

## EDITORIAL

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**SUMMARY**

In health care, lifestyle change can only happen through behaviour change. Improvements in patient outcomes may be achieved by deploying inexpensive, brief interventions within and between consultations. These types of innovations, however, do not always generate the desired change. We used BJ Fogg's behaviour change model and Lawson and Flocke's teachable moment concept to assess 12 simple innovations where the trigger, ability, and motivation could be identified in the study design and to determine whether these innovations proved effective for achieving behaviour change. We propose that the factors identified in Fogg's model are important considerations for developing efficient and effective tools for promoting behaviour change.

**Key Words**

Behaviour change, trigger, lifestyle change, health promotion, Fogg's behaviour model

## INTRODUCTION

Currently, most healthcare appointments offer limited time for each patient consultation. At the same time, clinicians must manage multiple, and sometimes competing, demands. Given the challenges associated with patient education—where seeking advice on health promotion is not the main reason for the patient's visit to the doctor—it can be difficult for doctors to encourage different lifestyle choices even when they might be beneficial. Accordingly, clinicians need the most efficient and effective means to promote healthy lifestyle choices among their patients.

Despite a growing number of innovations that promote healthy lifestyle choices, many are costly, and the poor efficacy of some is disappointing.<sup>1</sup> We explore why promising innovations do not always change healthcare behaviours. By innovations, we are referring to small interventions that are not routine practice and do not require a policy change or substantial funding. We used two recognised frameworks: Fogg's behaviour change model and Lawson and Flocke's teachable moment concept to review simple healthcare innovations that are essentially no more than a cue, prompt, call-to-action, or request.

The frameworks we used to assess behaviour change innovations encompassed two parts:

1. BJ Fogg's behaviour change model (**B=MAT**),<sup>2,3</sup> which states three elements are required for a person to make a specific choice or adopt a specific behaviour (B): the ability to perform an action (A); the motivation to choose that action (M); and a trigger to take the action (T); and
2. A “teachable moment” defined as a specific point in time when an individual is more likely to adopt a specific course of action due to a significant event in their lives (eg, pregnancy or bereavement).<sup>4</sup>

Although there are many behaviour change models, we selected Fogg's<sup>2,3</sup> model for three reasons. First, it focuses specifically on triggers, abilities, and motivations.<sup>5</sup> Second, it predicts that behaviour change requires all three.<sup>6</sup> Third, since Fogg's model does not assume that personal capacities are universal, it takes into account an individual's context, and it can be used to address habits and routine behaviour. Although Fogg's model is, to our knowledge, yet to be tested in experimental research designs, there is some evidence that the model could predict behaviour change in a healthcare context.<sup>7,8</sup>

We defined six key terms:

1. **Outcome:** An objectively determined clinical improvement.
2. **Trigger:** A cue, prompt, call-to-action, or request. Triggers can take different forms depending on the context. Specifically, Fogg<sup>2,3</sup> described spark triggers (high ability; low motivation), facilitator triggers (high motivation; low ability), and signal triggers (high motivation; high ability).
3. **Target:** A person or people for whom the trigger is intended.
4. **Motivation:** A process that initiates, guides, and maintains goal-oriented behaviour.
5. **Ability:** The skills and/or resources necessary to perform a task or to act.
6. **Teachable moment:** A specific set of circumstances with greater potential for the person to adopt a lifestyle change, which is associated with greater self-efficacy.

We searched the literature using PubMed for studies aimed at changing health-related behaviours. We purposely selected publications to optimise diversity, ensuring all three types of Fogg's triggers were represented—namely, signals, sparks, and facilitators. The aim here was not to systematically identify all relevant publications as per a systematic review, but rather to summarise, interpret, and critique exemplar papers using the Fogg model as a lens to inform innovation design. From this search of the literature, we identified 12 publications as small-scale behaviour change interventions (Table 1).

### Effectiveness of innovations

Not all identified innovations proved effective: seven of the 12 achieved the targeted behaviour change (Table 2). Innovations that involved the use of text messaging and telephone reminders had limited effect on the relevant behaviours. Four of the 12 studies appeared to satisfy Fogg's<sup>2,3</sup> criteria—where motivation, ability, and trigger were explicitly considered—and all achieved the desired behaviour change. Five of the 12 publications did not meet Fogg's criteria, and only one was effective. Further examination of the ineffective innovations suggests that the study design elements did not align with Fogg's behaviour change model. Specifically, they failed to design the trigger with reference to the subjects' motivation and ability within a teachable moment.

