18. IMPLEMENTATION FROM A HABIT PERSPECTIVE

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Abstract

In their efforts to provide evidence-based care healthcare professionals prescribe, provide advice, conduct examinations, perform surgical procedures, and engage in a range of clinical behaviours. Their clinical actions are characteristically performed repeatedly – sometimes multiple times per day – in the same physical locations with the same colleagues and patients, under constant time pressure and competing demands. This repetition under pressure in a stable setting provides ideal circumstances for creating contingencies between physical and social cues and clinical actions. Healthcare professional behaviour provides an ideal setting in which to advance theory, methods and interventions to better understand habit formation and habit reversal. Contemporary theoretical and methodological development in the psychology of habit has begun to be applied to understand and promote the formation, breaking, and replacement of habitual behaviour in healthcare professionals. This chapter highlights key theoretical approaches, methods, and intervention techniques that have been applied to conceptualize, measure, develop, and break habit and automaticity in healthcare professionals. These insights have the potential to synergistically contribute novel perspectives to the wider habit literature.

The Role of Habit in Predicting the Behaviour of Healthcare Professionals

From a psychological perspective habit can be defined as a phenomenon whereby internal and external cues trigger automatic reactions, based on a learned stimulus-response association (Gardner, 2014). Repeated performance in a stable context is a defining characteristic of habit (Lally, van Jaarsveld, Potts, & Wardle, 2010). As applied to healthcare professional behaviours, consider a disinfectant dispenser at an elevator that may cue healthcare professionals to automatically disinfect their hands. Initially, the decision to disinfect their hands may be a deliberate process, however sufficient cueing and repetition may automatically trigger hand-sanitising behaviour. Hand sanitising is but one of the many routine clinical actions required to achieve an evidence-based healthcare practice. Some actions, like hand sanitising, serve a health-protective purpose, while others affect patients more directly in the provision of healthcare, including the range of examination, testing, prescribing, advising, surgical, and referral behaviours.

New medications, interventions and technologies continue to be developed and implemented with the potential to improve patient and public health. The availability of these new developments does not guarantee that patients will receive them. A considerable amount of healthcare provided to patients is either not needed, out-dated, or potentially harmful (Prasad & Ioannidis, 2014). Recognising that provision of evidence-based care to patients requires healthcare professionals to change their own clinical behaviour, a concerted effort within the field of implementation science draws upon behavioural science

to support healthcare professional behaviour change. The nature of such behaviours, prototypically characterised by a social and physical setting that promotes repetition of behaviour, favours the formation of habitual clinical behaviours that rely less solely on a process of active reflection and involve more automatic responses to cues (see Table 1). Given competing demands, time and resource constraints faced by healthcare professionals (Presseau, Sniehotta, Francis, & Campbell, 2009), habit formation may be adaptive, minimizing cognitive resources required for a given behaviour to ensure that it can be performed with a maximum of patients and/or for when such resources are especially needed.

Habit can manifest itself in two ways: by triggering the initiation of behaviour (habitual instigation), and/or by promoting the subsequent course of action (habitual execution) (Gardner, Phillips, & Judah, 2016). Healthcare professionals may be habitually triggered to sanitise their hands upon encountering the sanitising gel dispenser after patient contact without requiring conscious deliberation (habitual instigation), and may then find themselves applying the gel and rubbing their hands without giving it much attention or active reflection (habitual execution). Depending on the clinical behaviour and circumstances, both habitual instigation and habitual execution of skilled clinical behaviours saves cognitive resources for the behaviours and circumstances requiring activation of reflective processes.

However, habitual behaviours can become maladaptive when they maintain clinical actions that should be replaced by better evidence-based practices (e.g. a new type of medication) or clinical actions for which there is no evidence of patient benefit (e.g. using a plaster cast on children with small fractures on one side of the wrist. Treatment with a removable splint and written information suffices; Handoll, Elliott, Iheozor-Ejiofor, Hunter, & Karantana, 2016), or clinical actions for which evidence suggests it may cause more harm than benefit (e.g. antibiotic prescribing for upper respiratory tract infection; Kenealy & Arroll, 2013).

Habit influences healthcare professionals' behaviour. A systematic review and meta-analysis of nine studies including 1,975 healthcare professionals found a medium-sized combined effect for the association between habit and healthcare professional behaviour (Potthoff et al., under review). This effect size is similar in magnitude to the association between intention and behaviour (Godin, Belanger-Gravel, Eccles, & Grimshaw, 2008), covering a range of healthcare professional behaviours. While there is clear evidence for the role of habit in healthcare professional behaviour, there is a need for more research that includes measures of habit in this literature (Potthoff et al., under review).

