Increasing attendance at pre-booked sexual health consultations: a systematic review

Rebecca Clarke[A,*] (iD), Gemma Heath[A], Jonathan D. C. Ross[B] and Claire Farrow[A]

For full list of author affiliations and declarations see end of paper

*Correspondence to:
Rebecca Clarke
School of Psychology, College of Life &
Health Sciences, Aston University,
Aston Triangle, Birmingham B4 7ET, UK
Email: Clarker5@aston.ac.uk

Handling Editor:
Christopher Fairley

ABSTRACT

Background. Attending a sexual health consultation is integral to the effective prevention and treatment of sexually transmitted infections (STIs). However, individuals who may be at risk of STIs do not always do so, leading to an increased risk of STI complications and transmission of infection to others. This systematic review aimed to identify interventions implemented to increase attendance at a pre-booked sexual health clinic appointment and to identify behavioural theory and behaviour change techniques (BCTs), which form the basis for such interventions. **Methods**. Articles were identified through a systematic search of four electronic databases (Web of Science; ProQuest; Scopus; PubMed) and included if they aimed to increase attendance at a pre-booked, synchronous sexual health consultation. The quality of included studies was assessed independently by two researchers. Findings were synthesised narratively. **Results**. Thirteen studies were included from three countries; eight non-randomised before–after study designs and five randomised controlled trials. Behavioural interventions increased attendance at pre-booked sexual health consultations. Text messages were the most frequently used mode for intervention delivery. A total of 19 BCTs were identified, but only three studies mentioned behavioural theory. The most frequently used BCTs in effective interventions were: using credible sources, employing prompts/cues and the provision of information about health consequences. However, these BCTs were also identified in interventions that were not effective, meaning that optimal content and theoretical underpinning of effective interventions remains unclear. **Conclusions**. Behavioural interventions can increase attendance at sexual health consultations. Further research is needed to examine the effectiveness of different BCT combinations.

Keywords: attendance, behaviour change, health services research, HIV, intervention, sexual health, sexually transmitted infections, systematic review.

Introduction

When left untreated, sexually transmitted infections (STIs) can lead to poor health outcomes including infertility, chronic pelvic pain and an increased risk of human immunodeficiency virus (HIV).[1,2] Access to, and attendance at sexual health clinic appointments (SHCs) can provide advice on prevention as well as rapid testing and treatment to reduce STI transmission and harmful sequelae. Yet, despite being preventable and treatable, STIs commonly remain untested and untreated. The latest National Survey of Sexual Attitudes and Lifestyles found that 75% of individuals at risk of STIs do not attend SHCs.[3] Moreover, those who do identify themselves to be at risk and book a clinic appointment, often still fail to attend.[4] Such non-attendance can lead to inefficient use of staff time and wasted resources, as well as increased waiting times for other service-users[5] and poor outcomes for individuals.

Healthcare services often implement techniques that remind patients about their appointment to reduce non-attendance, such as sending short message service (SMS) text messages.[5,6] However, literature examining factors associated with the use of SHCs, suggests that barriers and facilitators to attendance can also occur at individual and

interpersonal levels, such as the embarrassment of a genital examination, lack of STI knowledge, and fear related to the stigma associated with STIs.[7,8] Further barriers can occur in healthcare service provision and delivery, including, for example, access to SHCs, healthcare provider characteristics and previous experiences or expectations of discrimination.[8–10] To date, only a small number of interventions to improve attendance at sexual health consultations have previously been investigated.[11] A greater understanding of what kinds of interventions can be implemented and which elements within these have the greatest effect on appointment attendance in the context of sexual health care is essential for optimising future intervention delivery.

The aim of this review was to identify the range and effectiveness of interventions implemented to improve attendance at pre-booked sexual health consultations. A secondary aim was to identify theoretical constructs and behaviour change techniques (BCTs) used within included interventions.

Methods

This review is reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.[12] The review protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO) (CRD42020197465). The development of this review's research questions and outcome measures were informed by an advisory group that consisted of the research team, sexual healthcare professionals and sexual health service-user representatives.

Eligibility criteria

Studies were eligible for inclusion if they: aimed to increase appointment attendance at a pre-booked, sexual health consultation during which service-users and healthcare providers were able to interact synchronously (e.g. face-to-face, telephone, video-call); interventions were delivered through any mode (synchronously or asynchronously); used a community sample of individuals aged ≥13 years; included an outcome measure for attendance of any real-time sexual health consultation (including reduction in missed appointments); and any study design comprising an intervention evaluation (including randomised controlled trials (RCTs), non-randomised control groups, single-arm designs, retrospective or prospective cohort studies).

Studies were excluded if they were published before 2000 or not fully available in English. Also excluded were studies conducted in non-WEIRD (western, educated, industrialised, rich, democratic) countries. This was because heterogeneity in access to health care and populations was considered to reduce meaningful conclusions that could be drawn from the data.

Information sources and search strategy

Four databases (Web of Science; ProQuest; PubMed, and Scopus) were systematically searched from 1 January 2000 to 1 September 2021. Additional studies were identified through reference chaining and citation checking via Google Scholar. The search strategy was developed in line with the Population (community sample) Intervention (set of behaviour change techniques) Comparator (any) Outcome (attendance) Study design (any) (PICOS) framework.[13] Boolean operators were used to adapt the search for each database and searches were limited to those available in English (see Supplementary File S1).

Study selection and data extraction

One reviewer (RC) screened titles and abstracts and three reviewers independently screened the full text of potentially relevant articles (RC, GH and CF). Data were extracted from the included articles on key study characteristics, including year of publication, country, study design and setting, recruitment information, sample demographics and intervention characteristics, including use of theory, mode of delivery and BCTs. Data on the use of theory, mode of delivery and BCTs were independently coded by the review team (RC, GH and CF). Discrepancies were resolved through discussion.

