Symposium

Applying habit theory to understand and change health behaviour
Habit: what and why?

- Habitual behaviour:
  - Action that has come to be automatically triggered by contextual cues
  - Learned through repetition in consistent contexts

- Relevance to behaviour change:
  - Habits can override motivation
  - So habit-formation may sustain behaviour even where motivation dips
  - Habit-formation is a proposed mechanism for long-term behaviour change
Overview

• Applications to behaviour change
  – Sedentary behaviour (Raluca Matei)
  – Weight management (Rebecca Beeken)

• Understanding the formation process (Gaby Judah)

• Defining ‘habit’ (Benjamin Gardner)

• Discussion (Justin Presseau)
Exploring the acceptability of a habit-formation intervention to reduce sitting time and increase physical activity among sedentary older adults

Raluca Matei*, Ingela Thuné-Boyle*, Mark Hamer*, Steve Iliffe*, Kenneth R Fox**, Barbara J Jefferis*, Benjamin Gardner*

* UCL, ** University of Bristol

This work was funded by the National Prevention Research Initiative (Grant no. MR/J000396/1)
Moving facts

- Sedentary ≠ physical inactivity
- Older adults are more sedentary and inactive than other age groups
- Motivation – a finite and expensive resource (Baumeister, 1998)
- Interventions often have only short-term effects
- Habit formation offers promise for initiating and maintaining behaviour change (Gardner, Sheals et al, 2014; Rothman, Sheeran & Wood, 2009)
Upholding habit development
Gardner, Lally & Wardle (2012)

• Be self-determined: Choose your own behaviour
• Make it easy: Choose simple goals (‘small changes’)
• Make it relevant: Choose everyday cues
• Be reassured: As habit forms, will become easier
• Self-regulate: Self-monitor to track progress
Present study (chair)

- Leaflet based on 10 tips aimed at breaking down sitting:
  - Balance, strengthening, cardio, stretching
  - Standing
- Based on ‘habit formation’ theory as both outcome and behaviour change technique (Lally & Gardner, 2013)
- Co-designed with older adults and experts
‘On your feet to earn your seat!’ leaflet

1. Leave the house daily
2. Make ad breaks active
3. Take a stand
4. Time to stretch
5. Tiptoe through the queue
6. Watch your step
7. Sit to stand with no hands
8. Improve your posture
‘On your feet to earn your seat!’ leaflet

9 Limber up

Below are physical activities which target different parts of the body. Do them in the same order each morning, at your own pace. These activities help to strengthen, lengthen and loosen your muscles, making it easier for you to perform your daily tasks.

Calf stretch
Sit near the front of a stable chair with your feet flat on the floor. Place your hands on one leg, and slowly straighten the other leg. Bring your toes on the straight leg towards you and hold for a count of 5. Swap legs and repeat. Stretch each leg 5 times.

Chest stretch
Reach both arms over your shoulders, behind your back, as if you're trying to scratch the middle of your back. Hold for 5-10 seconds and repeat 5 times.

Toe rise
With feet apart, rise up and down onto your toes. Do this 5 times at first, and build up to 30. Use support if you need to.

10 Wall push-ups

Do 10 push-ups against a wall each morning. This is easier than a push-up done on the floor, and will strengthen your arms, shoulders and chest.

Place your hands flat on the wall in front of you, with your hands at the same height as your shoulders. Gently push yourself forwards and backwards from the wall. Doing wall push-ups in a corner stretches the shoulders and middle portion of your back more.
## ‘On your feet to earn your seat’ leaflet

<table>
<thead>
<tr>
<th>Tip no.</th>
<th>Date:</th>
<th>Mon</th>
<th>Tues</th>
<th>Wed</th>
<th>Thurs</th>
<th>Fri</th>
<th>Sat</th>
<th>Sun</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Leave the house daily</td>
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</table>

**DID YOU KNOW?**

- Keeping active in older age can lower the risk of chronic illnesses, reduce symptoms of depression and improve the quality of everyday life.
- Sitting for long periods is thought to increase the risk of heart disease, diabetes and some cancers.

