabris, Heck, Pedram Heydari, Anh Huynh)

What if we tell people the agent could have imposed either policy for everyone? (Within-subjects)

Checklist: AB effect 71% as large ($d=1.19 \rightarrow d=0.84$)
- 53% of participants rate A/B test as less appropriate than the average of A & B
- 37% rate the experiment as less appropriate than both policies
- 27% rate both policies not-inappropriate (3, 4, or 5 Likert) & the A/B test inappropriate (1 or 2)
- Ranking: 37% rank A/B test 1st; 46% rank it last

What if we also model clinical equipoise for them?

Best Drug–Walk-In: 61% as large ($d=0.64 \rightarrow d=0.39$)
- 43% of participants rate A/B test as less appropriate than the average of A & B
- 40% rate the experiment as less appropriate than both policies
- 27% rate both policies not-inappropriate (3, 4, or 5 Likert) & the A/B test inappropriate (1 or 2)
- Ranking: 59% rank A/B test 1st; 37% rank it last
Thank you!