The psychology of habits: How they form and how to break them

Dr Robert Whelan

Lecture outline

• How are habits learned?
• Everyday habits
• When habits are maladaptive
  – Addiction
• Breaking habits

HABIT FORMATION

• Wood et al. 2002: People recorded once per hour what they were thinking, feeling, & doing
• 43% of actions were performed almost daily and usually in the same context
  – Eating certain foods in same locations
  – Often no conscious thoughts of the action
• Popcorn at a movie
• Cigarette with coffee
Everyday examples

- Participants rated movie trailers
- Given a free drink and box of popcorn
- Unbeknown to them, popcorn was either fresh or 7 days old and ‘decidedly stale’
- Those who occasionally ate popcorn liked the stale popcorn less than the fresh and ate less of it
- However, participants who habitually ate popcorn at the cinema:
  - they liked it less, but they ate just as much as if they had been given fresh popcorn

Habits

- Learned automatic responses with specific features
  - Activation by recurring context cues and
  - (b) insensitivity to short-term changes in goals (a.k.a., not goal dependent)

- Habits are learned
  - Learning is a process by which experience produces a relative and adaptive change in the capacity for behaviour
  - Organisms must learn
    - Which events are important to survival
    - If responses will have positive or negative consequences
Classical Conditioning: Learning by Association

Ivan Pavlov

Conditioning Trial:

Test Trial:

Little Albert (J.B. Watson)
Complex Learning

• Why do we learn new behaviors?
• Classical conditioning only deals with reflex responses that we already possess
• Most of our behaviors are stimulated by something in our environment

• Operant Conditioning
• Defined as - the form of learning concerned with changes in emitted responses as a function of their consequences

Origins of Operant Conditioning

• Edward Thorndike
• Instrumental Conditioning
• “Law of Effect”
  – Satisfying outcome
  – Unsatisfactory outcome

B. F. Skinner

• Skinner coined the term “operant”.
• Disagreed with the “soft” concepts of Thorndike’s “satisfying” and “unsatisfactory” outcome(s)
Inventor

- Cumulative Recorder
- Operant Conditioning Chamber ("Skinner Box")
- Air Crib
- Teaching Machine
Watson vs. Skinner

- Radical behaviorism
  - Attempts to explain all behavior, including private behavior (e.g. thinking & feeling)
- Methodological behaviorism
  - Philosophical position that considers behavioral events that cannot be publicly observed to be outside the realm of the science

Skinner vs. Watson & Pavlov

- Watson and the Pavlov → environment important because it elicited behaviour
- Skinner → environment important because it selected behaviour
  - Reinforcement contingencies the environment provides determine which behaviours are strengthened
Reinforcement

- **Primary reinforcers**
  - food, water, shelter
  - innate biological needs

- **Secondary reinforcers**
  - Conditioned reinforcers
  - something that will provide a primary reinforcer
    - money, poker chips etc.

Desired change in behavior

<table>
<thead>
<tr>
<th>Type of reinforcer</th>
<th>Increases response</th>
<th>Decrease response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive reinforcer</td>
<td>POSITIVE REINFORCEMENT</td>
<td>OMission (withholding positive reinforcer)</td>
</tr>
<tr>
<td>Negative reinforcer</td>
<td>NEGATIVE REINFORCEMENT (escape, avoidance)</td>
<td>PUNISHMENT</td>
</tr>
</tbody>
</table>

Schedules of Reinforcement

- **Continuous reinforcement** - every response is followed by a reinforcer
- **Partial reinforcement** – only some responses get reinforcers
Habits vs. goals

- Habits and goals are driven by different types of reward learning
- **Goal-directed**
  - Computationally demanding mental planning
- **Habits**
  - Computationally undemanding but inflexible
  - Short-term reward value changes → little influence

Habit formation

- Habits often originate in goal pursuit
  - People are likely to repeat actions that yield desired outcomes
  - Goals defined as valued outcome
- Habit strength is a continuum
  - Weak habits performed with lower frequency and/or in more variable contexts than strong habits

Measuring everyday habit strength

- Reaction time measures
  - Shorter RT = stronger habit
  - Word association
- Self reports
- **Self-Report Habit Index:** a questionnaire measure of the experience of automaticity and frequency of past performance
**Reward Mechanisms in Habit Learning**

- Habits strengthen via reward-learning mechanisms
- Unexpected rewards increase dopamine firing
  - ‘stamps in associations’
- These reduce over time as rewards become more predictable

**Reward Pathway**

- There is a axonal network in the brain labeled the ‘reward pathway’
- This reward pathway is activated by:
  - Food, water and sex, activities (such as sky diving, paragliding etc) and exercise

*This reward pathway is also activated by drugs and alcohol*
Neurobiology of Reinforcement

- Drugs of abuse and natural reinforcers produce increases in DA

![Graphs showing AMPHETAMINE and FOOD release over time after amphetamine administration.]