Use of theory

The Theory Coding Scheme[14] was used to assess the extent to which theory had been applied within the intervention design. This 19-item checklist contains statements that are coded 'yes', 'no' or 'don't know' based on the explicit description of theory within the article. Items 1–11 were used to assess whether theory had been mentioned in the study, whether theory had been used to select participants or tailor intervention techniques, and whether theoretical constructs/predictors were explicitly linked to intervention techniques.

Mode of delivery

Adapting an approach outlined by Webb and Sheeran,[15] the intervention's mode of delivery was subdivided and presented as two aspects: (1) intervention format (e.g. text message); and (2) intervention facilitator (e.g. digital).

Behaviour change techniques

Intervention content was coded for BCTs using the Behaviour Change Taxonomy (v1).[16] This taxonomy contains 93 BCTs, clustered into 16 groups: Goals and Planning, Feedback and Monitoring, Social Support, Shaping Knowledge, Natural Consequences, Comparison of Behaviour, Associations, Repetition and Substitution, Comparison of Outcomes, Reward and Threat, Regulation, Antecedents, Identify, Scheduled Consequences, Self-Belief,

and Covert Learning. BCTs were only reported as being used in an intervention when explicitly described in the paper.

Critical appraisal of included studies

The Mixed Methods Appraisal Tool (MMAT)[17] was used to assess methodological quality of retrieved studies independently by three researchers (RC, GH, CF). An overall quality score was calculated after responding 'yes', 'no' or 'can't tell' to five questions relevant to the study design. Discrepancies were resolved through discussion.

Data synthesis and analysis

Meta-analysis was not possible due to heterogeneity in the intervention modes of delivery, outcome measures and participants. Instead, a narrative approach was used to synthesise intervention characteristics and outcomes, theoretical application, mode of delivery and BCTs. Data were presented in a tabular format. Interventions were considered effective if the SHC attendance outcome was reported to have significantly increased ($P < 0.05$) in the intervention group and, where available, was significantly greater than that in the control group. To ensure that the reported effectiveness of intervention components only reflected active elements in the intervention group, BCTs present in both the control group and intervention group were not coded.

Results

The systematic search of the databases identified 615 articles, with 13 additional articles identified through reference checking. Of these, 13 articles met the inclusion criteria (Fig. 1). Of the 13 included articles, eight used non-randomised before–after study designs[18–25] and five used randomised controlled trials.[26–30] Five studies were conducted in Australia, five in America and three in the United Kingdom. All interventions were delivered within a clinical setting and one included community engagement.[18] The studies reported a variety of outcome measures for attendance at SHC consultations: attendance at clinic appointments ($n = 6$),[18,23,24,28–30] return visits to clinic ($n = 1$),[18] and retesting rates ($n = 7$).[19–22,25–27] The follow-up period for measuring participants' attendance ranged from 1 month[29,30] to 12 months.[24,25,28] Further details about intervention characteristics can be found in Supplementary File S2.
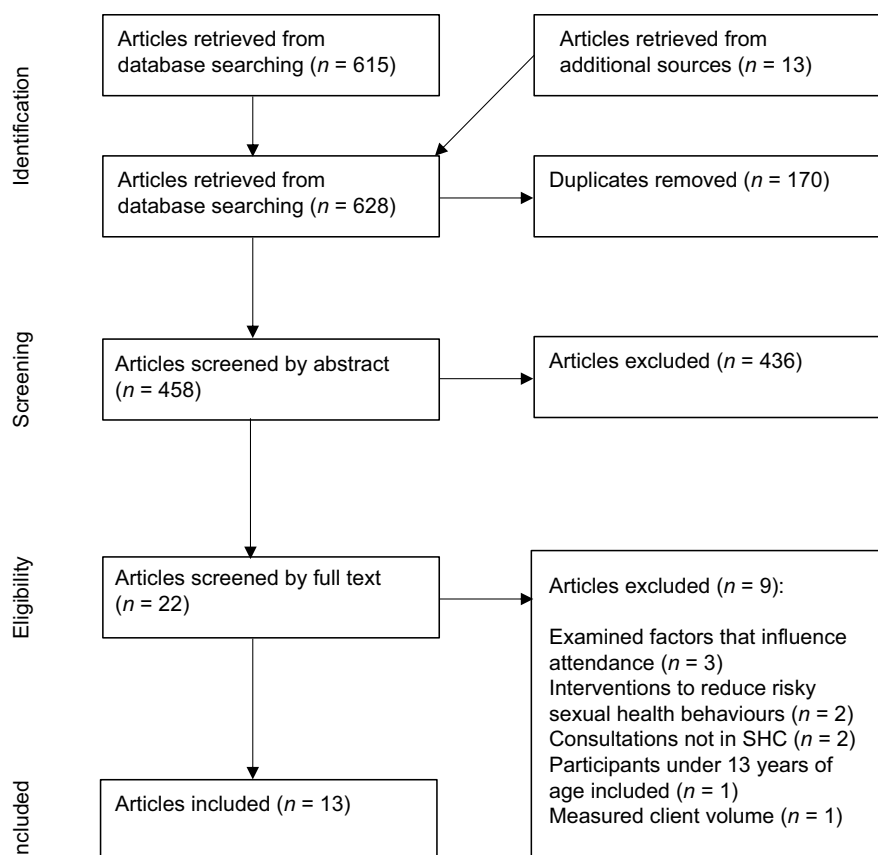

Fig. 1. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow diagram of the systematic search and selection of articles.

Quality assessment

Methodological quality was identified as moderate in 10 studies, with three rated as low quality[20,27,30] (Table 1). Within the included studies, intervention fidelity was often unclear[19,21,24,25] and four interventions were reported not to have been delivered as intended because SMS messages were not delivered to all participants.[20,22,26–29] Furthermore, not all studies reported whether analysis controlled for confounders[18,20,22,24] and there were doubts about the representativeness of some populations studied.[20,27,28] Rutland *et al.* (2012)[30] was reported as a conference paper. Consequently, the information provided about the study is very limited and, therefore, increases the risk of bias.