**HANDY HINT**

Put notes on your fridge, cupboard or wall to remind yourself to do your chosen activities.
Standing (over)view:

- Acceptability study
  - attrition rates
  - adherence rates
  - qualitative responses towards recommendations
  - behavioural responses to intervention
Outcomes and Sta(nd)tistical Analysis

Primary

• Adherence (self-monitored via a tick-sheet over 8 weeks)
• Attrition
• Personal experiences and favourability towards recommendations (qualitative data)

Secondary

• Sedentary behaviour (Gardiner et al, 2011)
• Self-Report Behavioural Automaticity Index (Gardner et al., 2012)
• Physical activity (IPAQ) (Hagstromer, Oja & Sjostrom, 2006)

• Repeated measures ANOVA and Friedman’s test
• Qualitative semi-structured interviews (thematic analysis)
Study design (ed for standing)

• Participants: (60-75 years old):
  - Sample 1 (N=30) (≥6 sitting hours; <150 moderate PA mins.; faith and community centres)
  - Sample 2 (N=18) (≥6 sitting hours; <30 moderate PA mins.; sheltered accommodation)

• Repeated measures: baseline, 4 week and 8 week follow-up
Results

• Attrition:
  ✓ Sample 1 (N=30): 4 participants (13%)
  ✓ Sample 2 (N=18): 6 participants (30%)

• Adherence:
  ✓ Sample 1 (N=26): 51% tips
  ✓ Sample 2 (N=12): 39% tips
Results – Qualitative Responses (& desk based thematic analysis)

• **Easy:**

‘It’s so easy to understand and even they show you! If you found THAT difficult to do, I think you need more than exercise…’ [Female, 60]

• **Beneficial to health:**

‘I’m [now] doing standing with no hands because it does loosen up my stiffness’ [Female, 61]

• **Habit-forming:**

‘But now it’s like a religion. When the adverts come on now, I’ve tried to give up all these teas and coffees as well – and I’ll just try and do exercises instead’ [Male, 68]
## Results - Behavioural (in action) responses

<table>
<thead>
<tr>
<th></th>
<th>Sample 1 (N=26)</th>
<th>Sample 2 (N=12)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline mean (SD)</td>
<td>T2 mean (SD)</td>
</tr>
<tr>
<td><strong>Moderate PA (in mins.)</strong></td>
<td>106.92 (248.80)</td>
<td>89.23 (127.87)</td>
</tr>
<tr>
<td><strong>Walking (in mins.)</strong></td>
<td>285.57 (320.37)**</td>
<td>383.07 (361.22)**</td>
</tr>
<tr>
<td><strong>Total sitting (in mins.)</strong></td>
<td>3504.03 (1784.60)*</td>
<td>2946.73 (1328.67)</td>
</tr>
</tbody>
</table>

* = p < 0.05  
** = p < 0.01
## Results - Behavioural (in action) responses

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<tbody>
<tr>
<td></td>
<td>Baseline mean (SD)</td>
<td>T2 mean (SD)</td>
<td>T3 mean (SD)</td>
<td>Baseline mean (SD)</td>
</tr>
<tr>
<td><strong>PA habit</strong></td>
<td>2.88 (0.91)</td>
<td>3.42 (0.79)</td>
<td>3.45 (0.85)</td>
<td>3.27 (0.99)</td>
</tr>
<tr>
<td><strong>SB habit</strong></td>
<td>3.86 (0.86)</td>
<td><strong>3.78 (0.57)</strong>*</td>
<td><strong>3.52 (0.88)</strong>*</td>
<td>4.00 (0.71)</td>
</tr>
</tbody>
</table>

* = p < 0.05
Conclusions

A habit-based sedentary reduction intervention:

- Is acceptable to *sedentary* both *highly inactive* and *inactive* older adults
- Shows potential to be effective
- Adherence?
‘On Your Feet to Earn Your Seat’, a habit-based intervention to reduce sedentary behaviour in older adults: study protocol for a randomized controlled trial

Benjamin Gardner¹*, Ingela Thuné-Boyle¹, Steve Iliffe², Kenneth R Fox³, Barbara J Jefferis⁴, Mark Hamer⁵, Nick Tyler⁶ and Jane Wardle¹
Please **stand-up** if you have any questions!

