Habit and Behavior Change

5

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Contents

Introduction

Why do we behave as we do? Ask your colleague why he is driving to work instead of using public transport, and you are likely to hear some sensible reasons: "It gets me faster to work," "The bus is unreliable," and "I need to carry my bag." While these may be genuine considerations, the most accurate and arguably the most honest answer is "that's what I always do." Ask an applied social psychologist why people behave as they do, and you are likely to be presented with a socio-cognitive model, most likely the theory of planned behavior (Ajzen, 1991). The basic assumption of these models is that *motivation* is driving our behavior and that attitudes and intentions are the most powerful determinants. However, the literature on the relation between attitudes and behavior has always been haunted by one salient finding: while intentions are reasonably good predictors of future behavior, measures of past behavior consistently outperform this prediction and share variance with future behavior that is not accounted for by intentions. There may be many reasons for this (e.g., Ajzen, 2002), but one is that when behavior is frequently executed, it may become dissociated from the intention it originated from. Indeed, Judith Ouellette and Wendy Wood (1998) demonstrated in a meta-analysis of studies which included measures of intentions, past behavior, and future

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K. Sassenberg, M. L. W. Vliek (eds.), *Social Psychology in Action*,
https://doi.org/10.1007/978-3-030-13788-5_5

behavior that frequently performed behaviors were less strongly correlated with intentions compared to infrequently performed behaviors.

In this chapter we will first define what habits are and describe consequences of habituation. We then briefly discuss how habit strength can be measured. The remainder of this chapter is devoted to habit change.

Defining Habit

In a diary study among students, Wendy Wood, Jeffrey Quinn, and Deborah Kashy (2002) established that between a third and half of the reported behaviors were things they did almost daily and usually in the same location. And they did not spend much thinking on those behaviors: their thoughts wandered about 50–60% of the time during those episodes. Thus, repeated behaviors are not only prevalent; they may acquire a quality of automaticity (e.g., Verplanken & Aarts, 1999). Also, a habit is formed when someone repeatedly and automatically responds in a specific way to a specific cue in a recurrent, stable, context (e.g., Wood & Neal, 2007). A cue can be anything, for instance, time (going to the gym at 5 o'clock), location (buying popcorn in the cinema), an object (not resisting that chocolate muffin), a person (joking with your roommate), a physiological state (grabbing a coke when thirsty), or activities (ordering a take-away when watching a football game). These cue-response associations are stored in memory, and a response is automatically triggered upon encountering the cue. We are now ready for a definition of habits as "memory-based propensities to respond automatically to specific cues, which are acquired by the repetition of cue-specific behaviours in stable contexts." (Verplanken, 2018, p. 4). Thus, perhaps contrary to how people talk about habits, a **habit** is defined as a cognitive structure which involves a propensity to act, and not as the act itself (e.g., Wood & Rünger, 2016).

Definition Box

Habit: Memory-based propensities to respond automatically to specific cues, which are acquired by the repetition of cue-specific behaviors in stable contexts.

Let us focus still briefly on the aspect of automaticity. Automaticity comes in many "flavors." John Bargh (1994) distinguished four qualities which define automatic processes and which he dubbed "the four horsemen of automaticity": lack of awareness, lack of intentionality, mental efficiency, and difficulty to control or stop a process. Processes may be automatic in some or all of these features, and this also holds for habits (Verplanken & Orbell, 2003). Thus, most habits are characterized by a lack of awareness and conscious intent, are difficult *not* to do, and are mentally efficient, for instance, allowing you to multitask.

Habits are not necessarily confined to observable behavior. We also have habits of thinking (e.g., Verplanken, Friborg, Wang, Trafimow, & Woolf, 2007; Watkins, 2008). Such mental habits follow the same principles as behavioral habits. Thus, habitual thoughts occur automatically upon being activated by cues in stable contexts. For instance, a person may always have certain thoughts when looking in the mirror, entering a confined space, or encountering a particular person. When these thoughts are negative, such habits may significantly contribute to dysfunctional outcomes such as low self-esteem (e.g., Verplanken et al., 2007) or a negative body image (e.g., Verplanken & Tangelder, 2011).

Box 5.1 Questions for Elaboration

Make a list of things you do frequently. For each habit:

1. Identify the cue which triggers the habitual response, for instance, with respect to food, study, or leisure.

2. Reflect on whether this habit is functional or dysfunctional. Is it healthy or convenient? Might it have harmful consequences?
3. Analyze to which extent Bargh's (1994) "four horsemen" apply: lack of awareness, lack of intentionality, mental efficiency, and difficulty to control or stop. For instance, do you remember making a conscious decision; did you do other things at the same time; would it be difficult *not* to do?