Intervention effectiveness

Appointment attendance and return visits

Eligible studies included four interventions that aimed to support patients' attendance at HIV care appointments. Following a 6-month bidirectional texting intervention, Rana *et al.* (2016)[23] reported participants' appointment adherence was an average of 79.1% of scheduled appointments, with 47% of participants achieving 100% attendance at their scheduled appointments. However, as no pre-intervention attendance data were reported, it is not known if the intervention significantly increased attendance. Tanner *et al.* (2018)[24] found that a combination of personalised messages sent through social media, SMS and mobile applications significantly decreased participants missed appointments from 68.4% in the 12 months before the intervention to 53.3% during the 12-month intervention ($P < 0.04$). Ingersoll *et al.* (2015)[28] also found that personalised bidirectional SMS messages improved missed appointments from 26.9% to 9% compared to 31% to 28% in the control group. Nevertheless, the findings were not significant ($P = 0.12$). Another study by Norton *et al.* (2014)[29] did not find the use of an SMS reminder and reminder phone call to significantly improve attendance rates compared to a control group who also received a reminder phone call ($P = 0.42$).

Two further studies explored intervention effectiveness on attendance in SHCs. Biggs *et al.* (2016)[18] reported a significant increase in the number of Aboriginal people attending sexual health consultations following a peer-based, incentive-driven intervention ($n = 313$) in comparison to a historical control group ($n = 83$, $P < 0.01$). However, despite this increase, there was no significant difference in the number of return visits in the 12-month period following the first appointment ($n = 169$ (intervention group) vs $n = 51$ (historical control group); $P < 0.31$). Rutland *et al.* (2012)[30] found an SMS notification with a health promotional message increased reattendance rates by 15.2% ($P = 0.032$) compared to 8.2% with an SMS notification without a health promotional message ($P = 0.36$) and 4.5% in the control group.

Retesting rates

Seven studies assessed intervention effectiveness for increasing attendance to repeat STI testing, including two studies that used SMS reminders in a sample of men who have sex with men (MSM). Bourne *et al.* (2011)[19] found the use of an SMS reminder for repeat STI screening significantly increased retesting in MSM (64% attendance) compared to the comparison group without an SMS reminder (30% attendance – OR 4.4 [95% CI 3.5–5.5], $P < 0.01$) and the pre-SMS group (31% attendance – OR 3.1 [95% CI 2.5–3.8], $P < 0.01$). Similarly, Zou *et al.* (2013)[25] found the number of men who returned to the clinic to be significantly higher among men who had 3-monthly (89.5% attendance, $P < 0.01$) or 6-monthly (87.7% attendance, $P < 0.01$) SMS and/or email reminders compared to a concurrent control group (70.8% attendance).

Four further studies used SMS reminders for men and women. Downing *et al.* (2013)[26] found both SMS reminders (22.7% attendance) and SMS reminders plus financial incentives (29.17% attendance) to increase retesting rates compared to a control group (0% attendance; $P < 0.04$ and $P < 0.04$ respectively). Guy *et al.* (2013)[21] reported retesting to be significantly higher in the SMS reminder group compared with the pre-SMS group (30% vs 21%; $P < 0.04$). Those in the SMS group were more likely to return than the pre-SMS group (OR 1.57 [95% CI 1.01–2.46]); however, SMS reminders did not significantly increase retesting when compared with a concurrent non-SMS group (30% vs 25%; $P < 0.30$). Nyatsanza *et al.* (2016)[22] found that sending a personalised SMS reminder significantly increased re-attendance rates for testing (56% [95% CI 50–62%]) when compared to a non-personalised SMS group (33% [95% CI 28–39%]; $P < 0.01$). However, Burton *et al.* (2014)[20] did not find SMS reminders affected re-attendance rates when compared to a historical control group. Burton *et al.* (2014)[20] hypothesised that tailored or bidirectional SMS messages might have been more effective.

Malotte *et al.* (2004)[27] examined the effects of a variety of interventions including financial incentives, motivational counselling and a phone call reminder on re-attendance for repeat testing. Their findings suggested that reminder phone calls were most effective to increase client return visits (OR 18.1 [95% CI, 1.7–193.5]). Malotte *et al.* (2004)[27] recommended combining motivational counselling and phone call reminders to maximise re-attendance.

Use of theory

Theory was mentioned in three included studies (Table 2).[24,27,28] Ingersoll *et al.* (2015)[28] reported that the Information, Motivation and Behaviour Skills (IMB) Model of Adherence[31] and Social Action Theory[32] were the theoretical foundations for the intervention. However, how the theories were used to inform the development and application of the intervention were not reported.

Table 1. Mixed-methods appraisal tool for included studies in the systematic review.

Category of design	Methodological quality criteria	Biggs et al. (2016)[18]	Bourne et al. (2011)[19]	Burton et al. (2014)[20]	Downing et al. (2013)[26]	Guy et al. (2013)[21]	Ingersoll et al. (2015)[28]	Malotte et al. (2004)[27]	Norton et al. (2014)[29]	Nyatsanza et al. (2016)[22]	Rana et al. (2016)[23]	Rutland et al. (2012)[30]	Tanner et al. (2018)[24]	Zou et al. (2013)[25]
2. Quantitative randomised controlled trials	2.1. Is randomisation appropriately performed?				☑		☑	☑	☑			□		
	2.2. Are the groups comparable at baseline?				☑	⊠		□	☑			□		
	2.3. Are there complete outcome data?				☑		☑	□	☑			□		
	2.4. Are outcome assessors blinded to the intervention provided?				⊠		☑	□	☑			□		
	2.5. Did the participants adhere to the assigned intervention?				⊠		⊠	□	⊠			□		
3. Quantitative non-randomised	3.1. Are the participants representative of the target population?	☑	☑	□		☑				☑			☑	☑
	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?	☑	☑	☑		☑				☑			☑	☑
	3.3. Are there complete outcome data?	☑	☑	☑		☑				☑			☑	☑
	3.4. Are the confounders accounted for in the design and analysis?	□	☑	□		☑				□			□	⊠
	3.5. During the study period, is the intervention administered (or exposure occurred) as intended?	☑	□	⊠		□				⊠			□	□
5. Mixed methods	5.1. Is there an adequate rationale for using a mixed-methods design to address the research question?										☑			
	5.2. Are the different components of the study effectively integrated to answer the research question?										☑			
	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?										☑			
	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?										⊠			
	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?										⊠			
	MMAT score	4	4	2	3	4	3	1	4	3	3	0	3	3

