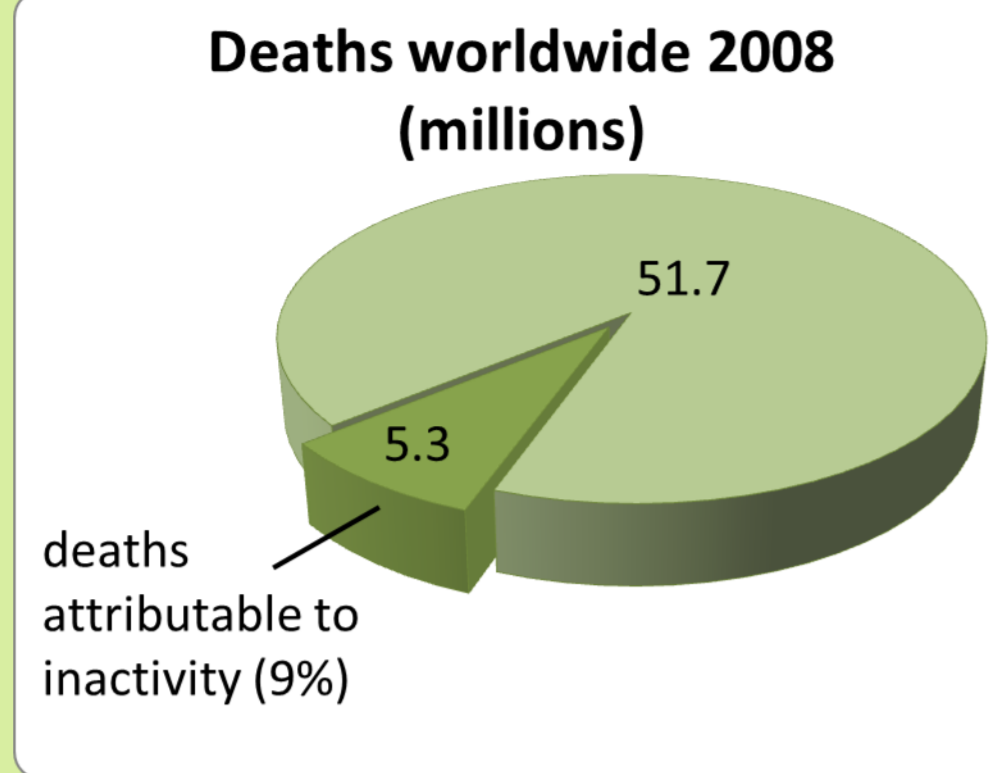


1. The problem

Sedentary lifestyles can **seriously impact on health**, contributing to obesity, cardiovascular problems and early mortality (Lee et al., 2012).

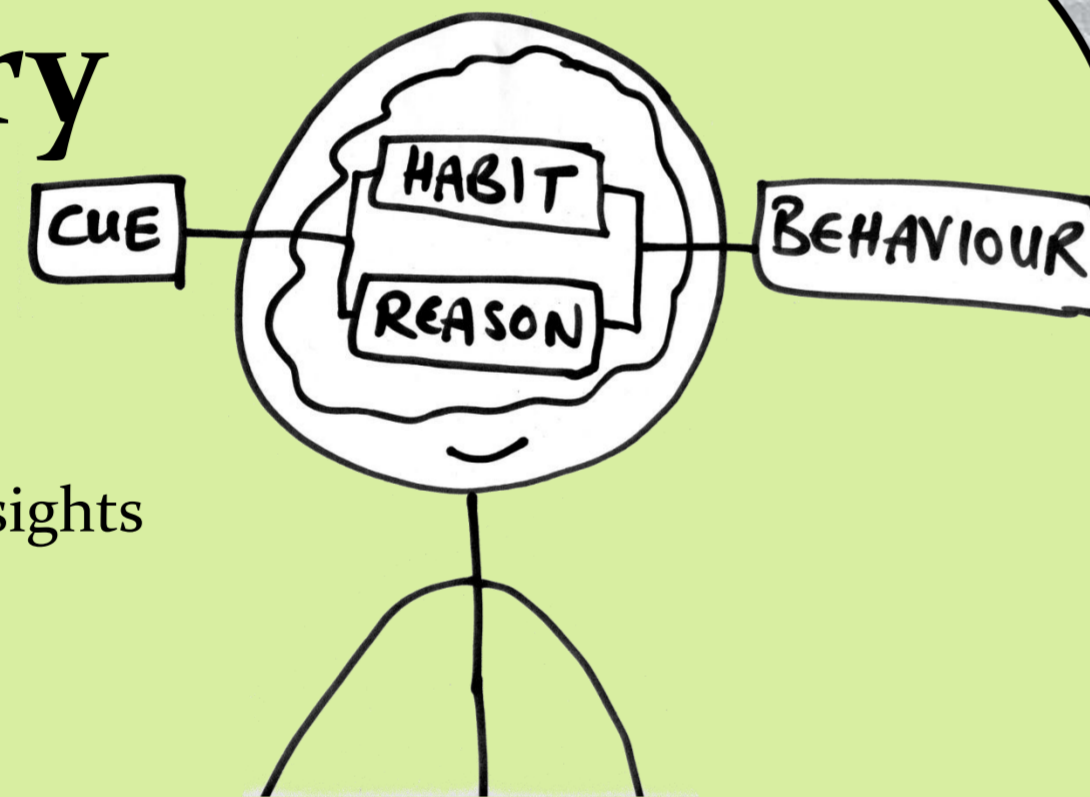
Yet humans often act in ways that are **detrimental to their own well-being**, despite having sufficient information about the potential consequences of their actions.