Repeat this exercise for a habit of thinking.

Consequences of Habituation

Apart from being efficient and dealing with the regularity of everyday life, habituation has other consequences. One is that habits come with an **action-oriented mindset**, that is, a cognitive orientation characterized by a focus on executing the behavior at hand. This is in contrast to a **deliberative mindset**, where the individual is oriented toward possibilities and alternatives, for instance, when one is in the process of making an important decision (e.g., Gollwitzer, 1990; see also Keller, Bieleke, & Gollwitzer, Chap. 2). Thus, people in a habit mindset tend not to pay attention to alternative courses of action or to information about the context in which the behavior occurs.

In a research program on transportation mode choices, Bas Verplanken, Henk Aarts, and Ad van Knippenberg (1997) tested this proposition in two laboratory studies. Participants in the first study were presented with a hypothetical travel mode choice situation and had the opportunity to search information about attributes such as travel time or convenience for a number of travel mode options. Previously, the strength of their habit of cycling was assessed. Those who had strong cycling habits selected less information compared to those with weak cycling habits, while the information habitual cyclists sought was predominantly about their own habit: cycling. In a second study, participants were presented with a series of unknown travel situations. Each time they had to "discover" the nature of those situations before making a choice of a mode of travel, for instance, in terms of distance, luggage, or weather conditions. Previously, participants' car use habit was assessed. Strong car use habit participants consistently selected less information than weak habit participants; in other words, strong habit participants needed to know less about the travel context in order to make up their minds on how to travel. This effect appeared even when participants were prompted to deliberate about every situation. These studies thus demonstrated that habit comes with **tunnel vision**, that is, a lack of attention to or interest in information.

Another consequence of habituation is that established habits are not driven anymore by conscious intentions. While goals and associated intentions may form the starting point of many habits, and leave their traces in our cognitive system (e.g., Aarts & Dijksterhuis, 2000), those links may weaken or get lost altogether over time. Habitual acts are then merely instigated by the context cues that have got associated with the behavior, that is, without the involvement of goals or intentions (e.g., Wood & Rünger, 2016). Thus, while non-habitual behavior is under the control of "willpower," habituation shifts this control to the context that triggers the habit. David Neal, Wendy Wood, Mengju Wu, and David Kurlander (2011) demonstrated this in the cinema. Participants were invited to either a cinema or a campus meeting room and were given popcorn while watching movie trailers. The popcorn was either freshly cooked or old and stale. In addition, their habit strength of "eating popcorn in movie theaters" was assessed. Participants who had a strong popcorn habit and received fresh popcorn ate similar amounts compared to strong habit participants who received stale popcorn. However, this was *only* the case in the cinema context, that is, the context in which they performed their habit, and not in the campus meeting room.

Finally, habits are "sticky," in the sense of difficult to override. Suppose you have a strong habit of driving a particular route to work. One day you drive a friend to the airport. While being engaged in a conversation, you suddenly realize you took a turn to work instead of the airport. Thus, in spite of a conscious decision to act differently from an established habit, this habit may still take over. This happens when you are off guard, in this case being engaged in the conversation with your friend. Unintentionally performing a habit under such circumstances has been documented as **action slips** (e.g., Heckhausen & Beckmann, 1990). Sheina Orbell and Bas Verplanken (2010; Study 2) conducted a survey among smokers in public bars 2 months before smoking in pubs became illegal in the UK, who then completed a second survey 4 months after the ban was introduced. The first measurement contained an assessment of the strength of the habit of smoking-while-drinking-alcohol. At follow-up participants were asked to report if they had made accidental action slips by lighting, or nearly lighting, a cigarette since the ban came into force. Forty-two percent of the smokers reported to have experienced such action slips, and this was predicted by the strength of the previously assessed habit strength of smoking when drinking alcohol.

Definition Box

Action-oriented mindset: A cognitive orientation characterized by a focus on executing the behavior at hand.

Deliberative mindset: A cognitive orientation toward possibilities and alternatives.

Tunnel vision: A lack of attention to or interest in information.

Action slip: Unintentionally performing a habit.