A better understanding of how and under what conditions habit influences healthcare professional behaviour could help to design more effective interventions to support healthcare professional behaviour change and better implementation of evidence-based care. Such an understanding can draw on theories of behaviour that describe how impulsive and deliberate processes interact to influence behaviour. There is a growing evidence-base supporting the utility of such theories for understanding and changing healthcare professional behaviour (Fuller et al., 2012; Potthoff, Presseau, Sniehotta, Elovainio, & Avery, 2017). In the following section we describe a selection of such contemporary theories applied to better understand habit in relation to healthcare

professional behaviour and highlight opportunities for further theory development to drive forward our understanding of habit.

Table 18.1: Characteristics of healthcare professional behaviour that may promote habit formation and undermine habit reversal

Characteristics of environment/context in which healthcare professionals work	**Mechanisms of habit formation**
Training (Reyna, 2008)	During clinical training HCPs repeat the same behaviours in a stable context, which facilitates cue-response associations.
Performance environment replete with physical cues that create contingencies (Shojania et al., 2010)	HCPs are constantly exposed to physical (e.g., clinical instruments) cues that trigger behaviour repeatedly.
Clear performance rules (policies) and professional roles (Schoenwald, 2010)	Policies and roles facilitate the safe performance of clinical behaviours, which facilitate habit formation. When policies and roles change there is a need for habit change.
Healthcare is provided within multidisciplinary teams of junior and more experienced HCPs (Hofmann, Friese, & Wiers, 2008)	HCPs often act in response to being prompted by colleagues in their team. Such social cueing can maintain behaviour and lead to habit formation.
Clinical actions can be influenced by patient and caregiver expectations and behaviours (De Sutter, De Meyere, De Maeseneer, & Peersman, 2001)	Patient and caregivers often have expectations for the care they think they should receive. Sometimes patients may express their expectations to the HCPs, which may prompt habitual behaviour.
Time pressure (Johnston et al., 2015)	With little time on their hands HCPs are often required to act fast and efficiently in the face of multiple demands.
Remuneration (reinforcement) schedules (Flodgren et al., 2011)	Some healthcare systems link specific remuneration for very specific behaviours, encouraging repetition and habit formation.

Theoretical Approaches to Understanding Habit in Healthcare Professionals

Contemporary theories of behaviour portray human behaviour as the result of conscious and unconscious processes (Evans, 2008). Three theories that have been used to date to understand and predict healthcare professional behaviour include the Reflective Impulsive Model (RIM; Strack & Deutsch, 2014), Fuzzy Trace Theory (FTT; Reyna & Brainerd, 2011) and Novice to Expert Theory (NET; Benner, 1982).

Although these theories use different terminology, there are key similarities between them (Stanovich & West, 2001), and collectively they have commonly been called dual process theories composed of two systems (Evans, 2008). One system (1) is characterised as fast, effortless, unconscious, and automatic; the other (2), as slow, effortful, conscious and deliberate (Stanovich & West, 2001). In this chapter we use Strack and Deutsch's terms '*reflective'* and '*impulsive'* to describe the two systems (Strack & Deutsch, 2004; Strack, Werth', & Deutsch, 2006). Habit is one of the processes of the impulsive system, however there are other processes that are part of this system (e.g., goal-directed automaticity; Wood & Neal, 2007). In the discussion below we are focusing on habitual automatic processes, rather than other non-habitual automatic processes.

Reflective Impulsive Model (RIM)

The RIM offers a comprehensive account of these two systems and describes their most important properties and functions (Strack & Deutsch, 2004; Strack et al., 2006). In contrast to some other dual processing theories (e.g., Heuristic-Analytical Theory; Evans, 1989) the RIM postulates that the reflective and impulsive system function in parallel, such that the impulsive system is always active whereas the reflective system may be disengaged (Strack et al., 2006). Applied to healthcare professional behaviour, an experienced nurse may for instance draw blood from a patients' arm without engagement of the reflective system. However, there may be patients whose veins are less visible, requiring the reflective system to be engaged to assist the impulsive system in the operation of behaviour.

The two systems differ in their processing *capacity*. The reflective system has limited capacity and does not deal well with distractions or extreme levels of arousal. The impulsive system on the other hand operates even under suboptimal conditions (Strack et al., 2006). Healthcare professionals are often under considerable pressure, work long hours (often in shifts). As they navigate multiple demands they rely on well-rehearsed routines that allow them to provide evidence-based care.

The reflective and impulsive systems also differ in how they process information. When healthcare professionals acquire new knowledge during training and clinical practice they draw heavily on the reflective system to form new semantic connections in memory (Strack & Deutsch, 2014; Strack et al., 2006). A healthcare professional in training may learn that hand hygiene is an important evidence-based practice to prevent the spread of infection. The impulsive system relies on associative links formed through repeated experience in similar settings (e.g. hand gel dispenser near elevator becomes a cue for hand sanitizing after sufficient repetition).

