Changing Behaviour: Targetting non-conscious and conscious processes

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Behaviour and Health Research Unit
Centre of Excellence for Public Health
Northern Ireland
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Changing Behaviour
Targeting non-conscious and conscious processes

I. The Problem
II. Understanding Behaviour
III. Targeting non-conscious processes...by changing environments to change behaviour
IV. Targeting conscious processes....by effective communications to increase acceptability of changing environments to change behaviour
V. Putting this into practice
I The Problem

- 63% deaths worldwide are due to:
  - Cancer, Cardiovascular disease, Diabetes, Respiratory Disease

- Key causes

- Eliminating these major risk factors will prevent:
  - 75% of diabetes and cardiovascular disease
  - 40% of cancers
  - AND reduce health inequalities by about 50%
## Understanding Behaviour

"Essentially, all models are wrong but some are useful." George E.P. Box (1987)

<table>
<thead>
<tr>
<th>Dual Process Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal directed &amp; Stimulus driven</td>
</tr>
<tr>
<td>Cold &amp; Hot</td>
</tr>
<tr>
<td>Conscious &amp; Non-conscious</td>
</tr>
<tr>
<td>System 2 &amp; System 1</td>
</tr>
<tr>
<td>Reflective &amp; Impulsive</td>
</tr>
</tbody>
</table>
Changing behaviour: Two broad approaches

Change people’s minds to...

Resist Environments

Change Environments
Targeting conscious processes ... using risk information
Targeting conscious processes... using personalised risk information
<table>
<thead>
<tr>
<th>Behaviour</th>
<th>Study</th>
<th>Date</th>
<th>Country</th>
<th>Disease Threat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>1 Audrain</td>
<td>1997</td>
<td>USA</td>
<td>Lung cancer</td>
</tr>
<tr>
<td></td>
<td>2 McBride</td>
<td>2002</td>
<td>USA</td>
<td>Lung cancer</td>
</tr>
<tr>
<td></td>
<td>3 Ito</td>
<td>2006</td>
<td>Japan</td>
<td>Lung cancer</td>
</tr>
<tr>
<td></td>
<td>4 Sanderson</td>
<td>2008</td>
<td>UK</td>
<td>Lung cancer</td>
</tr>
<tr>
<td></td>
<td>5 Hishida</td>
<td>2010</td>
<td>Japan</td>
<td>Lung cancer</td>
</tr>
<tr>
<td></td>
<td>6 Hollands</td>
<td>2012</td>
<td>UK</td>
<td>Crohn’s disease</td>
</tr>
<tr>
<td>Diet</td>
<td>7 Chao</td>
<td>2008</td>
<td>USA</td>
<td>Alzheimer’s disease</td>
</tr>
<tr>
<td></td>
<td>8 Marteau</td>
<td>2004</td>
<td>UK</td>
<td>Heart disease</td>
</tr>
<tr>
<td></td>
<td>9 Godino</td>
<td>2012</td>
<td>UK</td>
<td>Diabetes</td>
</tr>
<tr>
<td></td>
<td>10 Hietaranta-Luoma</td>
<td>2014</td>
<td>Finland</td>
<td>Heart disease</td>
</tr>
<tr>
<td></td>
<td>11 Nielsen</td>
<td>2014</td>
<td>Canada</td>
<td>Hypertension</td>
</tr>
<tr>
<td></td>
<td>12 Meisel</td>
<td>2015</td>
<td>UK</td>
<td>Obesity</td>
</tr>
<tr>
<td></td>
<td>13 Voils</td>
<td>2015</td>
<td>USA</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Physical Activity</td>
<td>14 Chao</td>
<td>2008</td>
<td>USA</td>
<td>Alzheimer’s disease</td>
</tr>
<tr>
<td></td>
<td>15 Marteau</td>
<td>2004</td>
<td>UK</td>
<td>Heart disease</td>
</tr>
<tr>
<td></td>
<td>16 Godino</td>
<td>2012</td>
<td>UK</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Alcohol</td>
<td>17 Komiya</td>
<td>2006</td>
<td>Japan</td>
<td>Cancers - alcohol related</td>
</tr>
<tr>
<td></td>
<td>18 Hendershot</td>
<td>2010</td>
<td>USA</td>
<td>Cancers – alcohol related</td>
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<tr>
<td></td>
<td>19 Hietaranta-Luoma</td>
<td>2014</td>
<td>Finland</td>
<td>Heart disease</td>
</tr>
<tr>
<td></td>
<td>20 Meisel-Luoma</td>
<td>2015</td>
<td>UK</td>
<td>Obesity</td>
</tr>
<tr>
<td></td>
<td>21 Voils</td>
<td>2015</td>
<td>USA</td>
<td>Diabetes</td>
</tr>
</tbody>
</table>