The Measurement of Habit

It is not easy to capture constructs as elusive as habits. Although they are prevalent in everyday life, people are hardly aware of them, as you may have experienced if you did the exercise suggested in Box 5.1. Similar to many psychological constructs, there are no ways we can measure habit objectively, so we have to rely on indirect indicators. Three families of measurements have been used to assess habit strength, observations, self-reports, and implicit measures (e.g., Orbell & Verplanken, 2018). Each type reveals a different aspect of a habit.

Some scholars observe behavior and consider the frequency of occurrence as a measure of habit (e.g., Gram, 2010). While observable acts may be the outcome of a habit, behavioral frequency does not capture the automaticity aspect of a habitual action. A physician may frequently refer patients to the hospital, but this (hopefully) is not a habit. Also, systematically observing overt behavior is difficult and time-consuming. Another observation-based instrument is the response frequency measure (e.g., Verplanken, Aarts, van Knippenberg, & van Knippenberg, 1994). Participants are presented with multiple choice scenarios, for each of which they are instructed to choose an option as quickly as possible. The prevalence of one particular choice option across scenarios is taken as a measure of habit. Importantly, time pressure is an essential element, which is not always easy to implement. Also, for each habit domain, scenarios need to be developed and tested, which renders this method somewhat cumbersome.

By far the most prevalent method of assessing habit strength are self-report measures. For a long time habit was equated with past behavioral frequency, which was an inheritance from the behaviorist school. Many studies employed one-item measures of the kind "How often did you do behavior X," followed by response scales such as "never" to "always." However, these measures also ignore the automaticity aspect. In addition, one-item measures are notoriously unreliable and subject to biases. Wendy Wood and colleagues developed the frequency-in-context measure

(e.g., Ji & Wood, 2007). This measure consists of a retrospective self-report of performance frequency weighed by a measure of the stability of the performance context. The unique feature of this measure is the quantification of context stability. However, "context" needs to be defined in each instance. Neither does this measure tap into the automaticity aspect. The most prevalent instrument to date is the Self-Report Habit Index (SRHI; Verplanken & Orbell, 2003; see Box 5.2). This measure consists of 12 items, which are self-reports of the experience of repetition and automaticity. Automaticity is broken down into facets we discussed above: lack of awareness and conscious intent, the difficulty of avoiding the behavior, and mental efficiency. The measure is generic and easy to use. However, a question remains how well people are able to report on such processes. An adapted version of the SRHI, the Habit Index of Negative Thinking (HINT; Verplanken et al., 2007), is used to assess habits of thinking.

Finally, as habits reside as memory traces and manifest as automatic responses, measures that tap into implicit processes have been used to assess habit strength. One such paradigm – the slips-of-action task – capitalizes on the action slip phenomenon discussed above (e.g., de Wit et al. 2012). Participants learn that certain cues are associated with rewards and others are not. Subsequently they are being instructed that these cues lead to losses instead of rewards (a so-called outcome devaluation paradigm). In a later test phase, habit strength is indicated by the failure to avoid responding to the initially rewarding, but later devalued, cues. Implicit measures are arguably the closest one may get to a habit. On the other hand, it is often difficult to establish the validity of such measures.

Researchers nowadays thus have a choice between a number of habit measures and can select the measure that is most suitable in a particular research context. For instance, computerized tasks, such as the slips-of-action task, are more suitable in a laboratory context, while the SRHI is highly suitable for questionnaires. The different measures also tap into different aspects of a habit and may thus be selected on that basis.

Box 5.2 Zooming In: Measuring Habits Using the Self-Report Habit Index (SRHI)

The Self-Report Habit Index (Verplanken & Orbell, 2003) is a generic instrument to assess habit strength. It consists of a stem ("Behavior X is something…"), followed by 12 items. The stem can refer to any behavior. The researcher can choose to formulate this as general or specific as required and, if the researcher so wishes, may include context information (e.g., "Conducting Behavior X in Condition Y is something…"). The 12 items assess facets of habit, including the experience of repetition, lack of awareness and conscious intent, lack of control, mental efficiency, and a sense of self-identity. The items are accompanied by Likert response scales (e.g., 5 or 7 point agree/disagree scales). Items may be slightly modified in order to accommodate a specific behavior or context (e.g., the researcher has to choose a time frame in item 7).

[Behavior X] is something…

1. I do frequently.
2. I do automatically.
3. I do without having to consciously remember.
4. That makes me feel weird if I do not do it.
5. I do without thinking.
6. That would require effort not to do it.
7. That belongs to my (daily, weekly, monthly) routine.
8. I start doing before I realize I'm doing it.
9. I would find hard not to do.
10. I have no need to think about doing.
11. That's typically "me."
12. I have been doing for a long time.