An extension of the RIM describes a range of situational and dispositional *boundary conditions* (see Table 2) that influence whether the impulsive or reflective system is dominant in controlling behaviour (Hofmann, Friese, & Wiers, 2008). Low cognitive control resources (e.g., due to tiredness or stress) may lower the functioning of the reflective system whilst favouring action driven by the impulsive system. For example, in the case of treating a sore throat, evidence-based practice guidelines encourage healthcare professionals to advise patients that sore throat can last around 1 week and that they should manage their symptoms with self-care rather than medication.

However, a more habitual (non-recommended) response may be to prescribe an antibiotic. In such a scenario a conflict in behavioural schemas (i.e., repetitive actions that are represented as generalisations in memory) may arise. If control resources are high (e.g., no time pressure, motivated patient) healthcare professionals may advise to manage symptoms with self-care (reflective system response). However, if there is a lack of time the reflective system might fail to inhibit the impulsive system prompting the healthcare professional to prescribe an antibiotic (impulsive system response). Indeed, Linder and colleagues (2014) showed that the likelihood of inappropriate antibiotic prescribing for acute respiratory infection increases during the course of both morning and afternoon clinic sessions, consistent with the hypothesis that impulsive responses are more likely when cognitive resources become depleted. Boundary conditions highlight the need for promoting the

formation of evidence-based habit that allow healthcare professionals to act appropriately even in high-pressure conditions (Hofmann et al., 2008).

Table 18.2: Potential boundary conditions that may promote the impulsive system in healthcare professionals

Boundary condition	**Boundary condition as applied to healthcare professional context**
Stress	A variety of factors can contribute to high stress levels in HCPs. This may include long working hours, lack of staff, patients with difficult problems, and medical emergencies.
Fatigue	Working hours of HCPs often stretch until late in the night and overtime can be the norm rather than the exception.
Cognitive load	HCPs have to perform highly complex tasks involving reading and interpreting test results, diagnosing, prescribing, and advising. These tasks have the potential to draw heavily on cognitive resources.
Emotional exhaustion	Many of the behaviours that HCPs perform have severe consequences for patient health. There are also things that happen to the patient that are sometimes outside of HCPs' control (e.g., death or other family tragedies).
Physical exhaustion	Some tasks that HCPs such as nurses perform can put severe strain on the body (e.g., moving patients in and from the bed).
Experience	With increased experience the amount of behavioural repetitions of clinical actions increases, which facilitates habit formation.
Hunger	Research shows that hunger is associated with more impulsive processing. With high amounts of pressure HCPs may sometimes not find the time to have a meal or a snack which may cause them to act more habitually.
Time pressure	HCPs often work under time pressure requiring them to act fast in response to the problems they are encountering. Such time constraints may favour impulsive actions.
Presence of old cues	There may be cues in the HCP's context which prompt habitual behaviours that are no longer in line with best practice (e.g. if a HCP is no longer recommended to order a specific diagnostic test, but the test ordering form is not updated and so the test still appears at the top of the form). In such situations impulsive actions may be favoured over more reflective processing.

RIM principles have been investigated in predictive studies of healthcare professional behaviour. One study tested the utility of a dual process model to predict six different clinical practice guideline-recommended behaviours performed in type 2 diabetes management in primary care (Presseau et al., 2014). The reflective pathway was predictive of all six behaviours, indicating the importance of deliberate decision-making. Importantly, the study also found that the impulsive system (represented by habit) accounted for significant amount of variability in four of the six clinical behaviours alongside the reflective system, suggesting that automatic processes are an important predictor of healthcare professional behaviour. Other research has used patient scenarios to investigate primary care physicians' simulated antibiotic prescribing for upper respiratory tract infection. The study found that evidence-based (no prescribing) decisions were more likely when difficulty with decision-making was lower and decision time was shorter, indicating that appropriate prescribing decisions can be made quickly using a less effortful cognitive process (McCleary et al., 2017). These results consistently show that rapid clinical actions may involve the use of intuitive processes and can be as accurate as clinical actions involving reflective processes, supporting their appropriateness in clinical settings, which may be contrary to popular belief that careful reflection is always favoured.