If not, **stand out** by doing **sit-ups**!
Habit-formation as a determinant of weight loss in the 10 Top Tips (10TT) Trial: A randomised controlled trial of habit-based advice for weight control in general practice

Rebecca Beeken
Health Behaviour Research Centre, UCL

Funded by the National Prevention Research Initiative (NPRI) Funding Partners
Health professionals in primary care are encouraged to give advice about weight control.

Advice in the Primary Care setting needs to be:
• Quick to explain
• Easy to implement
• Establish permanent behaviour change
Ten Top Tips

1. Keep to your meal routine (helps develop habits)
2. Focus on your food (helps to avoid slips)
3. Look at the labels (helps lower calorie choices)
4. Go reduced fat (-200 kcal)
5. Walk off the weight (-100 to 200 kcal)
6. Pack a healthy snack (-100 kcal)
7. Caution with your portions (-100 kcal)
8. Up on your feet (-100 kcal)
9. Think about your drinks (-150 kcal)
10. Don’t forget your 5 a day (-50 Kcal)

Total calorie deficit = 800-900 kcal
Healthy Habits

• A habit is something you do automatically, like tying your shoelaces or brushing your teeth

• Habits are formed when you do something over and over again in the same place or at the same time

• We know that habits can affect our health in different ways
  – e.g. always taking the stairs instead of the lift at work can increase fitness levels

• Getting into a routine and practising the healthy tips every day, helps turn them into healthy habits
Turning the tips into habits

• Plan ahead
  – How will you fit the tips into your daily routine?
  – Making a plan increases your chances of doing something

• Be prepared
  – Do you need to do anything differently (e.g. pack walking shoes)

• Repeat the tips at the same time or in the same place
  – This makes it more likely that you will form habits

• Keep track of your progress in the logbook
Small-scale study in a volunteer population (Lally et al, 2008)
Design

A two-arm, individually-randomised, controlled trial in obese adults (n=537) in primary care, comparing weight loss in patients receiving a simple weight control intervention based on habit formation theory (10TT) vs. ‘usual care’

Primary Outcome

Change in body weight over 3 months
Secondary Outcomes

• Frequency of behaviors

2a. In the past two weeks I chose reduced fat foods
-2 -1 0 1 2
None of the time Rarely Some of the time Most of the time All of the time

• Automaticity of behaviors

2b. Choosing reduced fat foods is something I do automatically
-3 -2 -1 0 1 2 3
Disagree Neither agree/disagree Agree
Primary outcome: Change in weight at 3 months

- 10TT reduced weight significantly more than usual care at 3 months by an adjusted average of 0.87kg (p=0.004)
Frequency of targeted behaviours

Mean frequency change

Usual Care (n=85) vs 10TT (n=78)
Automaticity of targeted behaviours

![Bar chart showing mean automaticity change between Usual Care (n=85) and 10TT (n=78).]
## Associations with weight loss

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency &amp; Weight loss</td>
<td>-0.09</td>
<td>(-0.11, -0.06)</td>
</tr>
<tr>
<td>Automaticity &amp; Weight loss</td>
<td>-0.08</td>
<td>(-0.11, -0.06)</td>
</tr>
</tbody>
</table>
Conclusions

• A minimal intervention based on habit formation theory can reduce weight and increase the frequency and automaticity of positive health behaviours

• Change in weight was related to increased frequency and automaticity, though the size of the associations was small.
  • Sample size
  • Measuring habits
  • Other processes
  • Only over the short-term
Future work

– To examine effects over 6, 12, 18 and 24 months

– To explore socio-demographic differences in habit formation

– Qualitative work
Thank you

- Jane Wardle (PI)
- Co-investigators
  - Helen Croker, Stephen Morris, Baptiste Leurent, Victoria Vickerstaff, Rumana Omar, Irwin Nazareth
- Study Team
  - Rose Wilson, Laura Fildes
- The National Prevention Research Initiative (NPRI) Funding Partners
- Participating practices and their nurses, GPs, practice managers, health professionals and patients

The role of perceived rewards in habit-formation:
The example of vitamin adherence

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Benjamin Gardner
Mike Kenward
Bianca DeStavola
Robert Aunger

London School of Hygiene and Tropical Medicine
Improving health worldwide
Why study habits?