After checking the internal reliability of the scale, the researcher typically averages the items into an overall habit strength score.

Perspectives on Habit Change

Almost by definition, habits are hard to change. The consequences of habituation we outlined above do not bode well for interventions that aim at behavior change through the provision of information and thus changing attitudes and intentions. If habits attenuate attention to information, and if there is no link between attitudes and intentions and behavior, such approaches bet on the wrong horse when aiming at changing strong habits.

So how does one change habits? This is of course one of those million dollar questions. Here we discuss two perspectives. The first is a "micro" level perspective and focuses on the cue-response contingencies that constitute a habit, namely, the use of implementation intentions. The second is a more "macro" perspective, which capitalizes on disruptions of the habit performance context. We will thus focus on the potential for change when contexts change, or when people change context, such as moving to a different city or location.

Using Implementation Intentions to Change Habits

If we zoom in on the mechanisms of habitual behavior, a key element in the process is when a cue triggers a habitual response. The "stickiness" of habits becomes obvious at that very moment: while bypassing our aptitude to reason and deliberate, a habit makes us act instantly and automatically. If one wishes to change habitual behavior, these cue-response moments should be a prime focus. Thus, in designing an intervention, it is of utmost importance to first analyze the habit context and identify the key cue-response occurrences which are to be broken and replaced by new, desired, responses.

One technique that has been proposed to do just that is the formation of **implementation intentions**. Implementation intentions are concrete "IF-THEN" plans, which may put an intention into action (e.g., Gollwitzer, 1999; see also Keller et al., Chap. 2). The "IFs" specify conditions in which action is required, in particular where and when to act. The "THEN" specifies the action itself. Implementation intentions have been found effective means of accomplishing goals, certainly given their simplicity (e.g., Gollwitzer & Sheeran, 2006). Implementation intentions do two important things when applied to changing habits. Firstly, they target existing cue-response links, that is, they break the existing habit. Secondly, implementation intentions specify the very cues and responses which, after successful repetitions, may form the future new habits. Implementation intentions may thus be considered as "instant habits" (e.g., Gollwitzer, 1999).

Sheina Orbell and Bas Verplanken (2010; Study 3) demonstrated that implementation intentions may be effective not only in creating new behavior but in particular instigating *automatic* responses. Participants were provided with a packet of dental floss and instructions how to use the material. They were randomly assigned to an implementation intention or control condition. In the implementation intention condition, they were instructed to write down where and when they would floss every day, such as "After I brush my teeth in the evening, I will floss in front of the bathroom mirror." Habit strength was assessed at baseline and 2 and 4 weeks later. At the end of the period, the remainder of participants' flossing material was collected and weighed, which thus provided a measure of flossing behavior. There were two important results. The first was that, in line with other implementation intention studies, having formed implementation intentions resulted in more frequent flossing, which was established by self-reported frequency and by the weight of the remaining flossing materials. Important for the present argument, an independent assessment of habit strength using the Self-Report Habit Index revealed that in the implementation intention condition, habit strength became stronger over time compared to the control condition (see Fig. 5.1).

Implementation intentions have been viewed as effective self-regulation tools. When applied to the formation of habits, the self-regulation aspect may also apply; by using implementation intentions to create new, desired, and durable

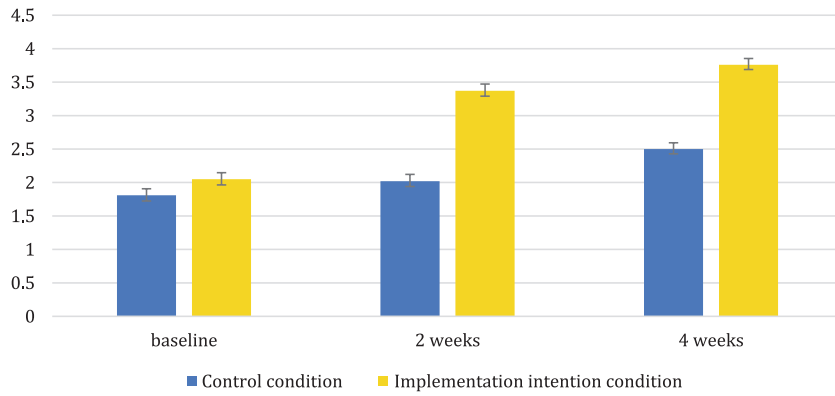

Fig. 5.1 Habit strength of flossing as a function of implementation intentions. (Note: $N = 278$; data from Orbell and Verplanken (2010). Habit strength was measured by the Self-Report Habit Index (Verplanken & Orbell, 2003). The bars present means and standard errors)

habits an individual can exert self-control in accomplishing important goals (e.g., Galla & Duckworth, 2015).

