

BMJ Open Feasibility and acceptability of safer gambling interventions (social norms and goal setting) delivered via text message for those at low-to-moderate risk of gambling harm: a four-arm randomised controlled feasibility study

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ABSTRACT

Objectives To assess the feasibility and acceptability of three SMS-delivered safer gambling interventions (goal setting (GS), descriptive norms (DN), injunctive norms (IN)) aimed at reducing the transition from low or moderate risk of gambling harm to problematic gambling, and the feasibility of a full-scale randomised controlled trial evaluating their effectiveness and cost-effectiveness.

Design Four-arm, parallel-group, pragmatic, randomised controlled feasibility study with a nested qualitative study.

Setting The study was conducted in the UK. Participants were recruited online via UK-licensed gambling operators' websites.

Participants Adults aged ≥18 years, gambling online at least weekly, with low-to-moderate gambling risk levels.

Interventions Participants were block randomised in equal proportions to a delayed intervention control group or one of three 6-week text message interventions delivered via the secure messaging app WIRE: (1) GS: weekly prompts to set gambling-related goals with personalised feedback; (2) DN: weekly messages challenging misperceptions about peer gambling behaviours and (3) IN: weekly messages addressing misperceptions about peer attitudes towards gambling.

Outcome measures Feasibility was assessed through recruitment and retention rates, intervention adherence, data completeness and feasibility and acceptability of the interventions and study procedures. Secondary outcomes included gambling risk behaviours and cognitions, anxiety, depression, quality of life, healthcare use and productivity, measured at baseline, 7-weeks, and 3- and 6-months post-randomisation.

Results Recruitment took place between April 2021 and August 2022 with final follow-up in February 2023. 167 participants (mean age 51.5; 36% male) were randomised (GS=43; DN=41; IN=42; Control=41). Retention at 6-months was 95.2%, with >95% completion for all outcome measures. Intervention adherence was high, with >95% of DN and IN participants responding to ≥4 messages and 93% of GS participants setting ≥4 goals.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The mixed-methods design enabled the assessment of the feasibility and acceptability of three brief interventions delivered via text message (injunctive norms, descriptive norms and goal setting) in the context of online gambling.
- ⇒ Objective gambling data were obtained to partially validate participant self-reports of goal outcomes.
- ⇒ Most participants were recruited through a gambling operator specialising in horse racing, which may limit generalisability of the findings to the wider population of online gamblers.
- ⇒ The social norms messages may have benefited from greater tailoring to specific types of gambling.

Qualitative findings indicated broad acceptability of the interventions and study procedures.

Conclusions The study was feasible to conduct, interventions and study procedures acceptable to participants, and predefined progression criteria met. Findings support proceeding to a full-scale randomised controlled trial of effectiveness and cost-effectiveness, focusing on the social norms interventions.

Trial registration number ISRCTN37874344.

INTRODUCTION

Gambling for money is a significant public health concern due to its potential to become harmful for some individuals, leading to detrimental effects on psychological and physical well-being and substantial costs to individuals, those around them (affected others) and broader society.^{1–3} Internet gambling, characterised by accessibility, anonymity, immersive interfaces and ease of spending, is associated with higher risk and greater severity of gambling-related harm compared

with land-based gambling.^{4 5} Rapid growth of internet gambling following the COVID-19 pandemic⁶ has heightened the risk of increased gambling harms, with 2.5% of the UK population classified as ‘problem gamblers’ based on Problem Gambling Severity Index (PGSI) scores.⁷ Compounding this issue, evidence suggests that individuals at low or moderate risk of experiencing problem gambling rarely seek help.⁸ This is concerning given that estimated excess costs to the UK government of harmful gambling amount to £412.9million annually,⁹ underscoring the urgent need for interventions to prevent gambling-related harms.

Risk factors for gambling-related harm are amplified when using mobile devices,¹⁰ with bets being higher and more frequent on average than those of computer users.¹¹ As over 95% of the UK population owns a smartphone, text messages are an efficient way to deliver interventions, in addition to being low cost. Although Short Message Service (SMS) delivered interventions have not reduced gambling severity among individuals at risk of problem gambling,^{12 13} they may be effective in preventing online gambling harms among individuals at low-to-moderate risk.¹²

Goal setting (GS) interventions have demonstrated robust effectiveness in changing health behaviours,¹⁴ particularly when goals are public, expressed to another person alongside behavioural monitoring, and are measurable and observable. A single-session, 15min, in-person, goal-setting intervention reduced gambling expenditure among individuals at moderate risk of experiencing problem gambling but not low-risk or non-problem gamblers.¹⁵ Mobile devices, however, provide opportunities for goal tracking and personalised feedback, core elements of goal-setting theory,¹⁶ and repeated sessions are typically more effective for sustaining behaviour change than single sessions.¹⁷ Despite these advantages, no studies have assessed goal-setting interventions delivered via text message as a safer gambling (SG) intervention.

Social norms interventions, which target individuals’ perceptions of typical behaviours and attitudes within their peer groups,¹⁸ have reduced alcohol use among young adults.¹⁹ Social norms include ‘descriptive’ (perceptions of peer behaviours) and ‘injunctive’ (perceptions of peer attitudes) norms.²⁰ To date, the limited randomised controlled trials (RCTs) of social norms interventions targeting gambling have primarily focused on university students. For example, descriptive social norms messages have shown potential in reducing risky gambling behaviour and misconceptions at 3-months follow-up.²¹ Although a recent meta-analysis found no evidence that social norms interventions reduce gambling among individuals experiencing problematic gambling, it was based on clinical populations and social norms interventions are designed for individuals below the clinical threshold for addiction.²² Furthermore, few studies have included injunctive norms (IN) messaging,²² tested the effectiveness of social norms interventions within the general

population or compared the feasibility of descriptive and IN messages for promoting SG. Additionally, most studies have relied on self-reported gambling data, which have not been validated against actual player data, leaving them susceptible to social desirability biases and inaccurate reporting.^{23 24}

Aims and objectives

The aims of this four-arm randomised controlled feasibility study were to assess (1) the feasibility and acceptability of three text message-delivered SG interventions designed to reduce the likelihood of individuals moving from low or moderate risk of gambling harms to experiencing problematic gambling and (2) the feasibility of conducting a full-scale trial assessing their effectiveness and cost-effectiveness.