Marteau et al Cochrane Library 2010; Hollands et al BMJ 2016
The impact of communicating genetic risks of disease on risk-reducing health behaviour: systematic review with meta-analysis

Gareth J Hollands,1 David P French,2 Simon J Griffin,3 A Toby Prevost,4 Stephen Sutton,3 Sarah King,1 Theresa M Marteau1

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Intervention</th>
<th>Control</th>
<th>Odds ratio IV random (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking cessation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audrain 1997</td>
<td>14/133</td>
<td>20/156</td>
<td></td>
</tr>
<tr>
<td>Hishida 2010</td>
<td>15/286</td>
<td>22/276</td>
<td></td>
</tr>
<tr>
<td>Hollands 2012</td>
<td>9/251</td>
<td>12/246</td>
<td></td>
</tr>
<tr>
<td>Ito 2006</td>
<td>43/341</td>
<td>52/356</td>
<td></td>
</tr>
<tr>
<td>McBride 2002</td>
<td>41/372</td>
<td>9/185</td>
<td></td>
</tr>
<tr>
<td>Sanderson 2008</td>
<td>10/43</td>
<td>5/18</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>132/1426</td>
<td>120/1237</td>
<td></td>
</tr>
<tr>
<td>Test for heterogeneity: I²=39%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test for overall effect: z=0.43, P=0.67</td>
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<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical activity</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chao 2008</td>
<td>0.19</td>
<td>0.46</td>
<td>111</td>
</tr>
<tr>
<td>Godino 2012</td>
<td>-0.01</td>
<td>0.10</td>
<td>184</td>
</tr>
<tr>
<td>Hietaranta-Luoma 2014</td>
<td>0.08</td>
<td>0.21</td>
<td>61</td>
</tr>
<tr>
<td>Marteau 2004</td>
<td>-0.01</td>
<td>0.17</td>
<td>213</td>
</tr>
<tr>
<td>Meisel 2015</td>
<td>0.03</td>
<td>0.12</td>
<td>139</td>
</tr>
<tr>
<td>Voils 2015</td>
<td>-0.06</td>
<td>0.09</td>
<td>230</td>
</tr>
<tr>
<td>Subtotal</td>
<td>938</td>
<td>766</td>
<td></td>
</tr>
<tr>
<td>Test for heterogeneity: I²=0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test for overall effect: z=0.61, P=0.54</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WHAT THIS STUDY ADDS

The results of this updated systematic review with meta-analysis using Cochrane methods suggest that communicating DNA based disease risk estimates has little or no impact on risk-reducing health behaviour.
Why doesn’t information (always) change behaviour?

**Effective Information**

**Ineffective Information**

**Motivation**
- Threat not seen as great enough
- **Certain current pleasure** more motivating than **Uncertain future gain**

**Behaviour**
- Intend to change our behaviour but...
  - Environments have a strong influences on much of our behaviour
  - Weak ability to inhibit immediate, habitual responses
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Targeting non-conscious and conscious processes

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Environmental cues, Non-conscious processes and behaviour

“Ninety-nine hundredths or, possibly, nine hundred and ninety-nine thousandths of our activity is purely automatic and habitual, from our rising in the morning to our lying down each night.”

