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Habit and climate change

Bas Verplanken and Lorraine Whitmarsh

Many climate-relevant behaviours are habitual. Habits are memory-based propensities to respond automatically to specific cues, acquired by repetition of behaviours in stable contexts. Socio-cognitive models are widely used to predict climate-relevant behaviours, but by positing behaviour as intentional, provide a poor account of habitual behaviours. While unsustainable habits are *barriers* to change, their very features (frequent, automatic and resistant to change) also make them *desirable* for sustainable behaviours to obtain. While informational approaches are generally ineffective for breaking habits, legislation, incentives, 'nudges', implementation intentions, competitions, and 'moments of change' (e.g., moving house) are more effective. Linking behaviour to identity and a stable context can ensure new habits to endure. Psychological theories and policy efficacy can be greatly improved by attention to habits.

Address
Department of Psychology, University of Bath, Claverton Down, Bath BA2 7AY, United Kingdom

Corresponding authors:
Verplanken, Bas (b.verplanken@bath.ac.uk), Whitmarsh, Lorraine (lw2253@bath.ac.uk)

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Introduction

Individuals and households have an impact on the environment and are contributing to the increase in atmospheric greenhouse gases. Tackling climate change will require profound behaviour change across a range of activities [1•]. In this article we focus on behaviours such as the way we travel; things we buy; how we deal with waste, energy and water; and how we spend leisure time. These activities are often routine or 'habitual', recurring in unchanging settings [2]. For example, transport [3••,4,5•], meat consumption [6], recycling [7], and water use [8•] all have strongly habitual components.

A long tradition has been established to use socio-cognitive models to describe and predict these behaviours, such as the theory of planned behaviour [9] and the value-belief-norm theory of environmentalism [10]. These models posit a motivation to act as the key determinant of behaviour, which may be fuelled by beliefs, values and attitudes. However, despite favourable beliefs, positive attitudes and a motivation to act, these often do *not* translate into actual behaviour [11]. Indeed, a meta-analysis of studies on belief in climate change showed only a weak relationship with actions that mitigate against it [12•].

While socio-cognitive models are valuable in describing new or infrequent behaviour, they provide a poor account of habitual behaviour. Habits can be defined as '(. . .) memory-based propensities to respond automatically to specific cues, which are acquired by repetition of cue-specific behaviours in stable contexts' (p. 4) [13••]. Thus, contrary to how the concept is often used, 'habit' is not the same as 'past behaviour'; repeating a behaviour may lead to the formation of a habit, that is, a memory trace, which then may lead to habitual responses when the individual encounters the context in which the habit was formed [14]. While the socio-cognitive models posit motivation ('willpower', i.e., *internal* control) as the key driver of behaviour, which occurs typically when individuals engage in new behaviour or adapt to new circumstances, habits represent regularity. Habitual behaviour is elicited by specific cues in stable and recurrent performance contexts (i.e., *external* control). Reflecting the powerful influence of habit, studies that include both socio-cognitive variables and a measure of habit tend to find that the latter dominates in accounting for frequently performed behaviours [5•,6,8•,15–17]. Habits come with 'tunnel vision' and 'inertia'. This manifests as a diminished interest in new information [18] and sticking with a habitual choice even if better alternatives are available [3••,19–21].

Motivational and habit accounts of behaviour are both important to consider [14,22,23]. Pro-environmental behaviour may start being controlled by motivation, for instance driven by a concern about global warming [51]. Motivational forces discontinue to exert influence behaviour once a habit has been firmly established and habit cues in the performance context take charge. However, motivational forces may return to operate when habits are disrupted or an individual attempts to change course [18,24].

Breaking unsustainable habits

It is almost tautological to state that habits are difficult to overcome. There are good reasons why this is difficult,

which primarily relate to the automatic nature of habitual behaviour and the performance context — the 'habit architecture' — that sustains it. Memory traces that form habits have been practised extensively and cannot easily be erased. While it is possible *not* to perform a habitual act, if one is motivated to do so, this will not affect the existence of the habit itself. Walker *et al.* [25] demonstrated that employees of a relocated organisation who switched to sustainable commuting were building up a new habit while still carrying their old car use habit, which thus provided the danger of habit slips and relapses. Another problem is that it is difficult to be aware of what triggers a habit. Although monitoring one's own behaviour in order to avoid unsustainable habits and make sustainable choices is not impossible, this requires mental resources, which can easily be exhausted [26]. Also, people may misattribute control over habitual behaviour to their own willpower, whereas in reality this behaviour is controlled by the performance context [27].