The objectives were to:

- ▶ Assess the acceptability and feasibility of key aspects of the study design, recruitment and randomisation processes, the data collection strategy, the respective interventions and any unintended consequences.
- ▶ Estimate eligibility, participation and drop-out rates, and intervention adherence.
- ▶ Explore participants’ experiences of participating in the trial, receiving the interventions and completing the outcome measures, via qualitative interviews and participant feedback about intervention messages.
- ▶ Assess the acceptability and suitability of the outcome measures and inform the selection of the primary outcome for a future full-scale RCT.
- ▶ Collect data on the variability of outcome measures to inform a sample size calculation for a larger trial and obtain preliminary effect size estimates.
- ▶ Pilot questions about primary healthcare use and productivity levels in preparation for an economic evaluation in a future definitive RCT.

METHODS

Study design

This was a 26-week, four-arm, parallel group, pragmatic, randomised controlled feasibility study with a nested qualitative study. We aimed to recruit 140 people with low-to-moderate levels of gambling risk to ensure adequate power to evaluate signals for progression across three prespecified progression criteria relating to study uptake, retention and intervention adherence. This study is reported following the Consolidated Standards of Reporting Trials 2010 extension for randomised pilot and feasibility trials.²⁵ Participants were randomised to a delayed intervention control group or one of three 6-week text message interventions (GS, descriptive norms (DN) or IN) delivered via a secure messaging app (WIRE). Details of methods and sample size justification are provided in our published protocol paper.²⁶

Eligibility criteria

Participants were UK residents aged over 18 years who gambled online at least weekly on at least one UK

gambling operator's website (assessed via self-report), owned a smartphone, were willing to download WIRE (a secure messaging mobile application used for intervention delivery) and had sufficient English language ability to complete the self-reported outcome measures and engage with the interventions. Those scoring ≥ 8 on the PGSI²⁷ at screening were not eligible to participate (see published protocol for full details of eligibility criteria).²⁶

Study setting, screening and recruitment

The study was advertised via communications on the SG sections of several UK-licensed gambling operators' websites. It was also advertised on the main rotating banner of a horse-racing focused operator's website. Individuals interested in participating clicked on a link directing them to a study information page with the participant information sheet (PIS) (see online supplemental file 1 in the published protocol²⁶) and consent form (see online supplemental file 2 in the published protocol²⁶). Potential participants were also asked whether they would be willing to be contacted for a qualitative interview about their experiences in the study (see 'Nested qualitative study').

Those who provided informed consent to participate in the feasibility study completed an online screening questionnaire via the Qualtrics survey platform (Qualtrics, London, UK) to assess their eligibility. Eligible participants were notified via email, resent the PIS and a 'Key Facts' summary (which provided a one-page summary of the information in the PIS), and given instructions on how to download the WIRE app, so they could participate in the intervention and receive text message reminders about the questionnaires. Those who were ineligible received an email notification along with information about the National Gambling Helpline.

Pre-randomisation: social norms ascertainment

To establish gambling behaviours (eg, frequency of gambling, typical amount gambled), attitudes (eg, feelings of regret, willingness to seek professional support) and perceptions of peers' gambling behaviours and attitudes, participants in all arms—including the control

group—received 12 pairs of questions via WIRE. These were sent over a 3-week period prior to completing the baseline questionnaires. Each pair of questions consisted of an item about the participant's own behaviour/ attitude and a corresponding question about their perception of that behaviour/attitude in their peer group, tailored to age range and gender. This information was used for the social norms interventions.

Randomisation

To ensure adequate allocation concealment, sequence generation and randomisation were undertaken using Sealed Envelope, a centralised, independent web-based randomisation service (<https://www.sealedenvelope.com>). Once a participant had completed and returned the baseline questionnaires, the study manager randomised them, in an equal ratio, to one of the four study arms via Sealed Envelope. Permuted randomised blocks of size 4 and 8 were used and randomisation was stratified by gender (male/female/'prefer not to say or other').

Blinding

Given the nature of the interventions, participants could not be blinded to allocation. The study manager screened and enrolled participants and sent the intervention materials and links for the online follow-up questionnaires, so was not blinded to allocation. All outcome measures were self-completed online.

Interventions

All three interventions (GS, DN and IN) were delivered weekly via WIRE and ran for 6-weeks (figure 1).

