What has experimental psychology done for behavioural medicine?

Promise and pitfalls of the experimental medicine approach

Matt Field
Dept. Psychological Sciences
Acknowledgments

University of Liverpool
• Paul Christiansen
• Ashleigh Haynes
• Charlotte Hardman
• Andrew Jones
• Eric Robinson

University of Amsterdam
• Reinout Wiers
Translational behaviour change research
Translational behaviour change research

Reinout W. Wiers¹, Mike Rinck², Robert Kordts³, Katrijn Houben⁴ & Fritz Strack³

University of Amsterdam, Department of Psychology, Roetersstraat, Amsterdam, the Netherlands;¹* Behavioural Science Institute, Radboud University Nijmegen, Nijmegen, the Netherlands;² LS Psychologie II, Universität Würzburg, Würzburg, Germany;³ and Clinical Psychological Science, Maastricht University, Maastricht, the Netherlands⁴

Retraining automatic action-tendencies to approach alcohol in hazardous drinkers
Translational behaviour change research

Cognitive Bias Modification Training During Inpatient Alcohol Detoxification Reduces Early Relapse: A Randomized Controlled Trial

Victoria Manning, Petra K. Staiger, Kate Hall, Joshua B.B. Garfield, Gabriella Flaks, Daniel Leung, Laura K. Hughes, Jarrad A. G. Lum, Dan I. Lubman, and Antonio Verdejo-Garcia
Overview

• The experimental medicine approach
• Example 1: alcohol approach bias modification
• Example 2: social norms and food intake
• Methodological issues
• Differences between experiments and RCTs
• Implications for systematic reviews and meta-analyses
THE EXPERIMENTAL MEDICINE APPROACH
The experimental medicine approach
“In order to acquire a robust evidence base for our toolbox of behaviour change methods, and given the limitations of doing meta-analyses of behaviour change intervention evaluations, it is necessary to incorporate experimental tests in the evidence-building process. Controlled experiments enable manipulation of single behaviour change methods and individual parameters for effectiveness”

Peters et al. (2015)
The role of experiments (Peters et al., 2013)
Figure 1

The experimental medicine (EM) approach to health behavior change. The EM approach specifies that research on health behavior change should proceed along four paths. Path A identifies putative targets, which are modifiable factors that may cause the behavior. Path B validates those targets by developing assays (i.e., measures) and testing the extent to which change in behavior accrues from manipulating the targets. Path C assesses the impact of different manipulations on the extent to which the target changes to discover how best to engage the target. Path D tests whether an intervention changes behavior because the intervention engaged the target and engaging the target changed the behavior. Whereas standard efficacy trials (Path X) often test only whether an intervention changes a behavior, the EM approach allows researchers to test both whether and why an intervention is effective.
If a putative target can be experimentally manipulated....

- We can investigate the **causal influence** of that target on behaviour (in a good way or a bad way) (path A)
- We can investigate the **best** way to change **that target** so that it leads to ‘good’ behaviour change (path B)

* ‘the best way’ = fastest, largest effect size, persistent effects
EXAMPLE: ALCOHOL APPROACH
BIAS MODIFICATION
A dual-process theory

Wiers, Field & Stacy (2016)
Measurement of automatic approach tendencies: the stimulus-response compatibility task (1a)
The stimulus-response compatibility task (1b)
The stimulus-response compatibility task (2a)
The stimulus-response compatibility task (2b)
Heavy vs. light social drinkers – automatic approach bias

Christiansen et al., 2012; Field et al., 2008, 2011; Kersbergen et al., 2015
MODIFYING automatic approach tendencies
Assessing effects of training on alcohol intake: the bogus taste test
Findings from lab studies

Wiers et al. (2010)

Di Lemma & Field (submitted)
Translation into a clinical intervention

Table 2. Logistic Regression Results for Treatment Outcome 1 Year After Treatment Discharge

<table>
<thead>
<tr>
<th>Variable</th>
<th>b</th>
<th>SE b</th>
<th>Wald z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>0.880</td>
<td>0.358</td>
<td>6.03</td>
<td>.014</td>
</tr>
<tr>
<td>Duration of alcohol problem (years)</td>
<td>0.033</td>
<td>0.018</td>
<td>3.59</td>
<td>.058</td>
</tr>
<tr>
<td>Number of detoxifications</td>
<td>-0.028</td>
<td>0.027</td>
<td>1.05</td>
<td>.31</td>
</tr>
<tr>
<td>Alcohol problems (AUDIT score)</td>
<td>-0.026</td>
<td>0.020</td>
<td>1.61</td>
<td>.20</td>
</tr>
<tr>
<td>Duration of treatment (days)</td>
<td>0.008</td>
<td>0.009</td>
<td>0.82</td>
<td>.36</td>
</tr>
<tr>
<td>Depression (BDI score)</td>
<td>-0.025</td>
<td>0.022</td>
<td>1.25</td>
<td>.26</td>
</tr>
<tr>
<td>Mental burden (SCL-90-R score)</td>
<td>0.022</td>
<td>0.020</td>
<td>1.25</td>
<td>.26</td>
</tr>
<tr>
<td>Condition (experimental, control)</td>
<td>0.760</td>
<td>0.299</td>
<td>6.46</td>
<td>.011</td>
</tr>
</tbody>
</table>