Fuzzy Trace Theory (FTT)

FTT explains how the reflective and impulsive system interact with human memory (Reyna & Brainerd, 2002). In FTT, memories are represented as *verbatim* and *gist traces*. For most decision-making, people draw on gist traces, which are 'fuzzy' representations of past events (e.g., mental shortcuts). For example, in their daily practice some healthcare professionals prefer judging risks in terms of high or low, rather than trying to recollect precise risk probabilities (Reyna & Brainerd, 2007). Verbatim traces are detailed representations of past events, including recollections such as ratio concepts. In contrast to some other dual process theories, FTT assumes that behaviours that are the result of gist-based decision-making can sometimes be more accurate than behaviours resulting from verbatim-based decision-making (Reyna, 2008). Importantly, reliance on gist traces is only superior if the actor is experienced in the topic of question.

In line with this proposition healthcare professionals with a lot of clinical experience are better advised to act according to their intuition rather than relying on verbatim-based reasoning. One study tested the so called *unconscious thought effect,* which refers to the phenomenon that some people make better decisions after being distracted for a period of time (de Vries, Witteman, Holland, & Dijksterhuis, 2010). The authors studied this effect in relation to one of the most difficult clinical decision-making processes: diagnosis. The study aimed to assess the effects of unconscious thought on the precision of diagnosis of psychiatric cases. Half of the participating healthcare professionals were asked to consciously reflect on a clinical case before making their diagnosis. The other half of healthcare professionals had to perform an unrelated distracter task. Compared to the conscious processing condition, healthcare professionals in the 'unconscious' condition (distracter task) achieved a higher number of correct classifications (de Vries et al., 2010). The study highlights the potential importance of unconscious decision-making in trained healthcare professionals; it also has important implications for habit formation and reversal in trained healthcare professionals.

Novice to Expert Theory (NET)

The Novice to Expert Theory (NET; Benner, 1982) was developed in the field of nursing and builds on Dreyfus Model of Skill Acquisition (Dreyfus, 1992). According to this model people pass through five levels of proficiency as they acquire new skills: novice, advanced beginner, competent, proficient, and expert. NET posits that nurses in the early stages of skill acquisition (i.e., novice and advanced beginner stage) rely mostly on reflective processing as they apply rules learned during their clinical training. For example, to determine fluid balance in a patient, nurses may check morning weights and daily intake of outputs during the past days. During this forming period nurses rely on mentoring as they have not yet learned how to see the wider context and prioritise their actions.

As nurses gain more experience and move through the stages of competence to expert they become less reliant on rules and their behaviour is more guided by intuition (in line with the impulsive system). When experts are asked why they performed certain masterful actions they will often reply, "Because it felt right. It looked good" (Benner, 1982). NET posits that with increased experience behaviour moves more into the background of experience rather than being controlled by conscious processes. However, the theory does not say that expert behaviour is never driven by reflective processes. According to NET,

experts still make use of analytical thinking when they are confronted with novel or difficult situations.

The NET draws attention to potentially tailoring healthcare professional behaviour change interventions to the phase of skill acquisition. For example, in the early stages of skill acquisition (habit formation) healthcare professionals may benefit from role-playing and practicing evidence-based practices in an applied or simulated setting. Advanced beginners also benefit from mentors who help them prioritise certain tasks. Proficient healthcare professionals like case examples to advance their knowledge and skills. Lastly, experts may need to watch video observations of their own behaviours to become aware and be able to change their habits in line with new emerging evidence (Benner, 1982).

What does each of the theories uniquely contribute?

When choosing a theory to help understand healthcare professional behaviour or to design and evaluate an intervention to change healthcare professional behaviour it is important to understand what each theory uniquely contributes (Birken et al., 2017). The RIM describes the circumstances under which each system (i.e., reflective and impulsive) is dominant in controlling behaviour. The model specifies *boundary conditions* that influence whether people's behaviour is likely to be the result of reflection or impulse.

The unique contribution of FTT is that it describes how healthcare professional use heuristics to guide behaviour. Importantly, the theory describes how, with increased experience, healthcare professionals rely more heavily on such short cuts, allowing them to solve complex tasks efficiently. However, in some situations heuristics can also lead to bias, causing inappropriate actions.

The NTT describes how healthcare professionals acquire new skills and how these skills become habitual over time. According to this theory behaviour is more strongly lead by the impulsive system as healthcare professionals gain experience in their profession. It assumes that during the initial years of their career and when developing new skills, healthcare professional behaviour is mostly driven by reflection, however that the experience of behaviour moves more into the background of consciousness as experience increases. It provides clear guidance for training that may support healthcare professionals at different stages of expertise in improving their skills.