Goal Setting (GS) intervention

Participants were provided with instructions and advice about how to set SMART (Specific, Measurable, Attainable, Realistic and Time-bound) goals, first via a video (which could be replayed at any point during the intervention period), then via messages in WIRE. Participants were asked to create a weekly goal relating to their gambling activity (money-based goals were recommended) and one to three action plans for the goal, and

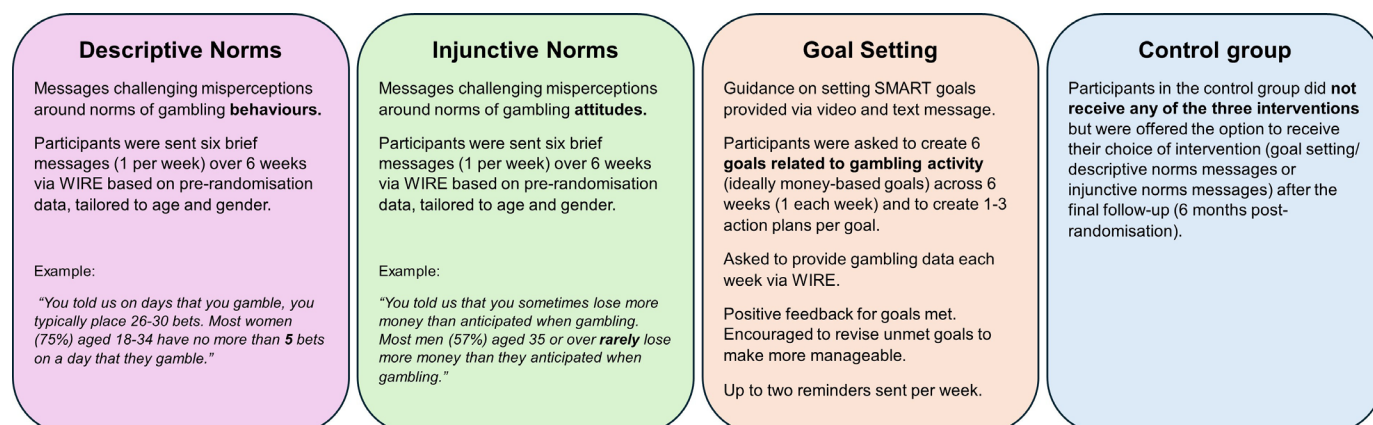


Figure 1 Description of study arms. SMART, Specific, Measurable, Attainable, Realistic and Time-bound.

to share these goals with the study manager via WIRE. At the end of each week, participants were asked to provide their gambling data for that week via WIRE (eg, screenshot/data file/text description). Participants were asked to create six goals in total over the 6-week period. They could keep the same goal or create a new goal each week. Each week, participants were asked if they had met the goal they had set. Those who had partially or completely achieved a goal were given positive feedback. Those who had not met a goal were encouraged to revise it to something more manageable. If participants did not create or share a goal, they were sent a maximum of two email and WIRE reminders per week.

Social norms interventions

In both social norms arms, participants were sent brief weekly text messages (6 in total) via WIRE (based on their social norms prerandomisation data plus data from a sample of 350 people who gamble recruited via Prolific) tailored to their age and gender (see published protocol for further details).²⁶ In both interventions, participants were invited to provide feedback about each message via the app, with no word count requirements.

Descriptive norms (DN) intervention: Messages presented participants with age range and gender specific information about norms of gambling behaviours, for example, 'You told us you gamble 7 days a week and that you think a typical person who gambles does so five times a week. Most men (61%) aged 35 or over gamble no more than 2 days a week.'

Injunctive norms (IN) intervention: Messages presented participants with age range and gender specific information about norms of gambling attitudes, for example, 'You told us that you sometimes feel you should cut down on your gambling. Most women (60%) aged 18 to 34 very rarely feel that they should cut down on their gambling'.

Control arm

Control arm participants did not receive an intervention but were offered the option of receiving their choice of intervention (GS, DN, IN) after the final follow-up (6-month post-randomisation).

Participants in all arms continued to have access to any SG tools made available by operators they had accounts with, including deposit limits and self-exclusion.

Outcomes

The primary outcomes were feasibility and process outcomes related to the study design, recruitment and randomisation, data collection strategy, methods and interventions. We prespecified three progression criteria using a traffic light system²⁸ with the green criteria detailed below (see published protocol for further details).²⁶

1. Study uptake: At least 35% of those screened as eligible were randomised.
2. Study retention: At least 70% of participants with 6-month outcomes.

3. Adherence to the interventions: At least 60% adherence to the interventions (defined as having viewed and responded to at least 4/6 messages in the social norms arms or setting at least 4/6 goals in the GS arm).

As an objective of this feasibility study was to inform the selection of outcome measures for a potential definitive trial, we included a broad range of secondary outcome measures. Full names, citations and the administration schedule for the outcome measures are provided in [table 1](#). These included gambling risk behaviours (PGSI), gambling cognitions (Gambling-Related Cognitions Scale, GRCS), depression (Eight-Item Patient Health Questionnaire, PHQ-8), anxiety (Seven-Item Generalised Anxiety Disorder Questionnaire, GAD-7), capability (ICEpop Capability Measure for Adults, ICECAP-A) and quality of life (European Health Interview Survey–Quality of Life, EUROHIS-QOL and EuroQoL Five Dimensions Five Levels (EQ-5D-5L)). Measures were administered at baseline, 7-weeks, 3-months and 6-months post-randomisation using the Qualtrics survey platform. Participants were emailed an online link to the questionnaires by the study manager. Up to three follow-up email reminders were sent. For those in an intervention arm, a reminder was also sent via the Wire app during the intervention period. At baseline, we also asked about age category, gender, household living arrangements, education, ethnicity, employment status, type of gambling activities undertaken (eg, sports betting, casino) and narcissism²⁹ (an exploratory outcome, not reported on here). Each online questionnaire pack included a link to the PIS, which contained information about the National Gambling Helpline and a link to GamCare support, if required.

To promote participant retention, £55 in Amazon vouchers was offered as compensation for completing study outcome measures (£5 for social norms questions, £10 each for the baseline, 3-month and 6-month follow-up questionnaires and £20 for the 7-week follow-up questionnaire).

Adverse events

The study manager and research team members were asked to inform the chief investigator of any concerning communications or potential adverse events (AEs) received or reported via WIRE, email or during interviews.