As is the case with any method, the use of implementation intentions has its limitations, especially when applied in the complex world of everyday life. In order to be effective, there are quite some conditions that need to be fulfilled (e.g., Adriaanse & Verhoeven, 2018): ensuring high motivation, formulating sufficiently specific IF-THEN plans, finding the critical cue that triggers the habit, creating strong enough IF-THEN links, and staying motivated and committed to the plan. As can be imagined, this can easily go wrong.

Habit Discontinuities

As habits are contingent on cues in the performance context, it follows that if that context changes, or individuals change context, habits are disrupted. There are many examples of such situations. Some are small or temporary, such as a strike that disrupts your commute. Others are more profound. This is particularly the case when individuals go through life course changes, such as transitions from school to work, moving house, starting a family, divorce, or retirement. Context change may also occur at larger scales, such as when companies reorganize, natural disasters strike, or an economic downturn affects people's financial resources. Whatever the scale of the disruption is, habits are likely to be affected and may no longer be feasible or useful. Or, in Kurt Lewin's (1947) terms, habits "unfreeze." What often happens is that after a while, individuals find their old habits, perhaps adapted to the new circumstances. However, disruptions also provide opportunities for habit change. Under those conditions behavior change interventions might be more effective than in default circumstances; individuals may be more sensitive to (useful) information, for instance, about available options and may be "in the mood for change." This has been discussed as the **habit discontinuity hypothesis** (e.g., see for a review, Verplanken, Roy, & Whitmarsh, 2018).

Definition Box

Implementation intentions: "IF-THEN" plans which specify where, when, and how to act.

The habit discontinuity hypothesis: Behavior change interventions are more effective if delivered when an individual's performance context changes, or the individual changes from one context to another.

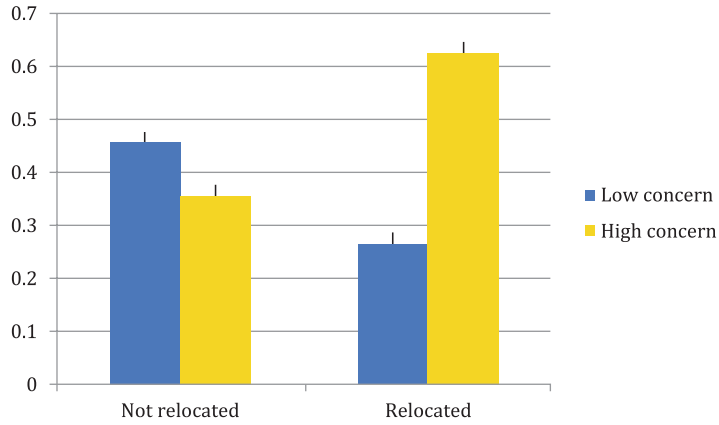

Fig. 5.2 Proportions of sustainable commuting as a function of relocation and environmental concern. (Note: $N = 433$; data from Verplanken et al. (2008); sustainable commuting was defined as any non-car use commuting. Environmental concern was measured by the New Environment Paradigm Scale (Dunlap, Van Liere, Mertig, & Emmet-Jones, 2000). The bars present means and standard errors)

A number of studies provided supporting evidence for the habit discontinuity hypothesis. For instance, Bas Verplanken, Ian Walker, Adrian Davis, and Michaela Jurasek (2008) conducted a survey among university employees and asked how they commuted to work. They also assessed their level of environmental concern. Unsurprisingly, environmentally concerned employees were less likely to commute by car than environmentally less concerned employees. However, this difference was *only* present if they had moved house in the previous year (see Fig. 5.2). This result thus suggested that a change of context (relocating) may have activated pro-environmental values, at least among those who adhered to those values, which were thus enacted in the new situation, whereas under default conditions, even environmentally concerned individuals did not turn those values into action. However, studies such as these are correlational in nature and therefore do not allow to draw causal conclusions. In the final section of this chapter, we discuss in more detail a field experimental study (Verplanken & Roy, 2016), which was able to provide some stronger evidence for the habit discontinuity hypothesis.