Ticked boxes: Yes. Blank boxes: Can't tell. Cross boxes: No. 0–2, low. 3–4, moderate. 5, high.

Table 2. Summary of intervention's use of theory and theoretical base.

Item no.	Item	Ingersoll et al. (2015)[28]	Malotte et al. (2016)[A,27]	Tanner et al. (2018)[B,24]
I	Theory/model of behaviour mentioned	Information, Motivation and Behaviour Skills (IMB) Model of Adherence;[31] Social Action Theory (SAT)[32]	Social-Cognitive Theory;[33] the Theory of Reasoned Action[35]	Social-Cognitive Theory;[33] Empowerment theory[34]
2	Targeted construct mentioned as predictor of behaviour	No	No	Yes
3	Intervention based on single theory	No	Don't know	No
4	Theory/predictors used to select recipients for the intervention	No	No	Don't know
5	Theory/predictors used to select/develop intervention techniques	Don't know	Don't know	Yes: Social-Cognitive Theory; Empowerment theory
6	Theory/predictors used to tailor intervention techniques to recipients	Don't know	Don't know	No
7	All intervention techniques are explicitly linked to at least one theory-relevant construct/predictor	No	No	No
8	At least one, but not all, of the intervention techniques are explicitly linked to at least one theory-relevant construct/predictor	No	No	Yes: Information, outcome-expectancies, self-efficacy, direct experience, vicarious learning, persuasion/social support, incentives (Social-Cognitive Theory); critical consciousness, action (Empowerment Theory)
9	Group of techniques are linked to a group of constructs/predictors	Don't know	Don't know	No
10	All theory-relevant constructs/predictors are explicitly linked to at least one intervention technique	No	No	No
11	At least one, but not all, of the theory relevant constructs/predictors are explicitly linked to at least one intervention technique	No	No	Yes

[A]Significant increase in attendance in some intervention groups within the study.
[B]Significant increase in attendance in the intervention group.

Tanner *et al.* (2018)[24] reported that intervention content was informed by Social Cognitive Theory[33] and Theory of Empowerment.[34] Examples of SMS messages sent to participants were provided, with the messages explicitly linked to constructs from Social Cognitive Theory (e.g. information, outcome-expectancies, self-efficacy, direct experience, vicarious learning, persuasion/social support, incentives) and Empowerment Theory (e.g. critical consciousness, action).

Malotte *et al.* (2004)[27] described motivational interviewing as commonly related to cognitive-behaviour theories, such as Social Cognitive Theory[33] and Theory of Reasoned Action.[35] However, the article did not report whether cognitive-behaviour theories were used to inform the motivational counselling used, which theories were used, or the extent of their use.

Mode of delivery

Seven modes of intervention format were reported (Table 3). The most used was SMS (*n* = 11), for which

implementation varied in content and frequency (Table 4). Other interventions utilised individual, face-to-face sessions (*n* = 2), telephone calls (*n* = 1), email contact (*n* = 1), social media (*n* = 1), app-based messaging (*n* = 1) and letters (*n* = 1). A total of 10 interventions used only one intervention format, whereas the remaining three used a combination of two or more formats.

Reflecting the intervention formats, digital facilitation was commonly reported (*n* = 11), with nine interventions facilitated via automated messaging, and three using bidirectional messaging.[23,24] One intervention sent reminder letters.[27] The following professionals facilitated in one intervention each: Aboriginal sexual health worker, SHC staff, interventionist, and a cyber-health educator.

Behavioural change techniques

A total of 19 BCTs were identified in the included interventions (Table 5). The number of BCTs used ranged from 0 to 14 (mean: 3.2). The most observed BCTs across

Table 3. Summary of intervention's modes of delivery.

	Intervention format	Intervention facilitator
Biggs *et al.* (2016)[A,18]	Individual, face-to-face sessions	Aboriginal sexual health worker and peers
Bourne *et al.* (2011)[A,19]	SMS	Digital (automated message)
Burton *et al.* (2014)[20]	SMS	Digital (automated message)
Downing *et al.* (2013)[A,26]	SMS	Digital (automated message)
Guy *et al.* (2013)[21]	SMS	Digital (automated message)
Ingersoll *et al.* (2015)[28]	SMS	Digital (automated message and bidirectional)
Malotte *et al.* (2004)[B,27]	Individual, face-to-face sessions and/or phone calls/letter	Sexual health clinic staff and/or printed material
Norton *et al.* (2014)[29]	SMS	Digital (automated message)
Nyatsanza *et al.* (2016)[A,22]	SMS	Digital (automated message)
Rana *et al.* (2016)[23]	SMS	Digital (bidirectional messaging: Interventionist (a trained research assistant with a Bachelor's degree)
Rutland *et al.* (2012)[A,30]	SMS	Digital (automated message)
Tanner *et al.* (2018)[A,24]	SMS, social media and/or app-based messaging	Digital (bidirectional messaging: Cyberhealth educator)
Zou *et al.* (2013)[A,25]	SMS and/or email	Digital (automated message)

[A]Significant increase in attendance in the intervention group.
[B]Significant increase in attendance in some intervention groups within the study.
SMS, short message service.