Note: AUDIT = Alcohol Use Disorders Identification Test (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993); BDI = Beck Depression Inventory (Hautzinger, Bailer, Worall, & Keller, 1994); SCL-90-R = Symptom Checklist-90-Revised (Franke, 1995).

Wiers et al. (2011)
Other clinical studies

Eberl et al. (2013)

Manning et al. (2016)
that the main thing getting in the way of sustaining her weight loss is a chronic lack of confidence. But half way through the programme, inexplicably Phil begins to resist the help. Tanya calls in behavioural scientist Professor Paul Dolan for radical mind-training.
EXAMPLE: SOCIAL NORMS AND FOOD INTAKE
Perceived social norms are associated with individual differences in food intake
Experimental manipulation of social norms influences food intake (1)
Experimental manipulation of social norms influences food intake (2)
Experimental manipulation of social norms influences food intake (3)

- Health info condition: 20% meal veg derived
- Social norms condition: 38% meal veg derived

Robinson et al. (2014)
Meta-analysis of laboratory studies


Eric Robinson, PhD; Jason Thomas, MSc; Paul Aveyard, PhD; Suzanne Higgs, PhD


High-intake norm (vs. no-norm control): SMD = 0.41, 95% CI = 0.20 to 0.63, p = 0.0001
Low-intake norm (vs. no-norm control): SMD = -0.35, 95% CI = -0.59 to -0.10, p = 0.005
Translation into interventions

- Results have generally been disappointing
  - de Bruijn et al. (2015); Mollen et al. (2013); Stok et al. (2012, 2014a, 2014b); Verkooijen et al., 2015).
METHODOLOGICAL ISSUES
Are laboratory outcome measures sensitive and valid?

• Ad-libitum intake, often disguised as bogus ‘taste test’.
  – Widely used in animal research, human appetite research, more recently in human alcohol research

• Less commonly used: operant measures, latency to drink / eat.

• Key questions:
  – Are these measures *sensitive* to experimental manipulations / putative interventions?
  – Do they have good construct validity?
Alcohol bogus taste tests

No standardized methodology

(variety and volume of drinks offered, presence of non-alcoholic alternatives, time given, complexity of bogus questionnaires.....)

Jones et al., 2016
Ad-libitum test meal food intake / bogus taste tests

• Similarly, no standard methodology (type of food offered, time.....)

• Sensitive to:
  – Caloric preload (Kim & Kissileff, 1996; Wiessing et al., 2012)
  – Negative and positive mood (Cardi et al., 2015)

• Associated with:
  – Self-reported hunger (Sadoul et al., 2014)
  – Disinhibition / self-control (French et al., 2012)
  – BMI / basal metabolic rate (Sadoul et al., 2014)

• Good test-retest reliability ($r = 0.78$; Horner et al., 2014; also Gregerson et al., 2008; Lara et al., 2010)
Do participants know that their alcohol intake is being monitored?

• Jones et al. (2016)
• Across studies, 36% of participants were aware of true purpose of taste test. However, this did not influence intake.
  – Statistical power?
  – May moderate effects of experimental manipulations / putative interventions?
Do participants know that their food intake is being monitored?

Heightened awareness of observation associated with reduced energy intake (SMD = 0.45, 95% CI = 0.25-0.66, p < 0.0001)
HOW ARE LABORATORY STUDIES DIFFERENT FROM RANDOMIZED CONTROLLED TRIALS?
Do participants know that they may be subject to an experimental manipulation?

- The norm is to *not* inform participants that they may be subject to an experimental manipulation / putative intervention (until debriefing).
- Participant awareness inconsistently measured (formally or informally) during debriefing.
- **Moderating role uncertain**
Sample characteristics

- Participants take part in lab studies for financial gain or course credit (maybe curiosity!), but they are not usually required to be motivated to change their behaviour.

- Participants who take part in RCTs are usually motivated to change their behaviour; financial incentives may be offered to increase compliance.
Other differences between lab studies and RCTs

• Lab studies: outcome measured (usually via observed intake) immediately (or very soon after) a single / brief ‘dose’ of intervention, in a strange context in which participants are probably uncertain about the most appropriate way to behave (therefore easy to manipulate), and other influences on their behaviour are tightly controlled.