Nested qualitative study

To explore participants' experiences of participating in the trial, receiving the interventions and completing the outcome measures, we conducted a nested qualitative study, the findings of which are reported in our published qualitative process paper.³⁰ Participation in this qualitative study was optional, with a £20 Amazon voucher offered as compensation. Consent to be contacted about the qualitative study was obtained as part of the consent process for the feasibility study. In accordance with the protocol-defined interview timelines,²⁶ eligible participants who had provided initial consent to be contacted were emailed a separate PIS and consent form for the

Table 1 Schedule of enrolment, interventions and outcome measures

	Enrolment	Baseline	Allocation	6-week intervention period	Follow-up (time postallocation)		
Time point	-t ₁	0	0		7 weeks	3 months	6 months
Enrolment:							
Eligibility screen	X						
Informed consent	X						
Social norms ascertainment ⁵⁰	X						
Allocation			X				
Interventions							
Descriptive norms				—————			
Injunctive norms				—————			
Goal setting				—————			
Assessments:							
Demographics		X					
Secondary outcomes							
PGSI ²⁷ (9 items)*	X	X			X	X	X
GRCS ⁵¹ (23 items)		X			X	X	X
PHQ-8 ⁵² (8 items)		X			X	X	X
GAD-7 ⁵³ (7 items)		X			X	X	X
EUROHIS-QOL ⁵⁴ (8 items)		X				X	X
EQ-5D-5L ³³ (5 items)		X				X	X
ICECAP-A ³⁶ (5 items)		X				X	X
Primary care health use†		X				X	X
Productivity†		X				X	X

*Using a 1-month recall period as used by others.⁵⁵

†Measures part of economic component—see 'Feasibility economic component' section.

EQ-5D-5L, EuroQoL Five Dimensions Five Levels; EUROHIS-QOL, European Health Interview Survey–Quality of Life; GAD-7, Seven-Item Generalised Anxiety Disorder Questionnaire; GRCS, Gambling-Related Cognitions Scale; ICECAP-A, ICEpop Capability Measure for Adults; Problem Gambling Severity Index; PHQ-8, Eight-Item Patient Health Questionnaire.

qualitative study. The study manager contacted participants selected for interview to confirm their willingness to participate, ensure they had provided informed consent and to schedule an interview at participants' convenience.

Audio-recorded interviews were conducted via video conference or WIRE with 10 participants from each of the three intervention arms (post 3-month follow-up), and with 6 participants from the control group (at the end of the study). Sampling was purposive and iterative with ongoing review of participant characteristics to ensure diversity in demographics, baseline PGSI scores and levels of engagement with the interventions. Recruitment continued until no new themes were identified from the interviews.³¹ The topic guide (online supplemental file 1) explored experiences with the interventions and study processes and was reviewed by someone with lived experience of gambling harms to ensure inclusive, non-stigmatising language.

Feasibility economic component

The aim of this component was to determine the acceptability and completeness of questions related to

healthcare use and productivity and explore the feasibility of a 3-month recall period. We administered healthcare use questions at baseline and 3- and 6-months follow-up, asking about numbers of contacts with general practitioners (GPs) and nurses in the past 3 months (including virtual, face-to-face and telephone) and whether gambling was mentioned during these contacts. We administered questions based on an existing measure of productivity³² (baseline, 3- and 6-months) that asked about number of days' sick leave and whether they were due to gambling-related health issues, number of days at work where productivity was perceived to be <50% of usual levels, and the extent to which non-work daily activities were perceived to be affected by gambling/ gambling-related health issues. We also administered a measure of health-related quality of life, the EQ-5D-5L³³ and a measure of capability, the ICECAP-A.³⁴

Analysis

Quantitative analysis

Quantitative analysis was undertaken using IBM SPSS V.29.0.10. As this was a feasibility study, analyses were