Table 4. SMS message reminder content and delivery.

	SMS content	Frequency of SMS delivery
Bourne *et al.* (2011)[A,19]	'You are due for your next screening. Please call SSHC on 93827440 to make an appointment.'	On average, 4 months after the baseline test
Burton *et al.* (2014)[20]	'It is time for you to have a routine test. Walk-in during opening hours or ring xxxxxxx for an appointment. Do not text back. From CMH'	6 weeks after an initial appointment (range of 2–12 weeks)
Downing *et al.* (2013)[A,26]	Group 2: '3 mths r up, drop in 4 a checkup or call 40506205 for an appointment' Group 3: '3 mths r up, drop in 4 a check-up or call 40506205 for an appointment and get $10'	Group 2 and 3: 10–12 weeks after treatment
Guy *et al.* (2013)[21]	'You are due for a repeat test. Please call SSHC on 93827440 to make an appointment.'	3 months after initial infection on a pre-established convenient date for the patient
Norton *et al.* (2014)[29]	'Reminder: you have a doctor's appointment tomorrow'	One message sent the night before the appointment
Nyatsanza *et al.* (2016)[A,22]	'Hi (Patient Forename) It's time for a routine test. Walk-in, call xxxxxx or email xxxxxxxx for appt'	Usually 6 weeks after an initial episode
Rana *et al.* (2016)[23]	Self-selected or participant created; e.g. 'You're worth it – remember your clinic appointment'; 'don't forget about your doctor's appointment... love, Godzilla'	Once weekly sent 3 weeks, 2 weeks and 1 week before scheduled clinic appointment, and once daily 2 days and 1 day before clinic appointment
Tanner *et al.* (2018)[A,24]	Tailored appointment reminders from existing guide messages; e.g. 'Sometimes people miss their appointments and then are less healthy. I don't want u to be one of them!'; 'After your appt do treat urself (*something that the cyberhealth educator knows that the participant values/ wants and is reasonable and within reach*)'	Not reported
Zou *et al.* (2013)[A,25]	'Your next check-up is now due. Phone for an appointment or walk in.'	Every 3/6/12 months based on patient preference

[A]Significant increase in attendance in the intervention group.
SMS, short message service.

the 18 intervention groups were *credible source* ($n = 12$) and *prompts/cues* ($n = 10$). The following BCTs were only observed once across intervention groups: *social support*

(*practical*), *social reward, self-incentive, reduce negative emotions, restructuring the physical environment, restructuring the social environment, focus on past success,* and *vicarious*

Table 5. Behaviour change techniques[16] identified in the interventions.

Group	BCT identified	Biggs et al. (2016)[A,18]	Bourne et al. (2011)[A,19]	Burton et al. (2014)[20]	Downing et al. (2013): G2[A,26]	Downing et al. (2013): G3[A,26]	Guy et al. (2013)[21]	Ingersoll et al. (2015)[28]	Malotte et al. (2004): G2[27]	Malotte et al. (2004): G3[A,27]	Malotte et al. (2004): G5[A,27]	Malotte et al. (2004): G6[27]	Norton et al. (2014)[29]	Nyatsanza et al. (2016)[A,22]	Rana et al. (2016)[23]	Rutland et al. (2012): G1[30]	Rutland et al. (2012): G2[A,30]	Tanner et al. (2018)[A,24]	Zou et al. (2013)[A,25]
Group 1: Goals and planning	1.2 Problem solving									■		■			■			■	
	1.5 Review behaviour goal(s)									■		■							
	1.9 Commitment									■									
Group 3: Social support	3.1 Social support (unspecified)	■						■							■			■	
	3.2 Social support (practical)																		
	3.3 Social support (emotional)									■		■							
Group 4: Shaping knowledge	4.1 Instruction on how to perform behaviour																	■	
Group 5: Natural consequences	5.1 Information about health consequences	■								■	■	■						■	■
Group 7: Associations	7.1 Prompts/cues	■	■	■	■	■	■			■		■			■		■	■	■
Group 9: Comparison of outcomes	9.1 Credible source	■	■	■	■	■	■		■	■	■	■				■	■	■	■
Group 10: Reward and threat	10.1 Material incentive					■			■										
	10.4 Social reward																	■	
	10.7 Self-incentive																	■	
Group 11: Regulation	11.2 Reduce negative emotions																	■	
Group 12: Antecedents	12.1 Restructuring the physical environment																	■	
	12.2 Restructuring the social environment																	■	
Group 13: Identity	13.2 Framing/reframing									■		■						■	
Group 15: Self-belief	15.3 Focus on past success																	■	
Group 16: Covert learning	16.3 Vicarious consequences																	■	
	Total BCTs used	4	2	2	2	3	2	1	2	8	2	7	0	0	3	1	2	14	3

[A]Significant increase in attendance in the intervention group.

consequences. Although Nyatsanza *et al.* (2016)[22] described use of both *prompts/cues* and *credible source* in the intervention group and Norton *et al.* (2014)[29] described *prompts/cues* in the intervention group, these BCTs were also reported in the control group and thus, they were not coded.

Within the 10 intervention groups found to have a significant increase in attendance behaviours, the number of BCTs reported ranged from 0 to 14 (mean: 4). The most frequently used BCTs described in effective interventions were: *credible source* (n = 8), *prompts/cues* (n = 8), and *information about health consequences* (n = 5). The following BCTs were solely used in interventions found to increase attendance at SHCs: *social support (practical), instruction on how to perform behaviour, social reward, self-incentive, reduce negative emotions, restructuring the physical environment, restructuring the social environment, focus on past success*, and *vicarious consequences*.

Eight intervention groups did not report a significant increase in attendance behaviours. The use of BCTs within these intervention groups ranged from zero to seven (mean: 2.3). The most commonly coded BCTs among intervention groups that did not report an increase in attendance were: *credible source* (n = 4), *prompts/cues* (n = 4), *problem solving* (n = 2) and *social support (unspecified)* (n = 2).