DSM-IV Substance Dependence (Addiction) Criteria

- Clinically significant impairment or distress manifested >=3 of the following, in the same 12-month period:
  - Tolerance, either of the following:
    - (a) Need for markedly higher amounts of the substance to achieve the desired effect
    - (b) Markedly diminished effect with continued use of the same amount of the substance
  - Withdrawal, either of the following:
    - (a) Characteristic withdrawal syndrome for the substance
    - (b) The same (or closely related) substance is taken to relieve or avoid withdrawal symptoms

Characteristics of addiction.

- It is powerful: Monkeys will self-administer to death
- Not everyone who uses drugs becomes addicted.
  - Perhaps 17% for cocaine
- Addiction may have nothing to do with the pleasure/reward associated with taking the drug.
  - Nicotine is very addictive but not particularly rewarding
- Addiction is not all about biology
  - Environmental effects & gene-environment interactions.
  - Biology is very relevant
Tobacco Overview

- Leaves of *Nicotiana tabacum* cured and (usually) smoked
- Indigenous to North America
- Smoked by natives for medicinal, ceremonial purposes (~1 B.C.)
  (enhancing fertility, predicting weather, conducting war councils, enabling vision quests, making peace)

Habits in the brain

- **Goals**: medial prefrontal cortex and the posterior dorsomedial striatum
- **Habits**: anterior dorsolateral striatum (aDLS)/putamen in humans
- **As habits develop, brain activity moves from goal-regions to habit-regions**

Changes in Dopamine Concentration in the Nucleus Accumbens

![Graph showing changes in dopamine concentration](image)
Drug Addiction: Updating Actions to Habits to Compulsions Ten Years On
Barry J. Everitt and Trevor W. Robbins

- Habits could be the building blocks of drug addiction

**Modulators of habit**
- Stress – incl. withdrawal stress
- Pavlovian-instrumental transfer (PIT)
  - A conditioned stimulus (CS) exerts motivational influences on the expression of instrumental behaviour.

**HOW CAN HABITS BE CHANGED?**
The habitual consumer

Wendy Wood, David T. Neal

Research on habits is important for consumer behavior because repetition is a central feature of daily life. About 45% of people’s behavior is repeated almost daily and usually in the same context. The tendency to act on habits is compounded by everyday demands, including time pressures, distraction, and self-control depletion. However, habits are not immune to deliberative processes. Habits are learned over alternatives and that have a slow-to-modify memory trace. In daily life, the tendency to act on habits is compounded by everyday demands, locations, preceding actions) that consistently covaried with past performance. Habits are prepotent responses that are quick to activate in memory contexts (e.g., the same context () that consistently covaried with past performance. Habits are prepotent responses that are quick to activate in memory contexts.

**Abstract**

To explain this phenomenon, we show that habits are a specific form of automaticity in which responses are directly cued by the contexts (e.g., environments) in which the response was performed a response in particular contexts, the context can come to trigger the response directly in the sense that it does not require supporting goals and intentions (Triandis, 1977; people report their intentions to perform some behavior in the next week & the strength of their habits – People with weak or no habits act on their intentions – people with strong habits continue to respond at past performance levels regardless of their intentions.

**Consumers**

- Consumers tend to buy the same brands of products across different shopping episodes
- Purchase the same amounts at a given retail store across repeat visits
- Eat similar types of foods at a meal across days

**Everyday examples**

- Triandis (1977): people report their intentions to perform some behavior in the next week & the strength of their habits
  - People with weak or no habits act on their intentions
  - people with strong habits continue to respond at past performance levels regardless of their intentions

**Habit change**

- Once habits have formed, repeated experiences across multiple occasions are needed to alter old habit memories and develop new ones
- Habit performance can be reinstated easily after people act in counter-habitual ways
- Standard interventions that change people’s beliefs, self-efficacy judgments, and intentions may not change behavior performance
Does Changing Behavioral Intentions Engender Behavior Change?
A Meta-Analysis of the Experimental Evidence