Measuring Habit in Healthcare Professionals

Studies to date examining the role of habit in relation to healthcare professional behaviour have used self-reported measures (Potthoff et al., 2019b), with most studies using a 2-3 item 'Evidence of Habit' measure (Eccles et al., 2011) derived from Learning Theory (Blackman, 1974) which focuses on the automaticity facet of habit (e.g., 'When I see a patient I automatically consider taking a radiograph'). For example, a cross-sectional study found a significant relationship between measures of habit and physicians' self-reported referral for lumbar spine x-rays (Grimshaw et al., 2011). Two other self-reported measures are the Self-Reported Habit Index (SRHI; Verplanken & Orbell, 2003) and the shorter Self-Reported Behavioural Automaticity Index derived from four items within the SRHI that focus on automaticity (Gardner, Abraham, Lally, & Bruijn, 2012). A prospective study

using the SRBAI showed that automaticity accounted for significant amounts of variability in healthcare professionals' behaviour over and above reflective constructs (Presseau et al., 2014). Given that much of the research on healthcare professionals takes place in an applied setting it is not surprising that measurement of habit in this context has been restricted to self-report. Though self-reported measures are a feasible method of measuring habit in healthcare professionals they clearly have limitations. For example, conceptually habit is viewed as a process that operates outside a persons' conscious awareness. Therefore, self-reported measures of habit are likely to represent a reflection on the consequences of behaviour, rather than a true estimate of habit strength (e.g., 'I cannot remember sanitising my hands, yet my hands smell like disinfectant; therefore I must have sanitised my hands automatically') (Sniehotta & Presseau, 2011).

To advance the measurement of habit in healthcare professionals, future studies could make use of routinely collected health administrative data gathered within healthcare systems to study habit and the impact of reflective and impulsive cognitive processes on healthcare professional behaviour, in particular to investigate boundary conditions that may determine whether reflective or impulsive processes are engaged.

As described above, Linder and colleagues (2014) used billing and electronic health record data to indicate that inappropriate antibiotic prescribing for acute respiratory infection was more likely to occur near the end of clinic sessions, when cognitive resources are likely depleted. Further work is needed to investigate this across a range of evidence-based clinical behaviours, which may form the basis of suggestions for interventions aiming to change environments in order to change behaviour (for example, Linder and colleagues suggest time-dependent decision support, shorter clinic sessions, mandatory breaks, or snacks). Also there is a need to triangulate findings by using a range of measures (e.g., self-reported habit measures alongside routine data) to validate any results.

To overcome difficulties of recalling habit cues (Gardner & Tang, 2013) future studies could employ self-reported habit measures in combination with video observations of healthcare professionals' clinical behaviours. Seeing their behaviour in action may enable healthcare professionals to make a more informed assessment about the level of automaticity of a given behaviour. Video observations can be further combined with conversation analysis which is a method to assess cues and automatic behaviours by examining interactions and the verbal and non-verbal cues that drive healthcare professionals behaviour (Drew, Chatwin, & Collins, 2001). Overall, self-reported measures are the most commonly applied method of measuring habit in healthcare professionals but have clear limitations. Using self-reported measures in combination with other methods may help overcome some of these limitations.

Strategies for Creating and Breaking Habit in Healthcare Professionals

Behaviour change strategies can be used to support healthcare professionals with changing their behaviour in line with evidence-based practice by addressing habitual processes (see Table 3 for additional strategies). This may involve creating new routines for delivering evidence-based care, substituting old ways of providing care with new practices, or breaking routines leading to out-dated and potentially harmful care.

Creating Habit in Healthcare Professionals

Healthcare professional behaviour change interventions predominantly target reflective processes by providing healthcare professionals with information (Giguère et al., 2012), revising professional roles (Glisson et al., 2010), or using mass media to inform a large number of healthcare professionals of a new evidence-based innovation . Different types of interventions, or intervention components, are likely needed to influence impulsive processes. Habit formation requires two main ingredients: behavioural repetition and the presence of consistent contextual cues (Shojania et al., 2010). Once a habit has been established, electronic reminders have the potential to serve as cues to trigger initiation and their effectiveness to change healthcare professionals' behaviour has been shown in systematic reviews (Shojania et al., 2010). Reminders may be installed on healthcare professionals practice computers to prompt the enactment of a particular evidence-based practice during a clinical encounter.

Healthcare professionals in a qualitative study reported that electronic pop-up reminders in their patients' electronic records supported them with making more frequent use of an information prescription for type 2 diabetes (Potthoff et al., 2019a). Importantly, they reported that it was essential that pop-up reminders only appeared for patients for whom an information prescription was appropriate. Therefore it is important that electronic reminder systems incorporate intelligent algorithms with key cue-behaviour contingencies that prevent too frequent reminding of healthcare professionals (Potthoff et al., 2019a). Notably, the issue of 'alert fatigue' (too many alerts) may lead to ignoring or override them (Ash, Sittig, Campbell, Guappone, & Dykstra, 2007). It is therefore important to balance the use of electronic pop-up reminders with other strategies aiming to influence habit.