• RCTs: outcome measured (usually via self-report) some time after multiple ‘doses’ of intervention, in a ‘normal’ context in which participants are less unsure about how they should behave, and there are multiple influences on their behaviour.
Other differences between lab studies and RCTs

- Lab studies: outcome measured (usually via observed intake) immediately (or very soon after) a single / brief ‘dose’ of intervention, in a strange context in which participants are probably uncertain about the most appropriate way to behave (therefore easy to manipulate), and other influences on their behaviour are tightly controlled.

- RCTs: outcome measured (usually via self-report) some time after multiple ‘doses’ of intervention, in a ‘normal’ context in which participants are less unsure about how they should behave, and there are multiple influences on their behaviour.
Summary: Important ways in which lab studies and trials differ

<table>
<thead>
<tr>
<th>Lab studies</th>
<th>Trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aim to demonstrate causality</td>
<td>Aim to establish efficacy</td>
</tr>
<tr>
<td>Participants unaware that receiving intervention</td>
<td>Participants aware that they may receive intervention</td>
</tr>
<tr>
<td>Participants not motivated to change / restrict</td>
<td>Participants motivated to change / restrict</td>
</tr>
<tr>
<td>Single, brief ‘dose’</td>
<td>Multiple ‘doses’</td>
</tr>
<tr>
<td>Measure alcohol / food intake directly</td>
<td>Measure alcohol / food intake via self-report</td>
</tr>
<tr>
<td>Measure outcome immediately after receiving intervention</td>
<td>Measure outcome some time after receiving intervention</td>
</tr>
<tr>
<td>Some uncertainty about how to behave</td>
<td>No uncertainty about how to behave</td>
</tr>
<tr>
<td>Other influences on behaviour are minimized</td>
<td>There are many other influences on behaviour</td>
</tr>
</tbody>
</table>
Could some of these factors determine ‘translatability’ of interventions?

• For example, perhaps effects of social norms interventions on eating behaviour are most pronounced:
  – Immediately after the intervention
  – After initial exposure (habituation to additional ‘doses’)
  – In an uncertain context
  – When other influences on behaviour (including other sources of norm information) are minimized
  – On overt behaviour, not self-report
  – When not motivated to change / restrict behaviour

• Whereas, perhaps effects of alcohol avoidance training are more robust to these factors?
Could some of these factors determine ‘translatability’ of interventions?

• For example, perhaps effects of social norms interventions on eating behaviour are most pronounced.
  – Immediately after the intervention
  – After initial exposure (habituation to additional ‘doses’)
  – In an uncertain context
  – When other influences on behaviour (including other sources of norm information) are minimized
  – On overt behaviour, not self-report
  – When not motivated to change / restrict behaviour

• Whereas, perhaps effects of alcohol avoidance training are more robust to these factors?
Implications

Experimental medicine has limited value?

OR

We should consider the roles of (most of) these factors in the laboratory before moving to trials?
Implications for meta-analyses

RESEARCH ARTICLE

The Effectiveness of Cognitive Bias Modification Interventions for Substance Addictions: A Meta-Analysis

Ioana A. Cristea1,2*, Robin N. Kok3,4,5,6, Pim Cuijpers5,6

1 Department of Clinical Psychology and Psychotherapy, Babeș-Bolyai University, Cluj-Napoca, Romania, 2 Department of General Psychology, University of Padova, Padova, Italy, 3 Department of Psychology, Faculty of Health Sciences, University of Southern Denmark, Odense, Denmark, 4 Centre for Innovative Medical Technology, Department of Clinical Innovation, Odense University Hospital, Odense, Denmark, 5 Department of Clinical Psychology, Faculty of Behavioural and Movement Sciences, VU University Amsterdam, Amsterdam, The Netherlands, 6 EMGO Institute for Health and Care Research, VU University and VU University Medical Centre, Amsterdam, the Netherlands

* ioana.cristea@ubbcluj.ro

Abstract
Effect sizes from lab studies and RCTs should not be combined

- Important differences between lab studies and RCTs (as described above)
- No reason to believe that effect sizes are comparable
  - E.g. why would a 50% increase in intake of cherry tomatoes in the lab be expected to correspond to the same after an intervention?
- It *may* be appropriate to apply risk of bias measures for RCTs to lab studies, but caution required (variable reporting standards)
- New guidelines (study design, reporting, risk of bias) needed?
The role of experiments (Peters et al., 2013)
Summary

• Experimental medicine plays a key role in behaviour change research
• Psychology experiments useful for identifying causal influences on health behaviour, and for validating tools to manipulate those factors
• A host of methodological issues complicate translation of EM research, and have implications for evidence synthesis