William James (1899)
Targeting non-conscious processes... by changing environments

Altering micro-environments to change population health behaviour: towards an evidence base for choice architecture interventions

Gareth J Hollands¹, Ian Shemilt¹, Theresa M Marteau¹, Susan A Jebb¹,², Michael P Kelly¹,³, Ryota Nal⁴, Marc Suhrcke⁴,⁵, and David Ogilvie⁶,⁷

Abstract

Background: The idea that behaviour can be influenced at population level by altering the environments which people make choices (choice architecture) has gained traction in policy circles. However, empirical support this idea is limited, especially its application to changing health behaviour. We propose an evidence definition and typology of choice architecture interventions that have been implemented within small micro-environments and evaluated for their effects on four key sets of health behaviours: diet, physical activity, alcohol and tobacco use.

Discussion: We argue that the limitations of the evidence base are due not simply to an absence of empirical support, but also to a prior lack of definitional and conceptual clarity concerning definitions of choice architecture interventions. This has hampered the potential for systematic assessment of existing evidence. To address this issue, we demonstrate how our definition and typology of choice architecture interventions can provide a framework for the systematic identification of preliminary mapping of a large body of available evidence for the effects of choice architecture interventions. The framework is designed to discuss key implications for future research, evidence synthesis and conceptual development.

Summary: This conceptual framework provides a foundation for future research to investigate the potential of choice architecture interventions within micro-environments for changing health behaviour. The framework may also serve as a template for mapping other under-explored fields of enquiry.

Keywords: Choice architecture, Nudge, Nudging, Behaviour change, Health behaviour

Hollands, Shemilt, Marteau, Jebb, Kelly, Nakamura, Suhrcke, Ogilvie. BMC Public Health 2013
Changing Environments

Size

**THE NEW (AB)NORMAL**

Portion sizes have been growing. So have we. The average restaurant meal today is more than four times larger than in the 1950s, and adults are, on average, 36 pounds heavier if we want to eat healthy things we can do for ourselves and our community. Order the smaller meals on the menu, split a meal with a friend, cut it in half and take the rest home. We can also ask the managers at our favorite restaurants to offer smaller meals.

<table>
<thead>
<tr>
<th>1993 (160g)</th>
<th>NOW (240g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight: 160g</td>
<td>Weight: 240g</td>
</tr>
<tr>
<td>Calories: 425kcal</td>
<td>Calories: 640kcal</td>
</tr>
</tbody>
</table>

**STEAK AND KIDNEY PIE (short crust, individual)**

**SLICE OF WHITE BREAD (large loaf, medium thickness)**

**CHICKEN CURRY WITH RICE (frozen)**

- **1993**
  - Weight: 160g
  - Calories: 425kcal
- **NOW**
  - Weight: 240g
  - Calories: 640kcal

**50% INCREASE**

- **1993**
  - Weight: 36g
  - Calories: 85kcal
- **NOW**
  - Weight: 40g
  - Calories: 95kcal

**11% INCREASE**

- **1993**
  - Weight: 260g
  - Calories: 305kcal
- **NOW**
  - Weight: 395g
  - Calories: 460kcal

**52% INCREASE**

FROM THE BREAD ALONE, HAVING A SANDWICH FOR LUNCH EVERY DAY IS EQUAL TO 7,300 CALORIES A YEAR MORE NOW THAN IN 1993
Size: Systematic Review

i. To estimate the effects of manipulating different portion, package or tableware sizes on selection or consumption of:
   food, alcohol or tobacco products

N=72 studies: 69 0 3

ii. To estimate the extent to which these effects may be modified by characteristics of the study, the intervention and the participants

Protocol: Hollands et al., 2014
Studies included

• **Participants**: Adults and children

• **Interventions and Comparisons**: At least two sizes of:
  - a portion of a food, alcohol or tobacco
  - its package
  - an individual unit
  - an item of tableware used to consume
## Size: effect on food consumption

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Outcome</th>
<th>Comparisons</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larger size vs. smaller size</td>
<td>Consumption</td>
<td>92 from 61 studies <em>(6711 participants)</em></td>
<td>Small to moderate increase SMD: 0.37 <em>(95% CI: 0.29 to 0.45)</em> – Moderate quality evidence</td>
</tr>
</tbody>
</table>

Effects unrelated to body weight or gender.