Other strategies can be leveraged to use the reflective process to 'program' the impulsive process, such as implementation intentions and action and coping planning (Gollwitzer, 1999; Hagger et al., 2016; Sniehotta, 2009). Action plans are very specific plans of when, where and how to perform a specific behaviour (Sniehotta, 2009). For example, an action plan for hand washing could be 'When I remove my protective gloves after surgery, then I will wash my hands at the sink outside the operating theatre'. Coping plans are specific plans to overcome pre-identified barriers to an intended behaviour (Kwasnicka, Presseau, White, & Sniehotta, 2013). For example, a coping plan could be 'If the soap dispenser outside the operating theatre is empty, then I will ask someone to refill it'.

There is evidence suggesting that such planning interventions are effective in supporting healthcare professional behaviour change (Casper, 2008; Squires et al., 2013; Verbiest et al., 2014). For example, one study found that 80% of healthcare professionals who formed an implementation intention for when, where and how to use staff-guided procedures in addition to receiving clinical training changed their behaviour, compared to 58% of healthcare professionals who received the training alone (Casper, 2008). Furthermore, a study assessing the mechanisms through which planning may effect healthcare professional behaviour showed that the relationship between action and coping planning and six clinical behaviours was mediated by habit (Potthoff et al., 2017). Together, these results suggest that healthcare professionals who formulated a specific plan may have formed a cognitive link between an opportunity to act and an appropriate response (i.e., providing guideline recommended care), allowing them to act in a fast and intuitive way, rather than having to rely on effortful decision-making each time (Potthoff et al., 2017).

healthcare professional behaviours also offer an opportunity to test strategies that could be effective in *breaking* existing habit. For example, the 'Choosing Wisely' initiative provides lists of unnecessary tests, treatments, and procedures (www.choosingwisely.org). One of the items on the list recommends not imaging for low back pain within the first 6 weeks, unless red flags are present. Initiatives such as Choosing Wisely aim to change healthcare professionals routines through media campaigns that are intended to educate healthcare professionals.

However, just as the provision of information is insufficient for creating habit, it is likely also insufficient as a strategy for helping healthcare professionals to break habit because the clinical context remains full of contextual cues that may prompt the habit, even when it is a *dormant habit*. Dormant habit describes existing habits that are only prompted rarely due to infrequent encounters of relevant cues (Gardner et al., 2012). One way of disrupting the influence of old undesired habit is to remove any contextual cues that may trigger automatic responses (Verplanken & Melkevik, 2008). This could involve removing out-dated information leaflets, checklists for test orders, computer prompts or making access to over-prescribed medications and lab tests more difficult.

A systematic review found that interventions such as those involving changes to laboratory forms (e.g. removing checkboxes for overused lab tests from laboratory order form) resulted in significant reductions in test-ordering (Thomas, Vaska, Naugler, & Turin, 2015). A vignette-based study looked at whether grouping of menu items in electronic health records (EHR) would affect primary care physicians' prescribing behaviour of antibiotics (Tannenbaum et al., 2015). The study found reduction in the prescription of antibiotics when over-the-counter (OTC) medications were listed separately followed by all prescription medications, as opposed to the opposite (all prescription medications listed separately followed by all OTC medication options in one group). These results suggest that changes to the configuration of EHR can be used as a way of encouraging evidence-based behaviours.

Removing or changing contextual cues may not always be feasible, especially if the patient themselves provide the social cue for a specific behaviour (e.g., patient with an upper respiratory tract infection (URTI) asking for an antibiotic). In such cases healthcare professionals could formulate implementation intentions that help them respond to an old habit cue in a more desirable way (Adriaanse, Gollwitzer, De Ridder, de Wit, & Kroese, 2011). For example, if patients with an URTI prompt healthcare professionals to overprescribe antibiotics they may want to form a plan that helps them substitute this behaviour with a more desired evidence-based response (Helfrich et al., 2018). Such a plan could be as follows 'If a patient with URTI asks for an antibiotic, then I will explain that it is important to first monitor the progression of the infection before prescribing an antibiotic'. Studies have indicated that planning may also contribute to breaking existing habitual behaviours: interventions involving action planning can influence primary care physicians' self-efficacy in managing upper respiratory tract infection without prescribing antibiotics, and reduce their likelihood of prescribing antibiotics in response to patient scenarios (Hrisos et al., 2008; Treweek et al., 2016).