- Many everyday behaviours habitual (Oulette, 2008)
- E.g. seatbelt use, healthy eating, medication adherence, hygiene...
- But aside from “context dependent repetition” (Lally et al, 2010), we don’t know how habits form.

➤ Knowledge of additional predictors of habit formation would help in designing interventions more likely to make the behaviour stick
Role of reward?

• Classic social cognitive approach:
  – positive attitudes → stronger intention → behaviour → automaticity

• Animal research:
  – Rewards important in reinforcing behaviour (Dickinson et al 1983)

  ➢ Does this reinforcement work for people too?

H1: Reward will moderate the behaviour-automaticity gain relationship, by leading to greater increases in automaticity for each behaviour repetition.
What counts as a reward?

H2: Different psychological features may serve as rewards to reinforce behaviour.

- Pleasure
- Intrinsic motivation
- Perceived utility
- Perceived benefits
Methods

Target behaviour:
• Vitamin C tablets
• Suitable for habit intervention as: simple, once daily, can have constant context

Sample:
• 80 participants from general population (low baseline rates of vitamin C)
• Study 16 weeks long

Self-report from emailed questionnaires every 4 weeks:
• Behaviour
• Automaticity (4 item Self Report Behavioural Automaticity Index)
• Intention
• Reward
• Context stability (same time and point in routine each time)

Analysis: Structural Equation Modelling
• Separate models for each reward type
• Separate models for each timepoint in study
Intervention

- At start of study
- Delivered via online questionnaire
- Information about benefits of vitamin C
- Information about possible benefits of vitamin C tablets
- Planning: told to think about where and when to take the vitamin C tablets, and write this in the questionnaire
Repeated the model with the four different potential reward types at the 4 timepoints.
MEDIATION: Reward affects behaviour which affects automaticity. Classic social cognition approach
Moderated effect

MODERATION: Reward increases the effect behaviour has on automaticity. This is reinforcement.
### H2: What counts as a reward?

<table>
<thead>
<tr>
<th>Tested constructs</th>
<th>Moderation seen?</th>
<th>Direct effect?</th>
<th>Act as reward?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleasure</td>
<td>8 and 12 weeks (bs≥.074, ps&lt;.042)</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>Intrinsic regulation</td>
<td>4 and 8 weeks (bs≥.056, ps&lt;.043)</td>
<td>16 weeks (b=0.247, p=.007)</td>
<td>Yes</td>
</tr>
<tr>
<td>Perceived utility</td>
<td>-</td>
<td>-</td>
<td>No</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>-</td>
<td>-</td>
<td>No</td>
</tr>
</tbody>
</table>
H1: Reward moderates behaviour-habit relationship

Reward (pleasure and intrinsic motivation) each strengthened the behaviour-habit relationship at 2 timepoints
Summary – mechanism of reward

- **Mediated effect** of reward on habit (via intention and behaviour) not seen

- **Moderated effect** of reward seen 4 and 8 weeks post intervention for intrinsic motivation, and 4 and 8 weeks post intervention for pleasure

- **Reward increased impact of behaviour on automaticity gain**
  - Supports reinforcement approach

- **Direct effect** of intrinsic motivation on automaticity seen at 16 weeks
  - Not theoretically supported (due to measurement error?)
  - Still further support that not only effect mediated by behaviour
Conclusions and Implications

• Finding a behaviour rewarding makes it become automatic more rapidly (i.e., is ‘reinforcing’)
• Pleasure of performing a behaviour, and intrinsic motivation may count as reward

Implications for practice:

➢ Consider experience of performing behaviour and how to make it more rewarding/enjoyable
➢ Consider methods to increase intrinsic motivation (autonomy, competence, connection with others)
➢ Less focus on intentions
Thank you!

Questions?