The principle of using habit discontinuities to "shake people up" is sometimes used by retailers. For instance, large stores and supermarkets move products around every now and then. While there may be many reasons to do so, an important motive for such changes is to disrupt customers' habits. Rather than entering the store and grabbing the products they habitually purchase, the new arrangements force customers to think and explore and expose them to parts of the store they otherwise would skip.

Box 5.3 Questions for Elaboration

Disrupt an existing habit (see, for instance, Box 5.1), and observe what this is doing to you. Answer the following questions:

1. How easy or difficult did you find disrupting the habit?
2. Did you simply stop doing it, or did you replace the habit with something new?
3. Would it be easier if something in the context or circumstances where your habit usually occurs would change?
4. Did you experience any emotions (e.g., anger, anxiety, relief, pride)?
5. Will you continue with your old habit in the future, or will you make a definite change?

Habit disruptions may teach you about your nonconscious patterns and alert you to potential new solutions or better options than your old habit provided. The least a disruption may show is how prevalent and powerful habits are in everyday life.

Some Caveats

We wish to add four caveats to the habit change issue. The first is that breaking a habit and replacing it by a new behavior does not mean the old habits are gone. The very definition of habit as a memory-based propensity suggests that while a new behavior may be performed, the memory trace of the old habit may still be intact and may only gradually decay. This was demonstrated in a study among employees of an organization that relocated their premises (Walker, Thomas, & Verplanken, 2015). A portion of these employees shifted to another commute travel mode after the relocation. Habit strength of the old mode was assessed a year and a half before the relocation, while habit strength of both the old and new mode were monitored after the relocation. These data suggested indeed that while habit strength for the new mode started to build, the old habit did not disappear abruptly, but decayed only gradually during the post-move period (see Fig. 5.3). Thus, for a certain amount of time, the presence of the old habit poses the risk of relapses, for instance, if the new behavior is blocked or if the motivation to uphold it weakens.

A second caveat is that habits may be embedded in larger routines or social practices (e.g., Kurz, Gardner, Verplanken, & Abraham, 2015). For instance, binge drinking among UK youngsters is no isolated behavior, but makes up part of a weekend leisure culture. Approaching such a behavior without taking that wider context into account is missing an important point and is thus likely to fail if behavior change is the objective. A largely unexplored field is the question how habits and social practices relate, for instance, how habits may create social practices and vice versa (e.g., Holtz, 2014).

A third caveat concerns the power of habits in creating and maintaining new behavior. Compared to the problem of breaking habits, *habit formation* has received relatively little attention to date, at least in applied areas focused on behavior change (e.g., Lally & Gardner, 2013). However, the very features that characterize habits and make them difficult to change – lack of awareness, the difficulty to avoid a habit, tunnel vision, the disconnection with intentions, and the "stickiness" of habits – are all features we would like to see new, desired, behaviors to obtain in order to become durable. Thus, habit formation, and not merely behavior change, should be a key objective in behavior change interventions (e.g., Lally, van Jaarsveld, Potts, & Wardle, 2010).

Finally, the behaviors we are interested in are often complex and consist of multiple phases and components (e.g., Phillips & Gardner, 2016). For instance, "running" involves a decision to do it, preparing your running gear, and the actual running. Each of these elements may or may not be habitual. It is thus important to identify the

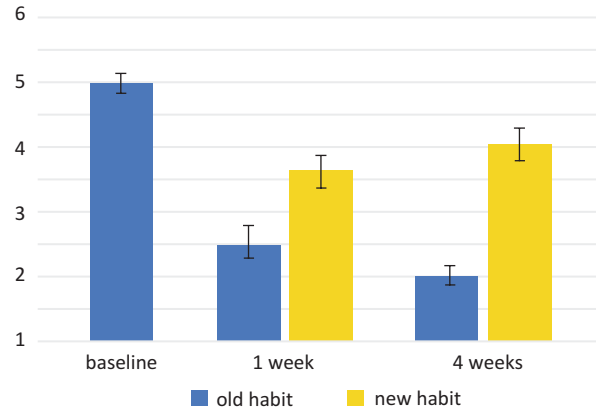

Fig. 5.3 Habit strength of old and new habits. (Note: $N = 112$; data from Walker, Thomas, and Verplanken (2015). Habit strength was measured by the Self-Report Habit Index (Verplanken & Orbell, 2003). The graph presents means and standard errors)

critical element that needs to be turned into a habit. In the running example, this probably is the *decision* to run, rather than the execution itself, as we are very good in finding excuses not to run (e.g., Verplanken & Melkevik, 2008).