**IF** sustained across the whole diet (i.e. all foods on all occasions), size of effect suggests that making sizes smaller across the whole diet could reduce daily energy consumed from food by:

- up to 16% in UK adults
- up to 8.5% in UK children
- up to 29% in US adults

Hollands, Shemilt, Marteau, Jebb, Lewis, Wei, Higgins, Ogilvie *Cochrane Library* 2015
Portion Size Effect: Evidence “largely outside of awareness”: Bottomless soup bowl experiments

Refilled vs. Normal bowls:
- Ate 73% more soup (14.7 vs. 8.4 ozs)
- Perceived ate same (5.4 vs. 5.4 ozs)
- Rated fullness same (5.1 vs. 5.7)

Wansink, Painter & North
*Obesity Research* 2005
Wine glass size: Impact on consumption (keeping portion size constant)

Location: Pint Shop: March-July 2015

Multiple treatment reversal design:
8 periods of 2 weeks:
A (Standard glasses)
B (Larger glasses);
A (Standard glasses)
C (Smaller glasses)
B (Larger glasses)
A (Standard glasses)
C (Smaller glasses)
A (Standard glasses)

Pechey, Couturier, Hollands, Mantzari, Munafo, Marteau BMC Public Health 2016
Wine glass size: Impact on consumption (keeping portion size constant)

Location: Pint Shop: March-July 2015

Wine sales 14% higher in bar area when 175ml served in large glasses (370ml)

Pechey, Couturier, Hollands, Mantzari, Munafo, Marteau BMC Public Health 2016
Changing Environments

Availability

Effective Interventions

- Increasing availability of healthier options
- Reducing price of healthier options
Healthier Eating in the Workplace: Pilot Study

Aim
To examine the impact upon energy purchased in workplace cafeteria of three environmental cues:

(a) **Size** of portions, packages and tableware

(b) **Availability** of healthier vs. less healthy options

(c) **Energy labelling**

Design
18 cafeterias, 6 per intervention
Stepped Wedge Design

Protocol: *under review*
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V. Putting this into practice
Policy options for changing behaviour

- Eliminate choice: regulate to eliminate choice entirely.
- Restrict choice: regulate to restrict the options available to people.
- Guide choice through incentives: use financial or other incentives to guide people to pursue certain activities.
- Guide choice through dis-incentives: use financial or other dis-incentives to influence people to not pursue certain activities.
- Guide choice through changing the default: make ‘healthier’ choices the default option for people.
- Enable choice: enable people to change their behaviours.
- Provide information: inform and educate people.
- Do nothing or simply monitor the current situation.

Greater levels of intervention:

Effective
Acceptable
Acceptability of interventions to reduce consumption of sugary drinks

Public acceptability in the UK and USA of nudging to reduce obesity: the example of reducing sugar-sweetened beverage consumption. Petrescu, Hollands and Marteau PLoS ONE 2016
Thanks!

Requests for papers: tm388@cam.ac.uk @MarteauTM
V Putting this into practice

Task A
As researchers you have been asked by Belfast Trust Hospitals to improve the healthiness of the food purchased by those working in and visiting these hospitals. Design a study evaluating one or more interventions to achieve this.

Task B
As Director of the Public Health Agency NI you are prioritising tackling obesity in your population for 2017. Design a study evaluating one or more interventions to improve the healthiness of the food purchased by your population.
Each table to outline one study: Task A (0.5 tables) & Task B (0.5 tables)

1. Study Aim(s)

2. Intervention(s)

3. Study Design

4. Outcome(s)