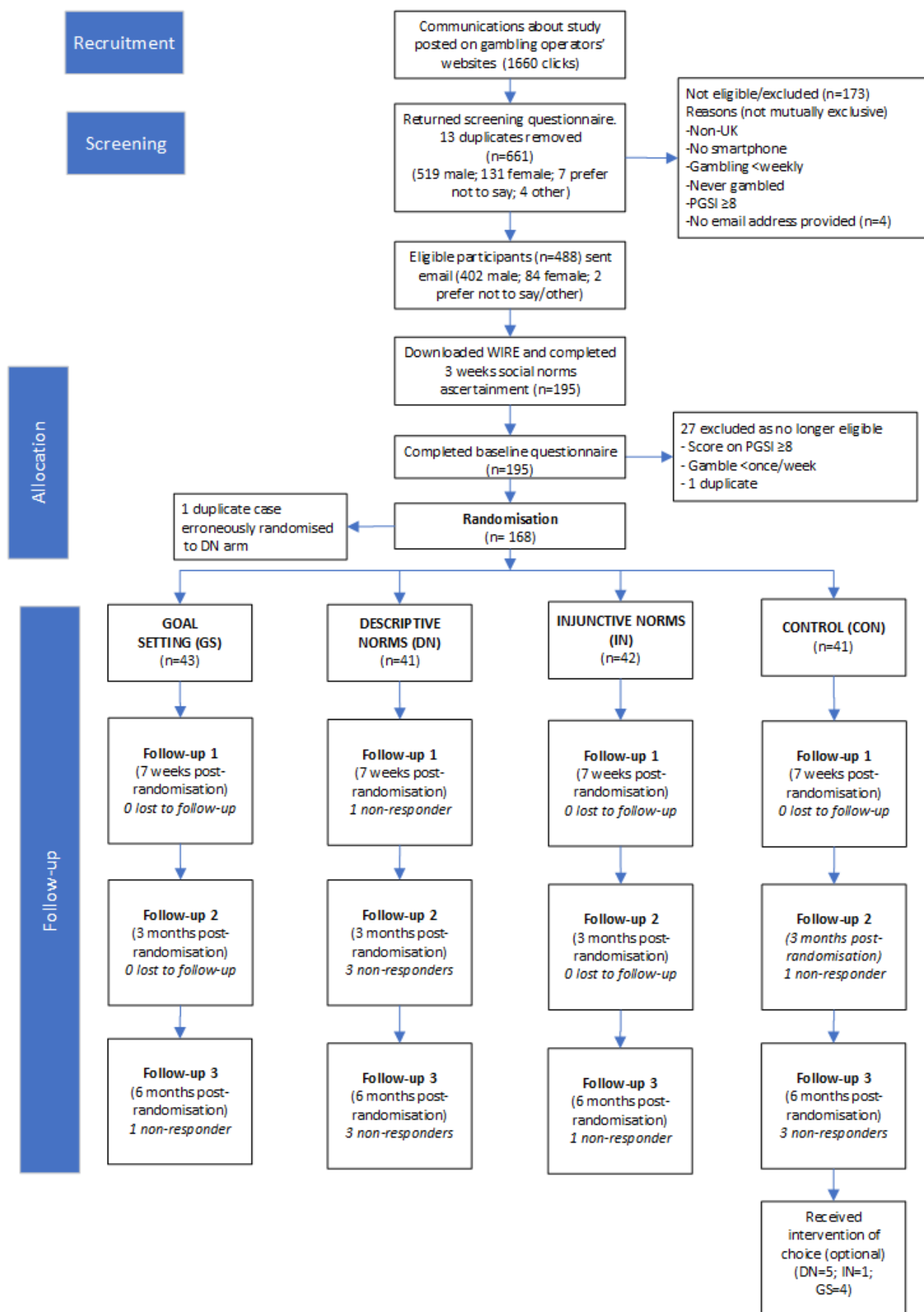


Figure 2 CONSORT diagram. CONSORT, Consolidated Standards of Reporting Trials; PGSI, Problem Gambling Severity Index.

Table 2 Participant baseline characteristics

	Goal setting (n=43)	Descriptive norms (n=41)	Injunctive norms (n=42)	Control group (n=41)	Total (n=167)
Sex, n (%)					
Male	36 (83.7)	35 (85.3)	36 (85.7)	35 (85.4)	142 (85.0)
Female	7 (16.3)	6 (14.6)	6 (14.3)	6 (14.6)	25 (15.0)
Age (years), mean (SD), range	50.0 (13.5) 23–72	50.6 (15.6) 18–75	54.2 (12.0) 30–76	51.4 (13.2) 21–71	51.5 (13.6) 18–76
Ethnicity, n (%)					
White	39 (90.7)	39 (95.1)	38 (90.5)	39 (95.1)	155 (92.8)
Mixed	1 (2.3)	–	1 (2.4)	1 (2.4)	3 (1.8)
Asian	2 (4.7)	1 (2.4)	2 (4.8)	1 (2.4)	6 (3.6)
Black	1 (2.3)	1 (2.4)	–	–	2 (1.2)
Prefer not to say	–	–	1 (2.4)	–	1 (0.6)
Children at home under 18 years					
Yes	9 (20.9)	14 (34.1)	7 (16.7)	10 (24.4)	40 (24.0)
No	34 (79.1)	27 (65.9)	35 (83.3)	31 (75.6)	127 (76.0)
Current living situation, n (%)					
With partner	27 (62.8)	27 (65.9)	27 (64.3)	21 (51.2)	102 (61.1)
With other adult (not partner or family)	4 (9.3)	2 (4.9)	–	2 (4.9)	8 (4.8)
With partner in multi-generational household	2 (4.7)	–	1 (2.4)	2 (4.9)	5 (3.0)
No other adults at address	2 (4.7)	2 (4.9)	1 (2.4)	3 (7.3)	8 (4.8)
Live alone	7 (16.3)	9 (22.0)	11 (26.2)	11 (26.8)	38 (22.8)
Other	1 (2.3)	1 (2.4)	2 (4.8)	2 (4.9)	6 (3.6)
Employment status, n (%)					
Employed part-time	5 (11.6)	4 (9.8)	6 (14.3)	1 (2.4)	16 (9.6)
Employed full-time	22 (51.2)	17 (41.5)	18 (42.9)	21 (51.2)	78 (46.7)
Self-employed	7 (16.3)	4 (9.8)	3 (7.1)	5 (12.2)	19 (11.4)
Unemployed	2 (4.7)	2 (4.9)	3 (7.1)	1 (2.4)	8 (4.8)
Student	–	–	–	1 (2.4)	1 (0.6)
Retired	6 (14.0)	13 (31.7)	11 (26.2)	11 (26.8)	41 (24.6)
Homemaker	–	1 (2.4)	–	1 (2.4)	2 (1.2)
Furloughed	–	–	–	–	–
Other	1 (2.3)	–	1 (2.4)	–	2 (1.2)
Highest level of education, n (%)					
Compulsory school education not completed	1 (2.3)	1 (2.4)	1 (2.4)	1 (2.4)	4 (2.4)
Compulsory school education completed	7 (16.3)	9 (22.0)	7 (16.7)	9 (22.0)	32 (19.2)
Vocational training/college	10 (23.3)	12 (29.3)	8 (19.0)	11 (26.8)	41 (24.6)
University degree	16 (37.2)	8 (19.5)	12 (28.6)	15 (36.6)	51 (30.5)
Postgraduate qualification	9 (20.9)	11 (26.8)	14 (33.3)	5 (12.2)	39 (23.4)

primarily descriptive and focused on baseline participant characteristics and estimation of key feasibility parameters including eligibility, uptake and retention rates, as well as intervention adherence, outcome measures and their completeness.