### Effectiveness of types of triggers

Among the selected publications, signal and spark triggers were equally successful, however, the use of a facilitator was not. This latter finding was unexpected, because the facilitator was used within a health service where one might have expected clinicians (the target group) to be motivated and able to improve hand hygiene (Table 1-12). However, the publication did not report on factors that might have competed for clinicians' attention within a busy inpatient setting and this intervention might not have represented a teachable moment. Although the trigger initially demonstrated potential, the desired behaviour was not sustained, suggesting it did not become a habit. The same outcome might apply to all 12 publications that we reviewed because the desired response could not be documented for longer than a few weeks or months. Fogg's<sup>2,3</sup> behaviour change model, where behaviour = motivation + ability + trigger, does not include habit as a factor. How subjects might consolidate triggered behaviour change to ensure they do not revert to previous behaviours requires a strong future research focus to sustain healthy lifestyle choices.<sup>9</sup>

### Motivation and ability

There was some evidence in favour of Fogg's<sup>23</sup> model insofar as the publications that noted the subjects' motivation (M) and ability (A) to adopt a specific behaviour reported positively triggering the desired behaviours (T). However, caution is warranted because references to subjects' motivations, abilities, and triggers were seldom explicit and could only be inferred. For example, one of the interventions to cue an increase in physical activity via an internet program might have been effective because the behaviour of people who were ambulant (ie, had ability) and had registered for the program (a proxy for motivation) were successfully triggered (Table 1–4). Conversely, other attempts to promote exercise failed where the intervention was not predicated on an assessment of motivation and ability (Table 1–3, 5). Three publications did not provide sufficient detail to evaluate whether Fogg's criteria were addressed; however, two of these reported positive behaviour change (Table 2–3, 8, 9). Given the focus of those studies, subjects' motivation and ability were likely addressed (Table 2).

### **The nature of triggers and the teachable moment**

Aside from a consideration of motivation and ability, some types of triggers were more effective than others. Letters to patients (Table 2–2, 8) were more effective than telephone calls or text messages (Table 2–3, 6). This finding might reflect different contexts and timing—that is, teachable moments. It might also reflect the nature of the trigger. A letter from someone familiar, delivered by “snail mail”, might have a greater impact than an impersonal telephone call or text message. A pleasant odour did not reduce anxiety, yet music as a trigger had a positive effect (Table 2–10, 11), which may suggest the nature of the trigger warrants consideration because, in some cases, the outcome was not positive (Table 2–10). Some studies reported equivocal results. Doctors who maintained eye contact with patients during consultations appeared to facilitate the disclosure of psychosocial problems. However, this trigger was not easily isolated. Other factors might have spurred the outcome in this study, including patient motivation and ability to disclose psychosocial concerns, as well as doctors' capacity to recognise and respond to relevant verbal and non-verbal cues (Table 2–9).

### **Setting**

One study was conducted in a non-clinical setting and while the results were disappointing, the trigger had some positive impact (Table 2–12). This finding suggests healthy lifestyle choices can be triggered across different contexts and might have an appreciable impact on public health. However, the publication included scant information on subjects' motivation and ability, and there was no information on whether the trigger was delivered during a teachable moment.

### **Fogg's behaviour change model as a predictor of intervention effectiveness**

In this small purposive selection of papers, Fogg's behaviour change model (B=MAT) appeared to predict which of the diverse interventions reported might succeed. However, none of these explicitly referred to Fogg's model within their study design. Nevertheless, viewed through the lens of Fogg's model, many of the disappointing outcomes might have been anticipated. The researchers did not verify whether the innovations had been tested to ensure they were used in the optimum conditions; furthermore, the information provided regarding the context in which the subjects were triggered did not explicitly identify the teachable moment(s).

Given the global rise of chronic and multi-morbid illnesses, and the increasing demand from resource-poor health services, there is an urgent need for innovations that efficiently and effectively promote healthy lifestyle behaviours. Interventions that require major funding or organisational change are unlikely to be adopted across different health systems. Further, innovations that are simply cues or calls to action, are more likely to be transferable.<sup>10</sup> Findings from this brief critique suggest that the target's motivation, ability, as well as the context in which behaviour change is being triggered can helpfully inform the design of innovations to promote health and perhaps other behaviours we seek to influence.

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#### PEER REVIEW

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#### CONFLICTS OF INTEREST

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Table 1: Summary of studies on innovations in primary care

Behaviour change challenge	Trigger	Trigger Type	Ability	Motivation or Teachable Moment	Outcome
<p>1. Encourage older people to attend a clinic for a health check</p> <p>Porter AMD. The Edinburgh birthday card scheme. <i>J R Coll Gen Pract.</i> 1987;35:22–3.</p>	<p>Birthday card with screening questionnaire</p>	<p>Signal</p>	<p>Facilitated by a nurse to coordinate routine referrals to multidisciplinary team</p>	<p>Patient's birthday at: 65 years, 70 years, 75 years, 80 years, as well as 85 years and over</p>	<p>158 cards posted; 133 patients responded; and 38 referrals to a healthcare professional</p>
<p>2. Increase physical activity among people with type 2 diabetes</p> <p>Agboola S, Jethwani K, Lopez L, et al. Text to move: A randomized controlled trial of a text-messaging program to improve physical activity behaviors in patients with type 2 diabetes mellitus. <i>Journal of Medical Internet Research.</i> 2016;18(11):e307.</p>	<p>Text messages twice daily for 6 months</p>	<p>Signal</p>	<p>Participant ability to be more physically active was not assessed</p>	<p>Not identified</p>	<p>Intervention group had significantly higher monthly step counts in the third and fourth months of the study, compared with the control group. However, over the 6-month follow-up period, monthly step counts did not differ statistically by group.</p>
<p>3. Increase physical activity among adults</p> <p>Poirier J, Bennett WL, Jerome GJ, et al. Effectiveness of an activity tracker- and internet-based adaptive walking program for adults: A randomized controlled trial. <i>Journal of Medical Internet Research.</i> 2016;18(2):e34.</p>	<p>Free online program that connects with activity trackers to increase walking</p>	<p>Spark</p>	<p>Excluded people with limited physical mobility and/or projected lack of internet access for four or more days during the study</p>	<p>Exclusion criteria might be proxy measures for motivation: failure to complete registration; prior use of Walkadoo; and inadequate tracker wear during the run-in period</p>	<p>265 participants were randomised to the Walkadoo intervention (n=133) and the control groups (n=132). The intervention group significantly increased their steps over the control groups with treatment effects observed in both sedentary and low-to-somewhat active participants.</p>

Behaviour change challenge	Trigger	Trigger Type	Ability	Motivation or Teachable Moment	Outcome
<p>4. Increase physical activity among adolescents with type 1 diabetes</p> <p>Newton KH, Wiltshire EJ &amp; Elley CR. Pedometers and text messaging to increase physical activity: Randomized controlled trial of adolescents with type 1 diabetes. <i>Diabetes Care</i>. 2009;32(5):813-5.</p>	<p>38 participants were allocated to the intervention group to receive a pedometer to wear for 12 weeks</p>	Spark	Not reported	Not assessed	<p>At 12 weeks the mean daily step count reduced by 840 in the control group and by 22 in the intervention group. Mean self-reported moderate or vigorous physical activity increased by 38.5 min/week in the control group and by 48.4 in the intervention group.</p>
<p>5. Missed appointments in outpatient clinics</p> <p>Junod Perron N, Dao MD, Righini NC, et al. Text-messaging versus telephone reminders to reduce missed appointments in an academic primary care clinic: A randomized controlled trial. <i>BMC Health Services Research</i>. 2013;13(125):1-7.</p>	<p>Text message or telephone reminders 24 hours before their appointment.</p>	Signal	Participant ability to attend the appointment was not assessed	Not assessed	<p>6,450 patients were included, 3,285 in the text-message group and 3,165 in the telephone group. The rate of missed appointments was similar in the text-message and the telephone groups.</p>
<p>6. Promote smoking cessation among young adult smokers</p> <p>Burford O, Jiwa M, Carter O, et al. Internet-based photoaging within Australian pharmacies to promote smoking cessation: Randomized controlled trial.</p>	<p>Participants received standardised smoking cessation advice. The intervention group was also digitally photoaged to preview a self-image as a lifelong smoker. compared to a non-smoker</p>	Spark	<p>Participants were recruited if they did not use nicotine replacement therapy and did not consume oral drugs for nicotine dependence. Participants in the intervention and control groups received standard 2-minute smoking</p>	<p>At recruitment, participants were asked about: attitudes towards personal appearance; opinions on health risks associated with smoking; and perceived barriers to</p>	<p>At 6-month follow-up, 5 of 80 control group participants (6.3%) suggested they had quit smoking, but only 1 consented to, and was confirmed by carbon monoxide validation. In the intervention group, 22 of 80 participants (27.5%) reported quitting, with 11 of 80 participants</p>

Behaviour change challenge	Trigger	Trigger Type	Ability	Motivation or Teachable Moment	Outcome
Journal of Medical Internet Research. 2013;15(3):e64.			cessation advice from a pharmacist.	smoking cessation.	(13.8%) confirmed by carbon monoxide testing. A repeated measures analysis suggested the average intervention group smoking dependence score had significantly dropped compared to control participants.
7. Encourage young people to attend a clinic for a health check  Aarseth S, Dalen I, Haavet OR. Encouraging adolescents to contact their GP: A community-based trial. British Journal of General Practice. 2014;64(622):e262–e267.	Letter from a general practitioner to all 16-year old people in one district.	Signal	The letter addressed the obligation of all primary care staff to maintain confidentiality, the right to choose a general practitioner, the opinion that nothing was too insignificant to discuss, treatment and referral, how to make contact, and payment regulations.	The letter included examples of problems and diseases that might concern adolescents.	Proportion of adolescents in contact with a general practitioner increased from 59% in the control group to 69% in the intervention group. The increase was greater for males. For diagnoses noted in the letter, the incidence rose from 38% in the control group to 55% in the intervention group. The patterns of the most frequent contact reasons did not change because of the intervention.
8. Limited awareness of psychosocial problems among general practitioners  Bensing JM, Kerssens JJ, van der Pasch M. Patient-directed gaze as a tool for discovering and handling psychosocial problems in general practice.	Gaze—that is, the time the general practitioner looked directly into the patient’s face during videoed consultations.	Spark	A video camera was positioned to record the general practitioner’s full face.	Not assessed	In consultations with a relatively high-degree of patient-directed gaze, general practitioners were more aware of patients’ psychosocial history and were better at identifying mental distress.

Behaviour change challenge	Trigger	Trigger Type	Ability	Motivation or Teachable Moment	Outcome
Journal of Nonverbal Behavior. 1995;19(4):223–42.					
9. Anticipatory anxiety among dental patients  Toet A, Smeets MAM, van Dijk E, et al. Effects of pleasant ambient fragrances on dental fear: Comparing apples and oranges. Chemosensory Perception. 2010;3(3-4):182–9.	While waiting for dental treatment, participants were exposed to the ambient odours of either orange or apple.	Signal	The anxiolytic effects of inhaling pleasant scents are demonstrated by animal and human studies.	Dental patients commonly experience anticipatory anxiety while waiting for their appointment at the dental clinic.	Orange and apple odours had no effect on the anticipatory anxiety or mood of dental patients awaiting their appointment in a dental clinic.
10. Women’s anxiety and perceived pain during colonoscopy examination  Chan YM, Lee PW, Ng TY, et al. The use of music to reduce anxiety for patients undergoing colposcopy: A randomized trial. Gynecologic Oncology. 2003;91(1):213–7.	Before the study, patients were asked their favourite music and invited to listen to these songs during their examination.	Spark	The positive effects of music therapy are well-reported.	Before their examination, participants identified their concerns about the finding; the examination; the clinicians; and their understanding of the information provided.	Women in the music group experienced significantly less pain and lower anxiety during their colonoscopy examination than women in the control group.
11. Limited hand hygiene practices among healthcare workers  Haas JP, Larson EL. Impact of wearable alcohol gel dispensers on hand hygiene in an emergency department. Academic Emergency	Emergency department staff were provided with a wearable hand sanitiser dispenser.	Facilitator	The dispenser contained a 40-millilitre cartridge of alcohol-based sanitiser and was mounted over a belt, pants waist, or pocket, or could be worn on a lanyard. Staff were trained in its use.	A trained observer assessed hand hygiene practices over 4 months during times reported by emergency department managers to be typically busy.	Hand hygiene improved during the first intervention period but was not sustained. There was no significant improvement in hand hygiene from baseline to the final intervention period. The dispenser was used for 9% of the hand hygiene episodes.



Behaviour change challenge	Trigger	Trigger Type	Ability	Motivation or Teachable Moment	Outcome
Medicine. 2008;15(4):393–6.					
12. Unhealthy lifestyle choices  Kroese FM, Marchiori DR, de Ridder DT. Nudging healthy food choices: A field experiment at the train station. Journal of Public Health. 2016;38(2):e133-e7.	In two snack shops, the display of unhealthy snacks near the cash register was replaced with a display of healthy snacks; furthermore, a sign in one of these shops was posted near the display stating “We help you make healthier choices.”	Signal	All products were available for purchase.	Not reported	Controlling for a baseline week of purchases, a greater proportion of healthy (but not fewer unhealthy) products were sold in both snack shops.

Table 2: Review of studies using Fogg’s Behaviour Change Model<sup>†</sup>

Study	Trigger Type	Ability	Motivation or Teachable Moment	Meets Fogg’s Criteria	Desired Behaviour Achieved
1	Signal	Yes	Yes	Yes	Yes
2	Signal	No	No	No	No
3	Spark	Yes	Unclear	Unclear	Yes
4	Spark	No	No	No	No
5	Signal	No	No	No	No
6	Spark	Yes	Yes	Yes	Yes
7	Signal	Yes	Yes	Yes	Yes
8	Spark	Yes	Unclear	Unclear	Yes
9	Signal	Unclear	Yes	Unclear	No
10	Spark	Yes	Yes	Yes	Yes
11	Facilitator	Yes	No	No	No
12	Signal	Yes	No	No	Yes
<b>Total</b>		<b>8</b>	<b>5</b>	<b>4</b>	<b>7</b>

<sup>†</sup> **Yes:** reported within the publication; **no:** not reported within the publication