Thomas L. Webb
The University of Manchester

Paschal Sheeran
The University of Sheffield

Meta-analysis of interventions that changed people’s intentions
- Corresponding changes in behavior only for non-habits
  - desire to get flu shot vs. actually getting flu shot
  - Not for habits: desire to eat healthfully vs. actual diet

Habit change
- One dinner has little impact on overall health
- Driving to work on a particular morning contributes minimally to traffic congestion
- As everyday behaviors are repeated
  - cumulative impact on medical, social, and economic outcomes
- Large societal change if people
  - Eat slightly less food
  - Reduce non-essential car journeys

Information campaigns
- Policy interventions → information campaigns
  - Daily food intake guidelines → various pyramid shapes, 5 fruits & vegetables daily etc.
  - Daily ozone reports → limit nonessential driving
- Information campaigns don’t often work
- Meta-analysis of 110 reports of the effectiveness of media interventions to curb substance abuse
  - Substance abuse increased although attitudes became more negative
Environmental cues

• Automatic responding that develops as people repeat actions in stable circumstances

• As people repeat actions, decision making recedes, and the actions come to be cued by the environment
  – Environment trigger habitual responses directly without input from intentions

• Disrupting environmental cues renders habits open to change

Changing environment

• People’s attempts to change behavior
  – 36% of their successful change attempts involved moving to a new location
  – 13% of unsuccessful attempts involved moving

• Context change disrupted automatic actions

• College students transferring to new university
  – Exercise intentions aligned more with actions

• Provide new city residents with a free bus pass
Changing habits: policies

- ‘Sin’ taxes: Cigarettes, sugary drinks

Contingency management

- Can change habits by providing rewards for alternative behaviour
  - Voucher-based treatment
    - Points accumulate for submission of drug-negative samples
    - Points start out very low and can be exchanged for merchandise at any time
      - Points for the first clean sample were worth $2.50
      - and each subsequent sample was worth $1.50 more
      - 1 Month: Each drug-negative sample was worth $16.50.

Contingency Management

- Key features to CM programs:
  - Identification of clinically relevant behaviour
  - Objective measurement of the behaviour
  - Selection of a reinforcer desirable to the target population
  - Linking target behaviour to the application of the reinforcer
Obesity presents an enormous public health burden \[1\]. It also places substantial economic costs on society\[3\]. It is crucial that the contents will be complete or accurate or up to date. The accuracy of any information contained herein is not guaranteed. The publisher does not give any warranty express or implied or make any representation as to the completeness, accuracy, or up to date nature of the information contained in this document.

**Background**

Many everyday health-related actions are performed repetitively and automatically, and repetition reinforces and establishes this association in memory (Wood & Neal, \[26\]). While enactment of the habitual response is automatically activated. When a new behaviour has been performed repeatedly and consistently in the past, the habitual response is automatically activated. While enactment of the habitual response is automatically activated.

**Weight loss requires consistent application**

Healthy Lives, \[35\] 60 minutes of walking at a brisk pace \[\[4.5 \text{ mph}\]\] is recommended. More activity \(45-60 \text{ mins}\) may be beneficial to health. The key is to be consistent and repetitive.

**Eating satisfying portions of low-energy-dense foods**

Eating satisfying portions of low-energy-dense foods, such as vegetables, fruits, or whole grains, can help reduce energy intake. Portion sizes have increased in the past 30 years; up by 135\% in 5 years \[27\]. Snack consumption is related to a substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, \(\frac{\text{replacing meals with snacks}}{\text{contributes to excess energy intake and weight gain.}}\]

**Effectiveness of intervention**

Randomised controlled trial of habit-based advice for weight control in general practice \[52\]. Weight loss requires consistent application of the habit. Strong, deliberate intentions have been shown to have a reduced influence on the development of automaticity. People who succeed at long-term weight loss tend to have a flexible approach to their diet, and they maintain their weight loss by using a rigid approach to their diet.

**Conclusions**

We discuss techniques for promoting habit formation, tracked using an automaticity-specific subscale of the SRHI, was found to typically follow an asymptotic curve (see Figure 1): initial repetitions caused strong, deliberate intentions have been shown to have a reduced influence on the development of automaticity. While enactment of the habitual response is automatically activated. While enactment of the habitual response is automatically activated.

**References**

Time pressure

- Participants in a travel simulation:
  - given varying amounts of time to take a new subway route that differed from their habitual one
  - Unlimited participants followed the new route with few errors of relapse to the old habit
  - Under time pressure Habit slips

Conclusion

- How are habits learned?
- Everyday habits
- When habits are maladaptive
  - Addiction
- Changing habits