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What is a ‘habit’?
Towards a coherent definition of habit in the health domain

Dr Benjamin Gardner
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UKSBM, 4th December 2014
Characteristics of habit

Habit:

- ...is a determinant of health behaviour  
  (e.g. Gardner et al., 2011; Triandis, 1977)
- ...prompts behaviour automatically  
  (e.g. Verplanken, 2006)
- ...can sustain behaviour where motivation dips  
  (e.g. Neal et al, 2013)

- But what does ‘habit’ mean?
- Habit ≠ repeated behaviour
Reviewing psychological definitions

• Systematic search, conducted Dec 2013
  – Sought literature reviews on habit and health
  – Explicit definition of ‘habit’
  – Published 1998-2013

• Eight eligible reviews/definitions found
## Existing definitions

<table>
<thead>
<tr>
<th>Number of reviews</th>
<th>Habit is…</th>
<th>Example definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Five</td>
<td>A type of behaviour</td>
<td>“behavioural patterns … that are elicited automatically upon encountering associated contexts” (Gardner et al, 2012)</td>
</tr>
<tr>
<td>One</td>
<td>A tendency towards behaviour</td>
<td>“tendencies to repeat responses given a stable supporting context … cognitive processing that initiate and controls the response is automatic” (Ouellette &amp; Wood, 1998)</td>
</tr>
<tr>
<td>Two</td>
<td>A type of automaticity</td>
<td>“a form of automaticity in responding that develops as people repeat actions in stable circumstances” (Verplanken &amp; Wood, 2006)</td>
</tr>
</tbody>
</table>
Habit as behaviour, or a tendency?

• Habit is used to predict / explain behaviour

• If habit is a *type* of behaviour, then this means ‘behaviour predicts behaviour’
  – ‘*A habit cannot be both the behaviour and the cause of behaviour*’ (Maddux, 1997)

• If habit is a *tendency* to repeat behaviour, this means:
  – ‘A person has a tendency to do a behaviour because they tend to do the behaviour’
Habit as automaticity?

• If habit is *automatic* responding…

• Habitual responses can be consciously inhibited
  (*e.g.* Quinn *et al.*, 2010)

• Behaviour is not an inevitable consequence of encountering habit cues
Definition must...

- Distinguish habit and behaviour
- Incorporate:
  - automaticity
  - context-dependency
  - learnedness
  - cue-responding
  - mental cue-behaviour associations
  - possibility of inhibition
A more coherent definition
Gardner (in press)

‘a process by which a stimulus automatically generates an impulse towards action, based on learned stimulus-response associations’
Conclusions: Implications for habit-formation interventions

• Habit does not generate *behaviour*, it generates *an impulse towards* behaviour
  – Habit impulses can be overridden given sufficient skills, resources and mental capacity

*Implication:*

• Habitual behaviour will not remain where people are sufficiently motivated and able to override it
Conclusions: Implications for habit-formation interventions

- Behaviour can be *habitual* yet *infrequently* enacted
  - If cue not encountered, behaviour will not be elicited habitually

*Implication:*

- Habit-formation will only promote frequent behaviour where cues are frequently encountered
Conclusions:
Implications for habit-formation interventions

- ‘Dormant habits’ / ‘Implicit habits’:
  - Stored associations that have not translated into behaviour for some time
    - Cue has not been encountered, or enactment inhibited
  - Interventions to change existing behaviours may disrupt *habitual behaviour* but not underlying habit

*Implication:*
- Old (unhealthy) behaviours may be reignited where dormant habits reactivated by old environments
A review and analysis of the use of ‘habit’ in understanding, predicting and influencing health-related behaviour

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(Received 22 September 2013; accepted 13 December 2013)

The term ‘habit’ is widely used to predict and explain behaviour. This paper examines use of the term in the context of health-related behaviour, and explores how the concept might be made more useful. A narrative review is presented, drawing on a scoping review of 136 empirical studies and 8 literature reviews undertaken to document usage of the term ‘habit’, and methods to measure it. A coherent definition of ‘habit’, and proposals for improved methods for studying it, were derived from
Thank you

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