Participants were analysed in the group they were randomised. Parameter estimates with 95% CIs are

presented for between-group (comparing each intervention to control) differences (both unadjusted and adjusted for baseline values). In keeping with the feasibility objectives, no formal hypothesis testing was performed, and missing data were not imputed (except in the case of using person-specific item-level mean substitution when minimum requirements were met to generate a valid

score). The EQ-5D-5L was mapped to the EQ-5D-3L using an established algorithm³⁵ when calculating health state values and quality-adjusted life-years estimates.

Qualitative analysis

Qualitative analysis employed framework analysis,³⁶ incorporating the insights from two of our patient and public involvement (PPI) representatives to inform interpretation. Full details are available in the published qualitative process paper.³⁰

Patient and public involvement

Three PPI representatives (two male; one female) were recruited via the Gambling Lived Experience Network. Two reviewed the outcome measures (see published protocol for details).²⁶ All reviewed the interview topic guide and sense-checked and commented on the qualitative findings.

RESULTS

Recruitment and retention

Participants were recruited between April 2021 and August 2022 and the final follow-up occurred in February 2023. Of the 661 individuals who completed the screening survey (excluding 13 duplicates), 488 were eligible (73.8%), and of those, 195 completed the 3-week prebaseline social norms ascertainment questions on WIRE (figure 2) and the baseline questionnaires (40.0%). However, in the time interval between screening and baseline measures, 27 people became ineligible to participate (13.9%), meaning that 168 participants were randomised (34.4%). One case, randomised to the DN arm, was found to be a duplicate of an existing enrolled case and was removed (no outcome data were completed in the second registration). In total, there were 43 in the GS group, 41 in the DS group, 42 in the IN group and 41 in the control (CON) group (figure 2). Of these 167 study participants, 166 completed the 7-week follow-up outcome measures (99.4%), 163 completed the 3-month follow-up measures (97.6%) and 159 completed the 6-month follow-up measures (95.2%).

Baseline characteristics

Baseline characteristics are presented in table 2 and online supplemental table S1. The sample included 85.1% males and 14.9% females, with a mean age of 51.6 years (SD=13.6, range 18–76). Most participants were hite (92.8%); 3.6% were Asian. The majority (75.6%) did not have children under 18 living with them and most lived with a partner (60.7%). Just under half were employed full-time (46.4%) and a quarter were retired (24.6%). Educational attainment was high, with most holding a university degree (30.4%), postgraduate qualification (23.2%) or vocational training/college qualification (24.4%). Most gambled daily (70.8%) and over 90% had active accounts with more than two operators. Over half

(53.6%) had not used SG tools and mobile phones were most typically used (73.8%) when gambling online.

Outcome measure completion rates

Outcome measure completion rates were high. Across all time points (baseline, 7-weeks, 3-months, 6-months), there was only 2.1% missing data (including 8 participants lost to follow-up) with completion rates >95% across all 3 follow-up time points (at baseline 99.9% with no loss to follow-up; at 7-weeks 99.4% including 1 loss to follow-up; at 3-months 97.6% including 4 lost to follow-up; at 6-months 85.2% including 8 lost to follow-up). At an item level, excluding loss to follow-up, there was very little missing data across all time points (PGSI=5 items; GRCS=1 item; PHQ-8=1 item; GAD-7=2 items).

Serious AEs

No serious AEs were identified during the study.

Acceptability of study procedures and outcome measures

Information about the acceptability of study processes and outcome measures is presented in the qualitative process paper.³⁰ Overall, participants found the study procedures acceptable. They described the study processes as smooth, highlighted positive interactions with the research team and felt that the questionnaire layouts and trial duration were appropriate. Most were willing to share their gambling data with the research team. However, some encountered technical difficulties when using the WIRE app. While the trial questionnaires were generally considered engaging and prompted reflections on gambling behaviours, a few participants noted that some questions felt repetitive, difficult to answer or seemed less relevant to the study's focus (such as the EQ-5D-5L items concerning physical health).

Acceptability of the interventions

Information about the acceptability of the intervention is presented in the qualitative process paper.³⁰ Participants mostly found the interventions interesting and useful. Those in the goal-setting group found it easy to set and plan weekly goals and appreciated the sense of accountability that came from reporting their progress to the study manager. Participants in the social norms groups reported finding the information engaging and, at times, surprising, prompting reflections on their own behaviours. It was suggested that the social norms messages would have been more useful had they included examples for specific types of gambling (eg, sports betting; casino games) and been based on real-world data from betting companies.

Acceptability of the delayed intervention arm

Acceptability of the delayed intervention arm is discussed in the qualitative process paper.³⁰ Most control group participants considered the 6-month waiting period before being offered their choice of intervention acceptable. However, a few participants felt the 6-month delay was too long and expressed curiosity about what was

Table 3 Adherence to the interventions

Study arm	Participants who completed the interventions	Messages viewed and responded to (DN and IN arms)	Self-reported goal outcomes	Goal types and sources of self-reported gambling data
DN	40/41 (97.6%) 1 participant inactive during intervention (reason unknown; did not complete follow-up outcome measures)	239/246 messages viewed (97.2%)—232 responded with comments (eg, 'This seems reasonable to me'). 7 responded with 'no comment'.	—	—
IN	41/42 (97.6%) 1 participant inactive during intervention (reason unknown; did not complete follow-up outcome measures)	246/252 messages viewed (97.6%)—242 responded to with comments (eg, 'I should definitely cut down on gambling'). 4 responded with 'no comment'.	—	—
GS	40/43 (93.0%) 1 participant withdrew from intervention (reason unknown; completed follow-up outcome measures). 2 participants were inactive during the intervention (reasons unknown; completed follow-up outcome measures).	—	240 goals set: 181 met (75.4%) 33 partially met (13.9%) 26 not met (10.8%)	Goal types: 117 (48.8%) money-based (eg, 'I will spend no more than £20 on online betting this week'.) 13 (5.4%) time-based (eg, 'I will only place bets in the morning'.) 13 (5.4%) loss-limits based (eg, 'This week I intend not to lose more than £50/day'.) 28 (11.7%) were based on abstaining (eg, 'I will not bet online this week'.) 69 (28.8%) were 'other' (eg, 'I will continue to withdraw funds every time I exceed £100 in winnings'.) Self-reported gambling data ► Received for 238/240 goals (99.2%) ► 293 sources of evidence submitted — 221 text comments (75.4%) — 60 screenshots or images (20.5%) — 12 PDFs or other files (4.1%)