Which tools are available to tackle unsustainable habits? A variety of intervention techniques have been deployed in the pro-environmental behaviour domain [28••,29]. Some approaches aim directly at behaviour change without necessarily capitalising on a pro-environmental attitude or motivation. An arguably straightforward approach is *legislation*, which may be effective in changing behaviour, if it is sufficiently targeted, supportive and equitable [30,31]. By reshaping the context of action (i.e., behavioural cues), policy making and legislation can discourage unsustainable habits or make them illegal [32]. Another approach that capitalises on habit principles is the use of *monetary (dis)incentives* (e.g., rebates, vouchers, taxes) to discourage unsustainable behaviour and make (pro-environmental choices. Maki *et al.* [33] provided meta-analytic evidence that such incentives can change behaviour and that, contrary to what is often suspected, some effects may remain after the incentive is removed, which may be accounted for by the formation of habits [34].

Another approach that attempts to discourage unsustainable behaviour and encourage choices without explicitly capitalising on attitudes or mental resources is summarised by the popular term *nudging*. These techniques manipulate the performance context in a such a way that pro-environmental choices are more likely. An example is to present a 'green' option as the default option amongst less sustainable alternatives. Ebeling and Lotz [35] tested two versions of energy contracts which included a 'green' option of uniquely use energy from renewable sources, which was presented as either 'opt-in' or 'opt-out'. The latter was significantly more frequently chosen than the former. Kurz [36•] manipulated the menus in a restaurant such that vegetarian options were more saliently presented compared to a control restaurant, which resulted in an increased sale of vegetarian meals.

It should be noted that while the use of legislation, monetary incentives and nudging techniques to tackle unsustainable behaviour may have some traction, their impact should not be overestimated and cannot be expected to make people adopt sustainable lifestyles. Legislation takes a long time to accomplish and requires political consensus. Effect sizes of financial rewards are modest at best. Nudging techniques are limited to specific behaviours in well-defined contexts.

Habit discontinuities

When one intervenes can be as important as *how* one intervenes. One approach is to capitalise on disruptions in people's lives or in the wider environment. People go through transitions such as leaving school, moving house, starting a family, or retirement. Also, environments may suddenly change, for instance through infrastructural changes or events such as the COVID-19 pandemic. These situations disrupt existing behaviours and habits and may be important moments for change. In those circumstances people may need information, consider options, are more likely to be guided by their attitudes and values, and may be 'in the mood for change', which may encompass more than merely an adaptation to a new situation. When habits are disrupted people may have to reconsider their options, and attitudes and values may thus come into play. If one holds pro-environmental attitudes and values, sustainable behaviours are more likely to occur [31,37,38–41]. Habit disruptions may thus provide unique opportunities to boost the effectiveness of behaviour change interventions [25,42,43•], which has been denoted as the *Habit Discontinuity Hypothesis* [41]. For instance, in a field experimental study Verplanken and Roy [43•] demonstrated that an intervention aimed at promoting sustainable behaviours was more effective if delivered within three months of people moving house, compared with a no-intervention condition and with people who had not relocated. The higher sensitivity for information can also be exploited in advance of a discontinuity, for instance by providing information that may assist people's decision where to relocate [44]. The principles implied by The Habit Discontinuity Hypothesis can also be applied at an organisational level, for instance by analysing an organisation's habits and routines and opportunities for changing them in a sustainable direction [45].

Building sustainable habits

While unsustainable habits are barriers to change, the very features of habits make them *desirable* for sustainable behaviours to obtain. That is, one would want sustainable behaviours to be executed frequently and automatically and difficult to change. This requires a proper habit architecture, that is, a performance context that is stable and effective in allowing unobstructed performance. While behaviour change interventions may create or change behaviour in a sustainable direction, consolidating these into habits might thus be adopted as a distinct intervention goal.

Traditional intervention techniques such as informational campaigns have not only little success because of the limiting influence of unsustainable habits, but also because those who *are* motivated to change may be unable to turn this into actual behaviour. Apart from conditions such as financial or infrastructural constraints [29], people may not have sufficiently articulated plans to act. For instance, Grimmer and Miles [46] found that participants who had concrete plans of buying pro-environmental products were more likely to turn their intentions into behaviour. The use of *implementation intentions* have been found to be effective to alleviate this problem. Implementation intentions are specific plans where, when, and how to act [47]. Such plans are particularly commensurate with forming habits, as they formulate the exact cues and responses that, by sufficient repetition, may turn into future habits [6].

An unusual type of intervention is 'gamification' of behaviour. Participants in such interventions typically compete in teams for a certain period of time, such as units in an organisation, and promote for instance carpooling or electricity use. These interventions combine a number of principles affecting behaviour, such as normative pressure, information diffusion, and habit formation. While positive results have been demonstrated which lasted beyond the actual game period [48,49], more research is needed to identify the exact underlying mechanisms of this type of intervention.