Discussion

This review identified 13 interventions designed to increase attendance at pre-booked SHC appointments. Findings suggest that behavioural interventions can be effective at supporting appointment attendance in the context of sexual health. Across all included interventions, only one study explicitly linked theoretical constructs to the BCTs implemented. A total of 19 BCTs were identified within 18 intervention groups, of which the most common were: *information about health consequences*, use of *prompts/cues,* and information provided by a *credible source*. There were seven different modes of intervention delivery and six different intervention sources. SMS was the most frequently employed mode of delivery, with a digital (automatic) facilitator.

Consistent with literature relating to other healthcare settings,[36] the present review indicates that mobile health (mHealth) interventions have the potential to increase attendance rates at SHC appointments.[11] This review strongly suggests, however, that the content of the mHealth intervention is as important as the mode of delivery. Previous research suggests that appointment reminders may be more effective when combined with additional behaviour change strategies such as providing sexual health information, access to advice from healthcare professionals, and social and psychosocial support that can address knowledge

deficits, low motivation and behaviour change.[37] This review also supports previous calls to tailor appointment reminder systems to a specific service or sub-population.[38] For example, appointment reminders could be combined with additional messages tailored to specific subgroups of patients, such as MSM (e.g. messages that target service-users perceived at risk of sexually transmitted diseases in MSM,[25] health consequences of missing HIV appointments[24]) and culturally appropriate messaging (e.g. messages that address attendance concerns specific to stigma within a local community[18]). Nevertheless, for the additional messages to be effective, acceptable and engaging, it may be essential to co-develop such messages with service-users. Future research also needs to assess the cost-effectiveness of more complex mHealth interventions that provide a variety of content compared with simpler approaches, such as SMS appointment reminders. Furthermore, consideration should be given to patient communication and technology preferences due to the sensitivity of sexual health and service-user privacy concerns.[29] Thus, it may be beneficial to explore the effectiveness of mHealth interventions compared to alternative modes of delivery.

The identification of BCTs within interventions highlights the importance of using *credible sources* to provide information, implementing appointment *prompts/cues*, and providing relevant *information about health consequences* to increase SHC appointment attendance. However, *credible sources* and appointment *prompts/cues* were also identified in ineffective interventions and it is possible that the BCT taxonomy does not capture differences within their application or content, which may alter their effectiveness.[39] Alternatively, the *credible sources* and appointment *prompts/cues* may have interacted with additional BCTs used within the interventions. As theory and literature suggests that appointment attendance should be understood in terms of both practical (e.g. *prompts/cues*) and perceptual barriers (e.g. *information about health consequences*),[8–10,40] it is essential for interventions to combine BCTs that address both of these elements. Combining strategies in this way was recommended by Malotte *et al.* (2004),[27] who suggested using a telephone reminder alongside motivational interviewing to increase return visits. However, the effectiveness of combining BCTs could not be reliably tested within this review due to the low number of relevant studies, and this should be a priority for future research.

Behavioural science literature further suggests interventions based on theory or guided by theoretical constructs are more effective at changing health behaviours.[41] The use of theory can help explain and predict specific behaviours in different contexts, populations and settings, highlighting which causal pathways should be targeted within interventions.[42] However, despite recommendations for complex interventions to be theoretically underpinned,[43] only 1 of the 13 included interventions explicitly reported the application and implementation of theory,[24] whereas

another two referenced the intervention as being theory-based without providing details.[27,28] Consequently, it is not possible to identify specific theoretical constructs that might mediate attendance to SHCs. Nevertheless, the review does highlight the importance of utilising and explicitly reporting theory in future evaluation of interventions that may, or may not, lead to increased SHC attendance to help enhance understanding of the causal pathways.

Strengths and limitations

This review used a robust and systematic methodology that limited bias in the identification and selection of relevant studies. Three researchers independently extracted data from included studies, coded for theory and BCTs and assessed quality, which adds further rigour. Although the review updates an earlier systematic review on interventions to increase testing and clinic re-attendance in SHCs,[11] it further provides new knowledge on behavioural theory, mode of delivery and behaviour change components in existing SHC interventions, contributing to a deeper and more nuanced understanding for developing future interventions.

Nevertheless, the review has limitations. Variation between included studies (e.g. research designs, outcome measures, participant demographics) rendered it impossible to perform more complex meta-analyses. Second, some studies were unclear as to whether all appointments were pre-booked or whether the interventions motivated attendance to walk-in clinics. Furthermore, the inclusion of a conference paper provided limited information.[30] Such studies were included in order to continue building knowledge within this limited field. Third, reporting of intervention development and intervention characteristics, such as the theoretical underpinning and application of BCTs, was limited. Interventions may have used additional theories and BCTs that were not reported; however, this is recognised as a common issue in systematic reviews that report the use of theory and BCTs.[11,44] Future interventions should report theoretical application and use standardised measures for BCTs to support the development of a robust evidence base.

Conclusion

This review provides new knowledge about the types of interventions implemented to improve appointment attendance at SHCs, including the effectiveness of specific intervention components. Findings indicate that SHC appointment attendance can be increased when both practical and perceptual barriers are targeted through the inclusion of BCTs, such as providing information from credible sources, using appointment reminders and giving information about the consequences. This provides a focus for future research to assess combining BCTs to improve clinic attendance rates. mHealth interventions may offer an effective approach for delivering theoretically informed interventions to a wide population, but cost-effectiveness analysis is also needed before widespread implementation.

Supplementary material

Supplementary material is available online.