Many attempts to change health behaviour fail, often because the behaviour is habitual. For example, a meta review of smoking cessation during pregnancy found a success rate of just 6% (Lumley et al. 2009).



2. The theory

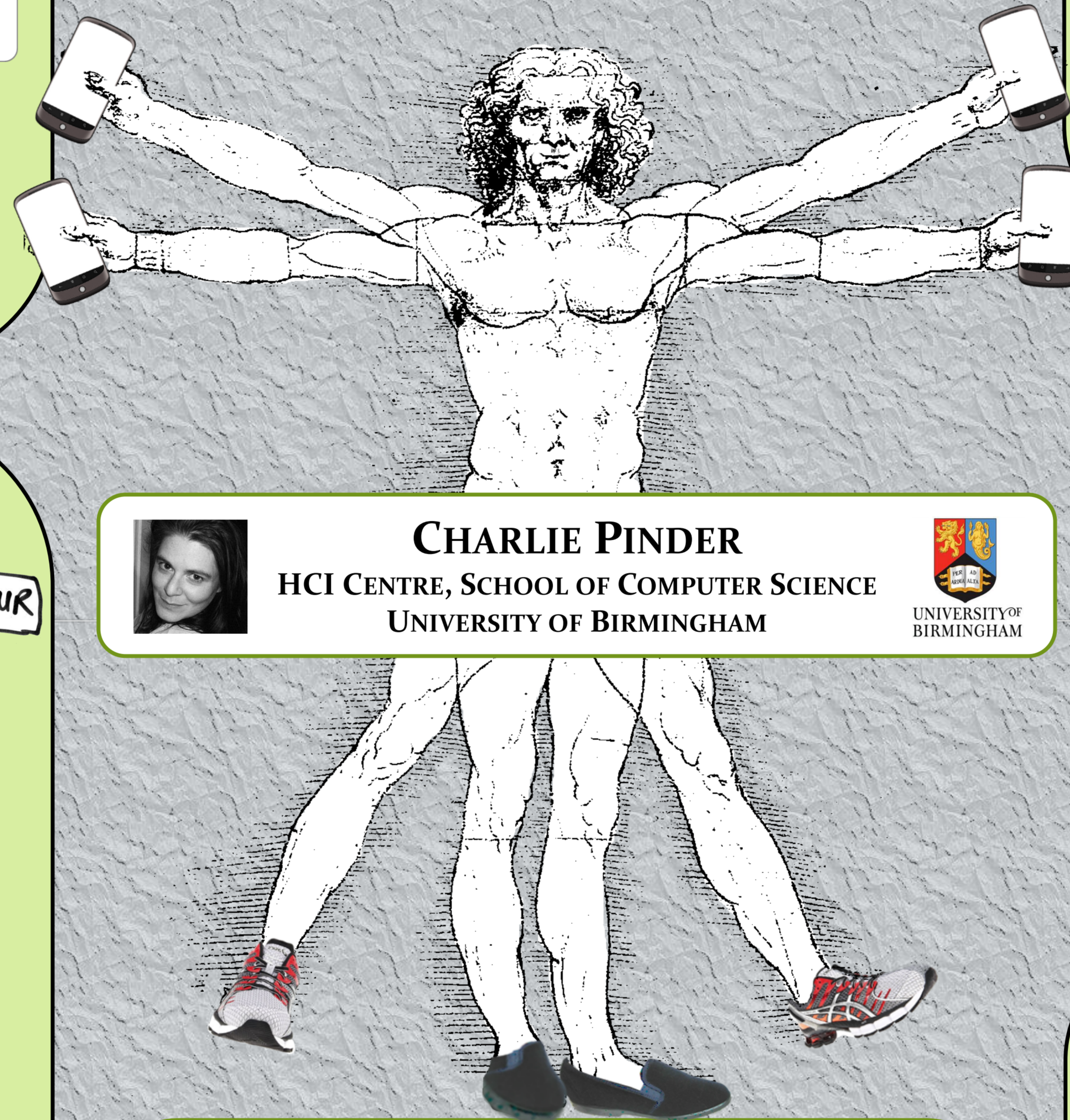
Dual-process models of **behaviour** and psychological **theories of habit** give key insights into why people persist in bad health habits.