The interventions discussed in this section require a degree of pro-environmental motivation, for instance in the form of pro-environmental values. One source of motivation may be information people acquire from the media, for instance about extreme weather events or disasters that can be attributed to climate change. This may lead to concern and even 'eco-anxiety' [50–52]. While this term pertains predominantly to negative feelings for many people, for others this anxiety is mixed with positive emotions such as hope, optimism, and determination, and is associated with pro-environmental attitudes, values and, importantly, pro-environmental behaviour [52–55]. For these individuals anxiety about global warming may thus be a motivation to act. Eco-anxiety may also have the potential to serve as catalysts for others to move in a sustainable direction, for instance in the form of volunteering, participating in pro-environmental projects, or other forms of pro-environmental action, and thus help to build collective pro-environmental habits.

Longevity of pro-environmental habits

Once habits are in place, what makes them stick? As habits are controlled by the performance context, the stability of that context is the prime condition for the longevity of habits. In some contexts stability can be guaranteed by legislation, such as keeping maximum speed limits. However, it is not unreasonable to suggest that pro-environmental habits may benefit from being intrinsically motivated [56,57]. Internalization of such habits may be indicated by associations with pro-environmental values and some form of ecological identity [58,59]. For instance, pro-environmental food behaviours were more strongly related to past behaviours (habits) amongst those with stronger pro-environmental self-identities [60]. Interventions to link existing pro-environmental behaviours with a 'green' identity may thus solidify those behaviours as pro-environmental habits. This may for instance be done by having individuals reflect on their pro-environmental credentials in the past [61], or by applying self-affirmation techniques [62].

In the long run, if and when habits are well established in the population, these may become part of social practices [2] and be supported by policy measures and legislation [32]. Social practices are bundles of attitudes and behaviours which in a society at a given time are considered as meaningful and culturally accepted, if not promoted, such as hygiene, safety, or indeed sustainable routines. For instance, separating waste for recycling is a widely prevalent habit and is integrated in people's household behaviours and supported by infrastructure.

Conclusion

Our review has highlighted that habits are a key driver of human behaviours that contribute to climate change via routine carbon-emitting activities. Habits can be a barrier to effective interventions to mitigate unsustainable behaviour. However, when they are factored into intervention designs, habits can lead to more durable, low-carbon and climate-resilient behaviours. Psychological theories and policy efficacy can therefore be greatly improved by attention to habits.

Conflict of interest statement

Nothing declared.

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Papers of particular interest, published within the period of review, have been highlighted as:

- • of special interest
- •• of outstanding interest

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This critical review synthesises psychological insights for tackling climate change, and highlights important areas to improve the discipline's contribution in this respect. Habits (driving, energy use, food choice, etc.) are

highlighted as a key driver of climate change and an important barrier to 'behavioural plasticity' (how readily a behaviour can be changed).

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3. •• Gao K, Yang Y, Sun L, Qu X: **Revealing psychological inertia in mode shift behavior and its quantitative influences on commuting trips**. *Transp Res Part F Traffic Psychol Behav* 2020, **71**:272-287

This article investigates habit as inertia to shift to alternative courses of action. One problem in correlational studies that pit attitude-driven against habit-driven behaviours is the lack of information about participants' expectations of behavioural outcomes of the preferred and alternative options. This may lead to endogeneity in the analyses and may portray a rational choice process as habit (i.e., a person repeatedly considers all outcomes, but keeps preferring the 'habitual' one). In a clever personalised scenario experiment the authors demonstrate the existence of' true' habit inertia in travel mode shift behaviour while controlling for potential endogeneity in the analyses.

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In a large Swedish survey on travel behaviour, this study finds that driving habit is a strong predictor of modal choice across all types of trip, particularly for leisure and shopping. These results are amongst the latest to demonstrate the power of driving habits to generalise across different types of journey.

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This meta-analysis investigates correlates of belief in climate change. The analysis revealed that demographics, subjective knowledge, and experience of extreme weather were less important than values, ideologies, worldview and political orientation. Effect sizes of correlations between beliefs in climate change and intentions to act were only small to moderate. Given the well-known intention-behaviour gap, the relation between belief in climate change and behaviour is likely to be very small.

13. •• Verplanken B (Ed): *The Psychology of Habit: Theory, Mechanisms, Change, and Contexts*. Springer; 2018

This collection is a comprehensive overview of habits research, and includes evidence on climate-relevant habits and of interventions to break and create habits. Through a contributions from leading habit researchers, this volume addresses many of the issues raised in the current paper, such as the challenges of and opportunities for breaking habits including habit discontinuities.

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This textbook provides a thorough overview of interventions to foster pro-environmental behaviours, including habits. Focusing particularly on water, energy, food and travel (and thus spanning both climate mitigation and adaptation actions), the volume includes many of the types of behavioural interventions noted in the current paper, such as informational, social, financial and structural measures to change behaviours. It identifies more research is needed particularly in how to change food habits — dietary choices being a major contributor to climate change.

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