References

1   Public Health England. Health matters: preventing STIs. 2019. Available at https://www.gov.uk/government/publications/health-matters-preventing-stis/health-matters-preventing-stis [accessed 1 March 2021]

2   Kuehn BM. A proactive approach needed to combat rising STIs. *JAMA* 2019; 321(4): 330–2. doi:10.1001/jama.2018.20400

3   Tanton C, Geary RS, Clifton S, Field N, Heap KL, Mapp F, Hughes G, Johnson AM, Cassell JA, Sonnenberg P, Mercer CH. Sexual health clinic attendance and non-attendance in Britain: findings from the third National Survey of Sexual Attitudes and Lifestyles (Natsal-3). *Sex Transm Infect* 2018; 94(4): 268–76. doi:10.1136/sextrans-2017-053193

4   Tomkins A, Naylor S, Morgan E. Short message service cancellation intervention to reduce integrated sexual health and HIV 'did not attend' appointment rates. *Int J STD AIDS* 2019; 30(2): 201–3. doi:10.1177/0956462418804656

5   Hallsworth M, Berry D, Sanders M, Sallis A, King D, Vlaev I, Darzi A. Stating appointment costs in SMS reminders reduces missed hospital appointments: findings from two randomised controlled trials. *PLoS One* 2015; 10: e0141461. doi:10.1371/journal.pone.0141461

6   Robotham D, Satkunanathan S, Reynolds J, Stahl D, Wykes T. Using digital notifications to improve attendance in clinic: systematic review and meta-analysis. *BMJ Open* 2016; 6(10): e012116. doi:10.1136/bmjopen-2016-012116

7   Trettin B, Vestergaard T, Stensgaard A. Understanding young people's barriers to sexually transmitted disease screening and meeting their needs: a focus group study. *J Nurs Educ Pract* 2015; 5(6): 81–6. doi:10.5430/jnep.v5n6p81

8   Balfe M, Brugha R, O'Connell E, McGee H, O'Donovan D, Vaughan D. Why don't young women go for Chlamydia testing? A qualitative study employing Goffman's stigma framework. *Health Risk Soc* 2010; 12(2): 131–48. doi:10.1080/13698571003632437

9   Normansell R, Drennan VM, Oakeshott P. Exploring access and attitude to regular sexually transmitted infection screening: the views of young, multi-ethnic, inner-city, female students. *Health Expect* 2016; 19: 322–30. doi:10.1111/hex.12354

10   Jaspal R. Perceptions of HIV testing venues among men who have sex with men in London and the Midlands, United Kingdom. *J Gay Lesbian Soc Serv* 2018; 30(4): 336–55. doi:10.1080/10538720.2018.1516587

11   Burns K, Keating P, Free C. A systematic review of randomised control trials of sexual health interventions delivered by mobile technologies. *BMC Public Health* 2016; 16(1): 778. doi:10.1186/s12889-016-3408-z

12   Page MJ, McKenzie JE, Bossuy PM, Boutron I, Hoffman TC, Mulrow CD, Shamseer L, Tetzlaff JM, Akl EA, Brennan SE, Chou R, Glanville J, Grimshaw JM, Hróbjartsson A, Lalu MM, Li T, Loder EW, Mayo-Wilson E, McDonald S, McGuinness LA, Stewart LA, Thomas J, Tricco AC, Welch VA, Whiting P, Moher D. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021; 372: n71. doi:10.1136/bmj.n71

13   Methley AM, Campbell S, Chew-Graham C, McNally R, Cheraghi-Sohi S. PICO, PICOS and SPIDER: a comparison study of specificity and sensitivity in three search tools for qualitative systematic reviews. *BMC Health Serv Res* 2014; 14: 579. doi:10.1186/s12913-014-0579-0

14 Michie S, Prestwich A. Are interventions theory-based? Development of a theory coding scheme. *Health Psychol* 2010; 29(1): 1–8. doi:10.1037/a0016939

15 Webb TL, Sheeran P. Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychol Bull* 2006; 132(2): 249–68. doi:10.1037/0033-2909.132.2.249

16 Michie S, Richardson M, Johnston M, Abraham C, Francis J, Hardeman W, Eccles M P, Cane J, Wood CE. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Ann Behav Med* 2013; 46(1): 81–95. doi:10.1007/s12160-013-9486-6

17 Pluye P, Gagnon M-P, Griffiths F, Johnson-Lafleur J. A scoring system for appraising mixed methods research, and concomitantly appraising qualitative, quantitative and mixed methods primary studies in mixed studies reviews. *Int J Nurs Stud* 2009; 46: 529–46. doi:10.1016/j.ijnurstu.2009.01.009

18 Biggs K, Walsh J, Ooi C. Deadly liver mob: opening the door – improving sexual health pathways for Aboriginal people in Western Sydney. *Sex Health* 2016; 13(5): 457–64. doi:10.1071/SH15176

19 Bourne C, Knight V, Guy R, Wand H, Lu H, McNulty A. Short message service reminder intervention doubles sexually transmitted infection/HIV re-testing rates among men who have sex with men. *Sex Transm Infect* 2011; 87(3): 229–31. doi:10.1136/sti.2010.048397

20 Burton J, Brook G, McSorley J, Murphy S. The utility of short message service (SMS) texts to remind patients at higher risk of STIs and HIV to reattend for testing: a controlled before and after study. *Sex Transm Infect* 2014; 90: 11–3. doi:10.1136/sextrans-2013-051228

21 Guy R, Wand H, Knight V, Keningsberg A, Read P, McNulty AM. SMS reminders improve re-screening in women and heterosexual men with chlamydia infection at Sydney Sexual Health Centre: a before-and-after study. *Sex Transm Infect* 2013; 89: 11–5. doi:10.1136/sextrans-2011-050370

22 Nyatsanza F, McSorley J, Murphy S, Brook G. 'It's all in the message': the utility of personalised short message service (SMS) texts to remind patients at higher risk of STIs and HIV to reattend for testing – a repeat before and after study. *Sex Transm Infect* 2016; 92: 393–5. doi:10.1136/sextrans-2015-052216