DN, descriptive norms; GS, goal setting; IN, injunctive norm.

happening in the intervention groups. At the end of the study, only five control group participants chose to take up an intervention (one selected the IN intervention and four opted for the GS intervention).

Intervention fidelity and adherence

All planned emails and WIRE messages were delivered. Adherence to the interventions was high: Over 90% of participants in each of the three intervention groups completed week 6 of the intervention and responded to at least 4/6 social norms messages, defined as making a comment or stating 'no comment' (those in the DN and IN groups) or set at least four implementable goals (those in the GS group). See [table 3](#) for further details.

Operator player data

We obtained detailed player transaction data from a single UK gambling operator, including number and value of deposits, bets (by sport/game type), returns and withdrawals. Data were available for 88 participants (IN: n=24; DN: n=21; GS: n=19; Control: n=24) across the 6-month study period (15 599 transaction records) and for 67 participants across the 6-week intervention period (2940 records). However, we note that over 90% of participants reported accounts with multiple gambling operators, and nearly half with 6 or more. As a result, these data represented only a partial view of participants' overall gambling activity, limiting the extent to which signs of behaviour changes or intervention effects could be assessed.

For the GS group, operator data were available for only 12/40 (30%) active participants during the intervention period. These data were used to verify participants' self-reports on whether they had fully, partially or not met their weekly goals. During the intervention period, these 12 participants set 72 goals in total. For 31 goals (43.1%), operator data matched participant self-reports, indicating consistency between objective operator data on how much participants had spent during a particular week and participants' self-reports of their spending. For 6 (8.3%) goals, there was a discrepancy between these two sources. The remaining 41 goals (56.9%) could not be evaluated, typically because participants reported gambling via other operators or at land-based events.

Secondary outcomes

Table 4 presents the unadjusted and baseline-adjusted between-group mean differences for the secondary outcomes. Cohen's *d* effect sizes for the adjusted mean differences (AMDs) are reported in online supplemental table S2. Line graphs presenting AMDs at follow-up by condition are provided in online supplemental figures S1–S8.

For the PGSI, unadjusted scores indicated reductions in gambling severity from baseline in both the GS and DN groups. However, improvements were more consistent in the control group across all time points. At 7-weeks, AMDs slightly favoured the control group. At 3-months AMDs favoured the GS group, suggesting a potential reduction in gambling severity compared with control (Cohen's *d*=0.25). At 6-months, the control group continued to improve, and AMDs favoured the control group relative to both the DN and IN groups, with small to medium effect sizes, respectively. Only the GS group showed a very small AMD in the expected direction at this time point.

For the GRCS other than the GS group at 7-weeks, unadjusted scores were lower than baseline at all time points, including in the control group. AMDs were in the expected direction only at the 7-week time point, and only for the social norms intervention groups, indicating slightly reduced cognitive distortions compared with the control group, although effect sizes were very small. At both 3- and 6-months, all AMDs favoured the control group, with effect sizes ranging from 0.07 to 0.35.

For the PHQ-8, AMDs were in the expected direction (reduction in depression symptoms) only for the DN group at 7-weeks and 3-months, although effect sizes were small. By 6-months PHQ-8 unadjusted scores had reduced considerably in the control group, and AMDs favoured the control group across all three intervention arms, with effect sizes ranging from 0.21 to 0.59.

For the GAD-7, all AMDs were very small or small. AMDs were in the expected direction (reduction in anxiety symptoms) for all intervention groups at 3-months. This pattern continued at 6-months for the DN group, though the effect size was very small.

For the EUROHIS-QOL, AMDs were in the expected direction (improvement in quality of life) for all three intervention groups at 3-months, with this pattern

continuing at 6-months for the GS and IN groups. Effect sizes ranged from very small to small (0.06–0.23).

For the EQ-5D-5L index scores, AMDs were in the expected direction (improvement in health-related quality of life) at 3-months across all intervention groups but favoured the control group at 6-months.

For the EQ-5D-5L thermometer, all three intervention groups showed effects in the expected direction (improvement in self-rated overall health) at both 3- and 6-months (effect sizes ranging from 0.05 to 0.22).

For the ICECAP-A, AMDs were in the expected direction (increased capability) at 3-months for the GS and IN groups, and at 6-months for the DN and IN groups. However, effect sizes were very small.

Not surprisingly, given the small sample size, nearly all the AMDs had wide 95% CIs that included zero. As this was a feasibility study not powered to test hypotheses about effectiveness, these estimates should not be used to inform decisions about progressing to a full-scale trial.³⁷

Health economics component

Data on productivity and primary care resource use are provided in online supplemental tables S3 and S4. Overall, the methods employed for the economic evaluation were feasible and practical. Completion rates for the EQ-5D-5L and ICECAP-A measures were high, with low levels of missing data. However, some participants reported finding the ICECAP-A questions unfamiliar and expressed uncertainty regarding the relevance of some of the ICECAP-A and EQ-5D-5L items.