Intervention strategies aimed at reducing cognitive effort and capitalising on the use of heuristics may contribute to the formation and/or breaking of healthcare professional habit. Fischer et al. (2002) compared two tools for assisting hospital clinicians in identifying Mycoplasma pneumoniae as the cause of community acquired pneumonia in children, and subsequently targeting the prescription of macrolide antibiotics. The first was a scoring system derived from a logistic regression analysis, which required a clinician to look up scores representing the risk of infection. The clinician summed the scores before consulting a risk interpretation sheet. The second tool was a fast-and-frugal decision tree, consisting of two yes/no questions for the clinician relating to the duration of fever and the child's age. Both tools performed similarly well in identifying children at risk (Fischer et al., 2002). However, the fast-and-frugal tree was more straightforward and could be easily memorised. Strategies such as these may assist healthcare professionals in breaking old habits based on out-dated evidence, and set the stage for habit formation of behaviours based on updated best available current evidence, in turn contributing to improving the quality of healthcare.

Table 18.3: Potential strategies to address impulsive processing in healthcare professionals

Strategy	**Definition/ description of strategy**
Learning Theory strategies (Skinner, 1963)	These techniques focus on producing change in behaviour by delivering reinforcement (e.g., through remuneration) or punishment (e.g., disciplinary actions or sanctions). When these strategies are applied to HCPs it is important to consider the complexity of the behaviour and the scheduling of reinforcement or punishment.
Techniques leveraging social cues (O'Connor, 2009)	This technique could involve engaging patients to prompt HCPs to provide certain clinical services. For example, media campaigns could be used to encourage patients to ask their HCP to provide them with advise on a given health behaviour. Such patient-mediated approaches are already being used successfully to support the implementation of new medical innovations.
Techniques that change the physical environment (Wood & Neal, 2007)	This could involve both adding and removing physical cues in the clinical environment. For example, stickers or posters could be added in practices. Equally, stimuli that relate to undesired practices (e.g., packaging of overprescribed medications or checkboxes for overused lab tests on forms) could be removed.
Techniques dealing with emotion and stress (Shapiro, Astin, Bishop, & Cordova, 2005)	Evidence based stress-management interventions may be suitable to reduce unhelpful habitual behaviours.
Behavioural substitution (Wood & Neal, 2007)	This technique involves increasing the frequency of a behaviour whilst reducing the frequency of another. For example, HCPs could provide physical activity advice to people with lower back pain instead of prescribing an opioid where appropriate.
Implementation intentions (Gollwitzer & Sheeran, 2006)	Prompting HCPs to make specific If-then plans linking situational cues with responses that are in line with delivering best practice care. For example, HCPs could make a plan to provide physical activity advise if a patients' BMI is outside the recommended range.
Coping planning (Kwasnicka, Presseau, White, & Sniehotta, 2013)	Getting HCPs to identify barriers to providing evidence-based care and ways to overcome these. For example, if a patient is eligible to receive physical activity advice but the HCP is running out of time he might provide a leaflet, which provides further information.
Public commitment (Ajzen, Czasch, & Flood, 2009)	Stimulating HCPs to commit to engaging themselves to deliver evidence-based care to their patients, and announcing that decision to their co-workers. For example, a healthcare professional could announce to his co-workers that he will from now on deliver self-

	management advise to all his patients with chronic conditions who have not received this type of advice before.
Audit and feedback (Ivers et al., 2012)	Gather and summarise data on the performance of specific clinical behaviours and feeding back to HCPs. This technique can be applied to either increase or decrease the performance of habitual actions.

Next Steps

Future research should explicitly test predictions of theories that hypothesise how the impulsive process influences healthcare professional behaviour alongside the reflective process. For example, in Table 2 we provided a list of potential boundary conditions that may promote the functioning of the impulsive process. Thus far, there has been relatively little research exploring the effects of boundary conditions on healthcare professional habitual behaviour (Linder et al., 2014). Future research could explore how boundary conditions such as stress, fatigue or cognitive load affect the implementation of evidence-based practices, e.g., if habitual behaviours (e.g. use of unnecessary diagnostic tests) are performed at a higher rate when healthcare professionals are under stress (e.g. busy clinic). Similarly, research could explore the role of professional experience as a moderator of the habit-behaviour relationship as hypothesised by the Fuzzy Trace Theory. This could be done by looking at whether more experienced healthcare professionals rely more heavily on the impulsive process when delivering healthcare.

Future research should explore novel habit measurement that addresses core facets of the habit construct (e.g. cue-dependency and underlying stimulus-response association). For example, one way of inferring the level of automaticity of a given clinical behaviour could be by testing its dependency on physical cues. If adding or removing a simple cue to a healthcare professionals' environment has a direct effect on behaviour it could be reasoned that behaviour was driven by the impulsive process. An example of this idea is the cues-of-being-watched paradigm in which placing an image of a pair of eyes above an "honesty box" for hot drinks, can lead to higher amount of contributions (Bateson, Nettle, & Roberts, 2006).