23 Rana AI, van den Berg JJ, Lamy E, Beckwith CG. Using a mobile health intervention to support HIV treatment adherence and retention among patients at risk for disengaging with care. *AIDS Patient Care STDS* 2016; 30(4): 178–84. doi:10.1089/apc.2016.0025

24 Tanner AE, Song EY, Mann-Jackson L, Alonzo J, Schafer K, Ware S, Garcia JM, Arellano Hall E, Bell JC, Van Dam CN, Rhodes SD. Preliminary impact of the weCare Social Media intervention to support health for young men who have sex with men and transgender women with HIV. *AIDS Patient Care STDS* 2018; 32(11): 450–8. doi:10.1089/apc.2018.0060

25 Zou H, Fairley CK, Guy R, Bilardi J, Bradshaw CS, Garland SM, Sze JK, Afrizal A, Chen MY. Automated, computer generated reminders and increased detection of gonorrhoea, chlamydia and syphilis in men who have sex with men. *PLoS One* 2013; 8(4): e61972. doi:10.1371/journal.pone.0061972

26 Downing SG, Cashman C, McNamee H, Penney D, Russell DB, Hellard ME. Increasing chlamydia test of re-infection rates using SMS reminders and incentives. *Sex Transm Infect* 2013; 89: 16–9. doi:10.1136/sextrans-2011-050454

27 Malotte CK, Ledsky R, Hogben M, Larro M, Middlestadt S, St Lawrence JS, Olthoff G, Settlage RH, Van Devanter NL, GCAP Study Group. Comparison of methods to increase repeat testing in persons treated for gonorrhoea and/or chlamydia at public sexually transmitted disease clinics. *Sex Transm Dis* 2004; 31(11): 637–42. doi:10.1097/01.olq.0000143083.38684.9d

28 Ingersoll KS, Dillingham RA, Hettema JE, Conaway M, Freeman J, Reynolds G, Hosseinbor S. Pilot RCT of bidirectional text messaging for ART adherence among nonurban substance users with HIV. *Health Psychol* 2015; 34: 1305–15. doi:10.1037/hea0000295

29 Norton BL, Person AK, Castillo C, Pastrana C, Subramanian M, Stout JE. Barriers to using text message appointment reminders in an HIV clinic. *Telemed J E Health* 2014; 20(1): 86–9. doi:10.1089/tmj.2012.0275

30 Rutland E, Roe H, Weaver A. O11 Health promotional messages in short message service (SMS) follow-up of GU medicine clinic defaulters; a tool to improve subsequent attendance rates? *Sex Transm Infect* 2012; 88: A4–5. doi:10.1136/sextrans-2012-050601a.11

31 Fisher JD, Fisher WA, Amico KR, Harman JJ. An information-motivation-behavioral skills model of adherence to antiretroviral therapy. *Health Psychol* 2006; 25: 462–73. doi:10.1037/0278-6133.25.4.462

32 Ewart CK. Social action theory for a public health psychology. *Am Psychol* 1991; 46(9): 931–46. doi:10.1037/0003-066X.46.9.931

33 Bandura A. Social foundations of thought and action: a social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall, Inc; 1986.

34 Zimmerman MA. Empowerment theory: psychological, organizational, and community levels of analysis. In: Rappaport J, Seidman E, editors. Handbook of community psychology. New York: Plenum Press; 2000. pp. 149–170.

35 Fishbein M, Azjen I. Predicting and changing behavior: the reasoned action approach. New York: Psychology Press; 2010.

36 Sallis A, Gold N, Agbebiyi A, James RJE, Berry D, Bonus A, Vlaev I, Chadborn T. Increasing uptake of National Health Service Health Checks in primary care: a pragmatic randomized controlled trial of enhanced invitation letters in Northamptonshire, England. *J Public Health* 2021; 43(1): e92–9. doi:10.1093/pubmed/fdz134

37 Palmer MJ, Henschke N, Villanueva G, Maayan N, Bergman H, Glenton C, Lewin S, Fønhus MS, Tamrat T, Mehl GL, Free C. Targeted client communication via mobile devices for improving sexual and reproductive health. *Cochrane Database Syst Rev* 2021; 8(8): CD013680. doi:10.1002/14651858.CD013680

38 McLean S, Booth A, Gee M, Salway S, Cobb M, Bhanbhro S, Nancarrow S. Appointment reminder systems are effective but not optimal: results of a systematic review and evidence synthesis employed realist principles. *Patient Prefer Adherence* 2016; 10: 479–99. doi:10.2147/PPA.S93046

39 Ogden J. Celebrating variability and a call to limit systemtisation: the example of the behaviour change technique taxonomy and the behaviour change wheel. *Health Psychol Rev* 2016; 10(3): 245–50. doi:10.1080/17437199.2016.1190291

40 Horne R. Compliance, adherence and concordance. In: Taylor K, Harding G, editors. Pharmacy practice. London: Taylor & Francis; 2001. pp. 165–184.

41 Davis R, Campbell R, Hildon Z, Hobbs L, Michie S. Theories of behaviour and behaviour change across the social and behavioural sciences: a scoping review. *Health Psychol Rev* 2015; 9(3): 323–44. doi:10.1080/17437199.2014.941722

42 Michie S, Atkins L, West R. The behaviour change wheel: a guide to designing interventions. 1st edn. London: Silverback Publishing; 2014.

43 Medical Research Council. Developing and evaluating complex interventions. 2020. Available at https://mrc.ukri.org/documents/pdf/complex-interventions-guidance/ [accessed 11 January 2021]

44 Prestwich A, Sniehoff FF, Whittington C, Dombrowski SU, Rogers L, Michie S. Does theory influence the effectiveness of health behaviour interventions? Meta-analysis. *Health Psychol* 2014; 33(5): 465–74. doi:10.1037/a0032853

Author affiliations
[A]School of Psychology, Aston University, Birmingham, UK.
[B]Department of Sexual Health and HIV, University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK.