Habit and habitual behaviour

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Habit and habitual behaviour

Writing in 1899, William James observed that "ninety-nine hundredths or, possibly, nine hundred and ninety-nine thousandths of our activity is purely automatic and habitual" (James, 1899, pp65-66). Nearly 125 years later, the concept of habit continues to stimulate important research regarding the most useful definition of habit, and how to harness habit to understand, predict, and change health-related behaviour (e.g., Gardner, 2015; Verplanken, 2018; Wood & Runger, 2016). Phillips and Mullan (2022) offer a thoughtful synthesis of theory and evidence regarding how habit can be applied to complex health behaviours. Their review addresses an important question that habit researchers are often asked: how credible is it to propose that learned cue-behaviour associations can underpin and sustain complicated real-world health behaviours? Drawing on a definition of complex behaviour as that which involves separable components and a greater number of sub-actions (or 'steps'), Phillips and Mullan address this question by suggesting that the same concept - i.e., habit - can underpin both simple and complex behaviours. Significantly however, they argue that 'complex habits' should be theorised differently to 'simple habits', to better recognise the multiple components of complex habits and the rewards that Phillips and Mullan suggest are needed for complex habits to form. In this commentary, we expand discussion of two areas of Phillips and Mullan's argument. First, we debate aspects of the definition of habit. Second, we highlight the importance of distinguishing between 'habit' and 'habitual behaviour' when considering behavioural complexity. We argue that conceptualisations of key terms have important implications for understanding, measuring and changing habit and habitual behaviour.

What is 'habit'?

Defining a phenomenon is vital for understanding and sharing ideas relating to that phenomenon. Habit is a social construct, for which there is not an objectively 'right' or 'wrong' definition. Definitions of habit must be judged according to their usefulness. Three

characteristics of a useful definition are that it is clear, coherent and consistent with theory and evidence. Perhaps owing to its behaviourist roots, definitions within psychology have traditionally portrayed habit as a form of behaviour (see Fleetwood, 2021; Gardner, 2015). This is problematic because defining habit as a *type of* behaviour lacks coherence with the many theories that portray habit as a *determinant of* behaviour (e.g., Hall & Fong, 2007; Maddux, 1997; Triandis, 1977). This problem prompted calls for habit to be defined independently of the behaviour that it generates (Ajzen, 2002; Verplanken, 2006).

Phillips and Mullan define habit as an association, not a behaviour: "habits are direct context-response associations learned through repeatedly rewarded responding" (p2; see too Fleetwood, 2021). In our own work, we have preferred to define habit more broadly, as the process by which a context-response association, learned through repeated behavioural performance in a specific context, triggers an impulse to enact the associated response upon exposure to context cues (Gardner, 2015). Our definition is more extensive than Phillips and Mullan's, in that we incorporate an account of how the context-response association drives behaviour (i.e., by automatically generating impulses; but see Fleetwood, 2021). Our definition thereby acknowledges the automaticity that is characteristic of a habitual response (Danner et al., 2007; Verplanken & Orbell, 2022; Wood & Runger, 2016), and so explicitly deems habit a non-conscious process (Bargh, 1994; Sheeran et al., 2013). In encompassing the mechanism through which habit directs behaviour, we believe our definition is more informative and communicative, especially for non-specialist practitioner audiences who may lack knowledge of the automatic processes through which associations generate behaviour (e.g., Strack & Deutsch, 2004). However, unlike Phillips and Mullan's definition, ours has the important limitation that it does not easily correspond with the term 'habit formation'. Habit formation describes the learning of the cue-behaviour association at the heart of the habit process, rather than learning how to enact the habit process. A person who, for example,

forms a habit for eating high-calorie snacks while watching TV learns to associate watching TV (context) with high-calorie snacking (response); they do not learn how to generate the impulse to snack, nor how to translate habit impulses into action. The cognitive architecture required for activating and acting on a context-response association is not learned. In practice however, this distinction is moot because the habit process and association are practically inseparable: the habit process cannot operate without a learned context-response association, nor can the context-response association translate into action without other components of the process. While we believe our definition is more useful for communicating the core concepts, the practical implications of both definitions are identical: to form habit, a response must be repeated in a consistent context such that a context-response association may develop.

Definitions of habit as a process, or as an association, both achieve conceptual independence between habit and behaviour. For coherence, the critique that follows adopts a definition that integrates the most informative and practically important aspects of our preferred definition with Phillips and Mullan's: habit may be seen as a form of learned context-response association that, upon exposure to the associated context, automatically generates impulses to respond.

Is reward necessary to define habit?

Another criterion for a useful definition is parsimony. Definitions should include only core facets of the phenomenon, or antecedents or sequelae of that phenomenon that uniquely distinguish it from related phenomena. Within the definition of habit as a learned cue-behaviour association that automatically generates impulses, the cue-behaviour association is the central phenomenon. Acquisition through learning is not a property of the association itself, but it is nonetheless crucial for describing how the association came into being and for differentiating habitual responding from other forms of automatic response (see Rebar, 2017). Similarly, our augmentation of Phillips and Mullan's definition with information on how the

learned context-response association directs behaviour - i.e., by automatically generating impulses to respond - distinguishes the goal-independent response generated by habit from goal-dependent responses based on outcome expectancies (Wood et al., 2022).

With regards to parsimony, we question the inclusion of reward within Phillips and Mullan's definition. This is unconventional; few definitions to date have explicitly incorporated a history of reward (see Gardner, 2015). Studies have suggested that rewarded actions tend to become habitual more quickly, or more strongly (e.g., Schnauber-Stockmann & Naab, 2019; Wiedemann et al., 2014). Rewarding an action can facilitate habit learning via three mechanisms: by bolstering the motivation to act; by promoting further repetition; and by strengthening the contribution made by each context-consistent performance to the imprinting of the context-response association (de Wit & Dickinson, 2009; Lally & Gardner, 2013). Whether rewards are *necessary* for habit to form is however an empirical question, which requires testing by examining whether habits can form in the absence of reward. Interestingly, habit formation studies spanning oral hygiene, dietary consumption and physical activity domains have shown notable increases in automaticity - i.e., habit formation - among people who received support to form healthy habits, despite a lack of incentives or tangible rewards for change (Judah et al., 2013; Keller et al., 2021; Lally et al., 2010). Yet, it remains possible that, in each of these cases, performing the behaviour - or simply acting on a positive intention - was intrinsically rewarding.

The possibility that a behaviour may yield unobservable rewards demonstrates the difficulty, in real-world health research contexts, of definitively establishing whether a behaviour is rewarding. While a consistently repeated action that yields a detrimental outcome would presumably be unlikely to become habitual, it remains untested whether a health behaviour for which there is zero reward value can become habitual. Importantly however, recent computational modelling research indicates that habit formation is most

parsimoniously portrayed as the result of repeated action-context pairings, independently of the reward value of the action or its outcomes (Miller et al., 2019). While rewards can bolster emerging habit associations, this work suggests that reward is not essential for such associations to form. The assertion that reward is required for habit to form is therefore contentious. In the interests of parsimony, reward does not warrant inclusion within the definition of habit.

Habit versus habitual behaviour

Recognising that habit is conceptually independent of behaviour necessitates acknowledgement of the distinction between *habit*, as a cognitive construct that generates behaviour, and *habitual behaviour*, which is generated by habit. The term 'habitual behaviour' has been defined broadly, to capture any behaviour facilitated in some way by habit (Gardner, 2015). There are multiple ways in which habit can generate behaviour. As Phillips and Mullan (2022) point out, any behaviour can be deconstructed into discrete phases of selection and performance. For example, enacting the complex behaviour of 'exercising in the gym' requires opting to 'exercise in the gym' rather than undertake any possible competing action, and performing a sequence of 'smaller' actions that comprise the act of 'exercising in the gym', such as changing into gym clothes, running on the treadmill, lifting weights, and so on. As Phillips and Mullan emphasise, this distinction is of less practical relevance for simple actions: for 'flicking a light switch', for example, opting to flick the switch and enacting the required muscle movements often occur in such rapid succession that they are inseparable in everyday experience[1]. Habit can operate within the selection or performance phases.

[1] Where an environmental disturbance obstructs usual performance - for example, the light switch has been moved from its usual location - the sequence involved in 'flicking the switch' would be extended to include 'looking for the switch' and any other actions required to recover progress towards 'flicking the switch' (e.g., Vallacher & Wegner, 1987). In this instance, selection and performance would be more noticeably distinct phases for the actor. However, prolonging of the act of 'flicking the switch' would, by Phillips and Mullan's definition of complexity, render 'flicking the switch' a more complex act than usual. This instance thus remains consistent with Phillips and Mullan's assertion that selection and performance merge in experiences of simple actions.

'Habitual instigation' describes habit triggering the selection of and commitment to perform a given action (e.g. 'leaving work' activates the impulse to 'exercise in the gym'; Gardner et al., 2016). 'Habitual execution' describes the automatic progression through at least part of the sequence of lower-order steps required to complete the higher-order action (e.g. the cessation of 'running on the treadmill' activates the impulse to 'lift weights'; Gardner et al., 2016; Phillips & Gardner, 2016). The characteristic effects of habit on behaviour frequency, whereby stronger habit promotes more frequent action, potentially despite a lack of motivation (Ouellette & Wood, 1998; Triandis, 1977), can be attributed to habitual instigation, not execution (Phillips & Gardner, 2016). Habitual execution relates to the quality or consistency of performance (Gardner et al., 2020).

The distinction between habitual instigation and execution has practical value. Researchers wishing to encourage better oral hygiene habits, for example, may wish to improve the frequency with which people engage in tooth-brushing episodes in appropriate settings, which would be facilitated by targeting habitual instigation, or they may wish to 'lock in' effective brushing techniques via habitual execution (Raison et al., 2020). From a theoretical perspective however, habitually instigated and executed behaviours are regulated identically by habit, albeit based on different associations operating at different levels of analysis. Ultimately, habitual instigation of tooth-brushing relies on an association between a context (e.g., finishing the prior act of 'washing my face') and the initiation of the act of 'brushing my teeth'. Likewise, habitual execution is built on associations between finer-grained contexts (e.g., finishing 'brushing top-left quadrant') and finer-grained acts ('brush top-right quadrant'). Habitually instigated and habitually executed actions are different forms of habitual behaviour but are built on the same underlying construct - i.e., habit.

Habit can initiate simple and complex behaviours alike (Gardner, 2022). The conceptual architecture of a habit association - i.e., the specification of a context, a response,

and a contingency between them (Hollands et al., 2016) - does not vary in complexity. Behavioural complexity is a property of behaviour, not habit. While there are theoretical benefits to conceptualising simple and complex behaviours differently, there is no need to reconceptualise habit itself to account for behavioural complexity, nor to question its uniform treatment across different behaviours (Phillips & Mullan, 2022). Phillips and Mullan's term 'complex habit' (e.g., p4) is problematic, and can more usefully and precisely be thought of as a complex behaviour facilitated by habit (i.e. a *habitual complex behaviour*). This seemingly subtle difference is not only theoretically important, but also has practical benefits in communicating more clearly to practitioners that, as Phillips and Mullan note, habit can trigger complex and simple behaviours equally.

Measuring habit versus measuring habitual behaviour

The distinction between habit and habitual behaviour has important measurement implications. Most purported habit measures, including all those considered by Phillips and Mullan, are measures of habitual behaviour - i.e., the extent to which a given behaviour is regulated by habit - rather than habit. These measures treat behavioural performance as a prerequisite for assessing the strength of an underlying habit. For example, the Self-Report Habit Index (Verplanken & Orbell, 2003), and its derivative Self-Report Behavioural Automaticity Index (Gardner et al., 2012), require participants to reflect on whether a behaviour that they perform shows characteristics of a habitual response (Orbell & Verplanken, 2015). Likewise, more objective measures based on the timing or location of an action focus on the consistency with which behaviour is performed, from which habit is inferred.

Measuring habitual behaviour is sensible when seeking to evaluate the extent to which habit may be involved in regulating a behaviour of interest, but where the aim is to test for the presence or strength of habit associations, this approach is flawed. Crucially, habits

can be held yet not acted upon (Quinn et al., 2010). A person with a habit for eating high-calorie snacks while watching TV may purposefully avoid the contexts that elicit their habit responses (e.g., stop watching TV), or inhibit their habit impulses such that they do not instigate the unwanted behaviour when exposed to the context (e.g., tell themselves not to snack; Quinn et al., 2010). For more complex behaviours, a person may abort a habitually instigated performance prior to concluding its execution (e.g., after automatically walking to the kitchen snack cupboard after turning on the TV, stop and walk away; Orbell & Verplanken, 2010). Disrupting a habitual behaviour does not necessarily disrupt habit itself, and so while these strategies may discontinue habitual behaviour, underlying habit associations will remain. Significantly, these habits will retain the potential to trigger the habitual behaviour when old contexts are re-encountered, or when momentary lapses of self-control prevent successful inhibition of the unwanted response. Even people who experience successes in losing weight through dietary and activity change, for example, report continued struggles against derailment from unwanted habit impulses (Gardner et al., 2021). Measures of habitual behaviour will fail to detect potentially important habit associations that pose a risk of relapse into unwanted behaviours.

Measures are available that tap habit independently of habitual behaviour. Habit impulses lead to quicker retrieval of habitual options in the presence of context cues (Danner et al., 2008; Hardwick et al., 2019). These characteristics have inspired the development of families of measures that infer habit associations from rapidly generated response patterns. Lexical decision tasks, for example, involve priming participants with a hypothesised habit cue, and assessing the speed with which they recognise a representation of their habitual response - for example, for habitual runners, the word 'running' - relative to when not primed (Neal et al., 2012). Faster recognition when primed indicates the likely presence of habit. Habit can also be assumed using cognitive interference paradigms, in which desired

responses are incompatible with habitual responses. Habitual responses are mobilised automatically, but if the habitual response is no longer the desired response, it can be overridden by non-habit alternatives (Hardwick et al., 2019). Crucially however, this substitution process is cognitively taxing, so time consuming. Habit can thus be indexed by the frequency with which, under heightened time pressure, the undesired, habitual response is elicited by the cue (Hardwick et al., 2019). Similarly, habit can be revealed by greater response latencies when participants are instructed to retrieve a non-habitual option in the presence of habit cues versus in the absence of such cues (Luque et al., 2020). This measure of 'switch costs' - i.e., the heightened cognitive effort required to respond to a habit cue in a non-habitual way (Luque et al., 2020) - offers a useful illustration of the distinction between assessing behaviour and habit. Within this paradigm, people adapt to selecting non-habitual options, but habits cause them to require longer to do so (Luque et al., 2020). A measure based solely on overt behaviour within this task (i.e., the choices made) would not indicate habit, but response latency measures reveal the cognitive struggle preceding this behaviour.

Existing measures that isolate habit from habitual behaviour may not be so readily compatible with the survey designs that dominate habit research within health psychology (Gardner, 2015), so more practicable, conceptually similar measures are needed. Nonetheless, researchers should be mindful of the limitations of inferring habit from measures of habitual behaviour, and whether doing so may obscure detection of important habits that may not manifest in behaviour. Certainly, when assessing the potential for unwanted 'old' habits to undermine long-term behaviour change, measures of habitual behaviour will likely be inadequate.

Conclusions

We concur with Phillips and Mullan's many helpful recommendations around how best to navigate behavioural complexity when seeking to apply habit to understand or change any

health-related behaviour. For example, while we contend that the concept of reward may not be an essential precursor to habit, we agree that practitioners should encourage repeated performance of rewarding behaviours, because this catalyses the formation of context-behaviour associations (de Wit & Dickinson, 2009). Clarity in terminology and measurement will be key to further developing and harnessing our understanding of the habit concept to support people to enhance their health.

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