There is a need to further explore effective habit change strategies. One way of doing this could be through theory-based process evaluation alongside experimental or quasi-experimental studies (Presseau et al., 2015). Such an approach could help evaluate the active ingredients of existing implementation strategies such as reminding clinicians, altering incentive/allowance structures, or obtaining formal commitments (Powell et al., 2015). To do this, trials should include measures of habit (e.g. self-report) to investigate whether there are any measurable post-intervention changes in automatic processing.

Lastly, more research is needed to uncover whether there are particular evidence-based practices that are more or less conducive to habit formation, or whether the circumstances drive habit formation across clinical behaviours. Evidence from a meta-analytic synthesis shows that behavioural frequency and stability of the context may be two key characteristics, which may help determine which behaviours are more conducive to habit formation (i.e. behaviours that are performed more frequently in a stable context are more likely to become routine) (Ouellette & Wood, 1998). An implication of these findings is that if we want to support healthcare professionals with forming new habits of providing

evidence-based care it is important to ensure that the new behaviour is repeated sufficiently in a stable context.

Lastly, research is needed to understand how many repetitions are necessary for a given behaviour to become habitual in the presence of specific contextual cues. Equally, the formation of new habit often necessitates breaking old habit and it should not be assumed that a newly formed habit will replace a pre-existing habit, even if the latter is rarely performed. Future research should investigate both the increase in focal habit alongside a decrease in pre-existing habit (see Figure 1).

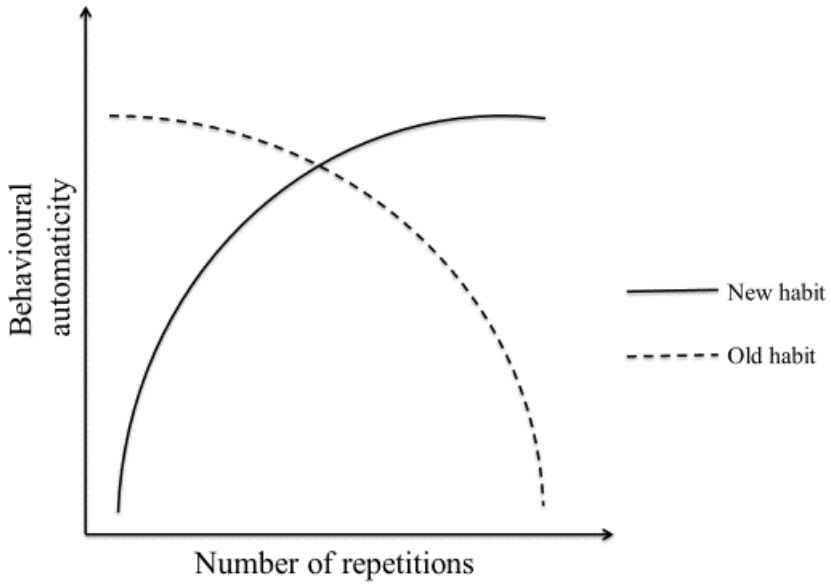

Figure 18.1: Formation of a new clinical habit and simultaneous breaking of old clinical habit.

Concluding Remarks

This chapter provided a state-of-the-art overview of theoretical approaches to understanding habit in healthcare professionals and strategies for creating and breaking habit in healthcare professionals. Given the nature of the setting in which healthcare professionals provide healthcare, habit is a centrally important construct to understand and target when implementing evidence-based practices. Theories and strategies from the behavioural sciences may provide the necessary tools to effectively change healthcare professionals' behaviour and improve care provided to patients. Much opportunity remains to advance habit theory and methods by leveraging the unique properties of healthcare professional behaviour and the settings in which they are enacted, which naturally facilitate habit formation.

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Table and figure captions

Table 1 Characteristics of healthcare professional behaviour that may promote habit formation and undermine habit reversal.

Table 2 Potential boundary conditions that may promote the impulsive system in healthcare professionals.

Table 3 Potential strategies to address impulsive processing in healthcare professionals.

Figure 1 Formation of a new clinical habit and simultaneous breaking of old clinical habit.

Figure 2 Indirect effects of action and coping planning on healthcare professional behaviours through habit. Path *a* is the direct effect of the predictor variable (action/ coping planning) on the mediator (habit). Path *b* is the direct effect of the mediator on the outcome variable (clinical behaviour). Path *c* is the direct effect of the predictor on the outcome variable. Path c' is the indirect effect of the predictor variable on the outcome variable. Adapted from "Planning to be routine: habit as a mediator of the planning-behaviour relationship in healthcare professionals" by S. Potthoff et al., *Implementation Science, 12*, p. 5. Adapted with permission.