Testing the *Habit Discontinuity Hypothesis* in a Field Experiment

Bas Verplanken and Deborah Roy (2016) tested the habit discontinuity hypothesis in a field experiment promoting sustainable behaviors among residents in Peterborough (UK), some of whom had recently relocated. The assumption was that relocation disrupted existing habits and opened a "window of opportunity" for more change. The hypothesis was thus tested that a behavior change intervention would be more effective among those who had relocated compared to residents who had not moved house.

The researchers liaised with an organization, the *Peterborough Environment City Trust*, who previously had developed an intervention to promote sustainable behaviors. Members of this organization were trained as research officers to collect the data and deliver a bespoke version of their intervention. Participants were cold-contacted at the doorstep. A total of 8063 contact attempts were made during the day, evenings, and weekends; 1612 individuals were at home and answered the door; 800 individuals agreed to participate in the study. Half of these were known to have moved house within the previous 6 months ("Movers"). This information was obtained through property websites and contacts with housing developers. The other half ("Non-movers") were matched to the Movers on key characteristics, such as house size, house ownership, and access to public transport. Movers and Non-movers were assigned to an intervention or no-intervention control group according to a clustered randomization procedure, through which particular areas were designated as intervention or control areas.

Data were collected at two points in time. A baseline survey was conducted upon recruitment. In the intervention condition, this survey served as the basis for a conversation about behavior change (see below). Eight weeks later participants received a second survey by mail, which constituted the post-measure. Participants received a £10.00 cash voucher and a lottery ticket for a £250.00 prize draw for submitting the second survey. A total of 521 (65%) participants completed the study.

The intervention consisted of a number of elements:

1. *Doorstep personal interview.* Upon agreement a conversation was held about behaviors participants considered to change or adopt. The research officers were trained to select any from seven possible levers in these conversations: underscore available information; highlight self-efficacy; raise awareness of environmental benefits; stress pro-environmental social norms; spell out financial benefits; promote a "green identity"; pledge to change behavior.
2. *Tailored information.* Shortly after the first survey and the doorstep interview, participants received information about the behavior(s) they had shown an interest in to change as revealed during the interview.
3. *Newsletter.* All participants received regular newsletters, which contained generic information and advice related to sustainable behaviors, as well as on current environmental and volunteering projects.
4. *Sustainable goodie bag*. Participants received a bag with free sustainability-related items, such as a cycling path map, bus time tables, a shower timer, and vegetable and flower seeds.

The main dependent variables were 25 sustainable behaviors, for instance, related to water use (e.g., taking less than 10 minutes showers), energy use (e.g., washing at 30 degrees), transportation (e.g., ecologically friendly driving), and waste (e.g., using reusable shopping bags). Self-reported frequencies were obtained for each behavior, which were averaged into a behavior index. The behaviors were thus assessed at baseline and 8 weeks later. In order to control for effects of other variables, at baseline a set of well-researched determinants of behavior were included: habit strength, intention,

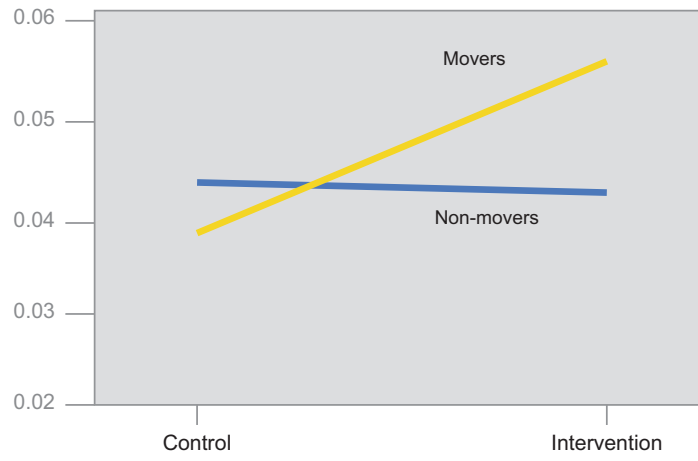

Fig. 5.4 Simple slopes representing the effect of the intervention for "Movers" and "Non-movers." (Note: $N = 521$; data from Verplanken & Roy, 2016)

perceived control, personal norms, biospheric values, and personal involvement.