- Habits are highly cued by **context**: so a cue might result in a behaviour without the conscious reasoning system being involved!
- Habits are behaviours that are performed **automatically**, which means they are relatively impervious to targeted information (Orbell & Verplanken, 2010).
- Habits may take 18-254 days to form (Lally et al., 2010), so new habits take time to bed in, while old habits are difficult to change and prone to persisting.
- Habits are triggered in the 'associative machinery' (Kahneman, 2011) of the brain.
- Habit-breaking techniques include: **changing environmental cues**; altering the **behavioural associations** with those cues; and altering the **cognitive biases** that filter and shape perceptions of cues.

WILL THE SEDENTARY SMARTPHONE OWNER PLEASE STAND UP?

BREAKING BAD HEALTH HABITS USING TECHNOLOGY



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References

1. Kahneman, D. (2011). Thinking, Fast and Slow. Farrar, Straus and Giroux.
2. Lally, P., van Jaarsveld, C. H. M., Potts, H. W. W., & Wardle, J. (2010). How are habits formed: Modelling habit formation in the real world. *European Journal of Social Psychology*, 40(6), 998-1009.
3. Lee, I.-M., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N., & Katzmarzyk, P. T. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *The Lancet*. Elsevier.
4. Levine, J. A., Vander Weg, M. W., Hill, J. O., & Klesges, R. C. (2006). Non-exercise activity thermogenesis: the crouching tiger hidden dragon of societal weight gain. *Arteriosclerosis, thrombosis, and vascular biology*, 26(4), 729-36.
5. Lumley, J., Chamberlain, C., Dowswell, T., Oliver, S., Oakley, L., & Watson, L. (2009). Interventions for promoting smoking cessation during pregnancy. *Cochrane Database Syst Rev*, 3. Wiley Online Library.
6. Orbell, S., & Verplanken, B. (2010). The automatic component of habit in health behavior: habit as cue-contingent automaticity. *Health psychology: official journal of the Division of Health Psychology, American Psychological Association*, 29(4), 374-83.

3. Practical applications

Increasing ownership of smartphones equipped with sensors presents an opportunity for **persuasive, pervasive** technological interventions to change people's sedentary habits.

Pervasive technology is always on, providing the opportunity for context-appropriate interventions. It is relatively easy to measure general activity using accelerometers in smartphones, and there is evidence that it is **differences in general non-exercise activity**, rather than differences in exercise regimes, that are **associated with differences in obesity** (Levine et al., 2006).

Persuasive technology tries to change your behaviour. The purpose of my research is to explore how to **effectively break bad habits** (and instil new ones) **using technology**.

4. Method

The plan is to test a variety of interventions to change habits:

- cognitive bias modification games (to change how cues are perceived);
- training to associate cues with new behaviour both in practice and via virtual association games;
- intermittent rewards and feedback;
- commitments to implementation intentions.

The interventions will be delivered within a long-term study (at **least 6 months** to test the longevity of the habit-breaking and habit-forming strategies), distributed via app store (to **maximise participants** and ease updates).

5. Evaluation

To determine which interventions are most effective in breaking habits, and which are most persistent in forming new ones, the plan is to use the smartphone platform to track interactions and quantitative behaviour changes, and to request qualitative feedback.

Issues with the evaluation include:

- A trade-off between user-configuration (to drive engagement) and effective evaluation.
- Difficulties in measuring the cognitive aspects of the system, including which process is active, and user engagement. For example, how best to establish whether cognitive bias modifications have been successful?