Remember that rather than testing the effectiveness of an intervention, the objective was to test whether an intervention was more effective in the context of a habit discontinuity (in this case relocation) compared to default conditions. Thus, in the present study, we were interested in the interaction between relocation status (i.e., whether or not a participant had moved house) and the intervention (i.e., intervention versus control group) while controlling for all other effects (i.e., baseline behavioral frequency, demographic variables, and all determinants). This was tested in a multiple regression, where the behavioral index in the post-test was regressed on all baseline measures, relocation status, intervention, and the all-important relocation x intervention interaction. Unsurprisingly, baseline behavior and all determinants were statistically significantly correlated with post-test behavior. From these variables, in the multiple regression baseline behavior, habit strength, and personal involvement obtained a statistically significant regression weight, suggesting these variables had a unique contribution in the prediction of post-test behavior. Also, the intervention obtained a significant regression weight, which suggested it was effective. The important result was a significant relocation x intervention interaction. In Fig. 5.4 simple slopes are presented, which graphically show this interaction and suggest that the intervention was only effective among Movers.

We analyzed the data of this study in some more detail, in particular with respect to the question how long the "window of opportunity" provided by relocation would last. In other words, is there an optimal time frame for an intervention that capitalizes on a habit discontinuity? In order to investigate this, we distinguished among Movers participants who had moved within the previous 3 months versus 6 months. It thus appeared that the intervention was only effective among the former participants, thus suggesting that the "window" lasted for a period of 3 months. A word of caution is necessary though. Firstly, these effects may be highly dependent on the domain, behavior, type of sample, and type of discontinuity. Secondly, habit discontinuities may "open" a window even before the actual change takes place. For instance, in the case of moving house, the process of "unfreezing" may start already some time before the actual relocation.

A field experiment such as the one we described here has many challenges. We mention three that were poignant in the present case. The first concerns a balance between "purity" and "realism." In order to test the habit discontinuity hypothesis, ideally we would have liked to have followed a proper randomized controlled trial, that is, a random allocation of participants to both the intervention and relocation conditions. As mentioned above, we employed a clustered randomized procedure: the intervention versus no-intervention conditions were assigned on the basis of geographic area. This was done in order

to prevent neighbors in different conditions talking to each other. As far as relocation was concerned, for obvious reasons "moving house" cannot be randomly allocated; the best we could do was to match participants on key criteria. Thus, in order to deal with the reality of this context, we had to accept losing some rigor with respect to the design and thus to making causal claims.

A second challenge was to protect the quality of the data. Field studies can easily become "messy," as researchers do not work under controlled conditions such as can be accomplished in the laboratory. Unexpected things may happen during data multiple research officers, collection or between pre- and post-tests. Also, as we worked with multiple research officers, the data collection and interview procedures were standardized and well-trained.

Finally, the key result was a statistically significant relocation x intervention interaction. However, the effect size was small. There were a number of possible reasons for that. Firstly, habit discontinuity effects may be small, and as the dependent variable was controlled for all major determinants, this may have left little variance to be accounted for. Secondly, while the behavioral index was composed of 25 behaviors, most participants probably made changes in only a few of those. The study thus provided a very conservative test. Finally, as discussed above, field studies may produce much "noise" in the data. Nevertheless, the effect we found was statistically significant and important as "proof of concept."

Conclusion

The habit concept has two faces. On the one hand, we struggle with what we may consider as "bad" habits, the things we know are unhelpful or unhealthy but difficult to change. But from an evolutionary point of view, our cognitive architecture made us creatures of habit for good reasons: habits enable us to avoid spending valuable mental resources to trivial decisions. Also, if we manage to turn "good" behavior into habits, this may help to establish and maintain a better and healthier life. In any case, habits are interesting and are worth a prominent place on the rich pallet of themes in psychology.

Summary

- Habits are memory-based propensities to respond automatically to specific cues, which are acquired by the repetition of cue-specific behaviors in stable contexts.
- Habituation may lead to "tunnel vision," that is, a lack of attention to or interest in information about the habit or the habit performance context.
- Habituation shifts control over behavior from "willpower" to the contextual cues which trigger the habit.
- Habits are "sticky": even if one chooses to act differently, a habit may easily take over, such as in the form of "action slips."
- Habit strength has been measured by means of observation, self-reports, and implicit measures. The Self-Report Habit Index (SRHI) is a prevalent generic 12-item self-report instrument to measure habit strength. The Habit Index of Negative Thinking (HINT) is a variant to measure habits of thinking.
- Implementation intentions – "IF-THEN" plans which specify where, when, and how to act – can be used to break old habit cue-response associations and build new ones.
- The habit discontinuity hypothesis states that behavior change interventions are more effective if delivered when an individual's performance context changes or the individual changes from one context to another.

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