As anticipated, given the sample comprised individuals with low-to-moderate levels of gambling severity, participants generally reported minimal impact of gambling on work productivity and daily activities. Although the productivity and health resource use questionnaires clearly instructed participants to complete all items and indicate zero where appropriate, some participants left fields blank (e.g., number of days in past 3-months when gambling/gambling-related health issues meant they could do less than half their usual amount when working and numbers of health contacts with GPs or nurses in past 3-months in which gambling was mentioned). Missing data are a recognised issue in economic evaluations,³⁸ particularly for questions where zero responses are common.

Progression criteria

The progression criteria related to retention and intervention adherence were met. Regarding the criterion for study uptake, the green threshold of 35% was nearly reached (34.2%) and given that we exceeded our original recruitment target, we considered this met (see table 5). In addition, qualitative findings suggested the interventions were well-received and feasible to deliver and the study design and procedures were generally acceptable.

Table 4 Summary statistics and between-group mean differences for secondary outcomes

	Intervention group		Difference between intervention group-control group (mean 95% CI)					
	GS (n=43)	DN (n=41)	IN (n=42)	CON (n=41)	GS	MD	DN	MD
	Mean (SD) range	Mean (SD) range	Mean (SD) range	Mean (SD) range	AMD	AMD	AMD	AMD
PGSI (higher scores worse)								
Baseline	2.62 (2.38) 42 0-7	2.55 (2.38) 40 0-7	1.51 (1.38) 41 0-6	2.44 (2.22) 39 0-7	-	-	-	-
7 weeks	2.63 (2.59) 43 0-10	2.58 (2.60) 40 0-9	1.69 (2.44) 42 0-13	2.27 (2.13) 41 0-7	0.36 (-0.70 to 1.38) 0.18 (-0.51 to 0.87)	0.31 (-0.77 to 1.38) 0.30 (-0.40 to 1.00)	0.31 (-0.77 to 1.38) 0.30 (-0.40 to 1.00)	-0.58 (-1.64 to 0.49) 0.32 (-0.38 to 1.03)
3 months	1.79 (2.46) 43 0-10	2.26 (2.46) 38 0-9	1.60 (3.12) 42 0-20	2.07 (2.08) 40 0-7	-0.28 (-1.40 to 0.83) -0.58 (-1.44 to 0.29)	0.19 (-0.96 to 1.33) -0.03 (-0.92 to 0.86)	0.19 (-0.96 to 1.33) -0.03 (-0.92 to 0.86)	-0.48 (-1.60 to 0.64) 0.22 (-0.66 to 1.09)
6 months	1.79 (2.39) 42 0-12	2.29 (2.62) 38 0-8	2.20 (3.36) 41 0-19	1.71 (2.03) 38 0-8	0.08 (-1.10 to 1.25) -0.07 (-1.18 to 1.03)	0.58 (-0.63 to 1.78) 0.45 (-0.68 to 1.58)	0.58 (-0.63 to 1.78) 0.45 (-0.68 to 1.58)	0.49 (-0.70 to 1.67) 0.92 (-0.20 to 2.04)
GRCS (higher scores worse)								
Baseline	59.00 (20.89) 43 32-135	54.95 (15.36) 40 29-92	55.83 (18.02) 42 27-110	54.12 (17.44) 41 23-105	-	-	-	-
7 weeks	61.07 (19.51) 43 28-107	52.95 (16.08) 40 24-92	52.77 (18.74) 42 24-100	53.70 (19.46) 41 26-92	7.36 (-0.62 to 15.35) 3.96 (-1.95 to 9.86)	-0.76 (-8.89 to 7.37) -1.52 (-7.54 to 4.50)	-0.76 (-8.89 to 7.37) -1.52 (-7.54 to 4.50)	0.93 (-8.97 to 7.10) -2.13 (-8.04 to 3.78)
3 months	58.56 (17.46) 43 26-89	54.77 (16.91) 38 26-92	51.14 (17.37) 42 23-92	48.93 (18.89) 40 24-98	9.63 (1.96 to 17.30) 6.83 (0.44 to 13.24)	5.85 (-2.06 to 13.76) 5.09 (-1.51 to 11.69)	5.85 (-2.06 to 13.76) 5.09 (-1.51 to 11.69)	2.22 (-5.50 to 9.93) 1.15 (-5.24 to 7.55)
6 months	55.90 (20.34) 42 23-92	52.63 (19.60) 38 23-92	52.88 (16.96) 41 30-89	50.37 (18.58) 38 23-93	5.54 (-2.83 to 13.90) 3.75 (-4.22 to 11.71)	2.26 (-6.31 to 10.83) 2.08 (-6.11 to 10.26)	2.26 (-6.31 to 10.83) 2.08 (-6.11 to 10.26)	2.51 (-5.90 to 10.93) 1.93 (-6.05 to 9.90)
PHQ-8 (higher scores worse)								
Baseline	3.88 (4.39) 43 0-18	4.66 (4.49) 41 0-18	3.52 (4.57) 42 0-22	5.12 (4.92) 41 0-22	-	-	-	-
7 weeks	3.79 (4.99) 43 0-21	3.05 (3.52) 40 0-14	3.60 (4.93) 42 0-21	4.24 (4.31) 41 0-21	-0.45 (-2.39 to 1.48) 0.43 (-0.89 to 1.76)	-1.19 (-3.17 to 0.78) -0.91 (-2.25 to 0.44)	-1.19 (-3.17 to 0.78) -0.91 (-2.25 to 0.44)	-0.65 (-0.26 to 1.30) 0.50 (-0.84 to 1.83)
3 months	3.67 (4.14) 43 0-20	3.89 (3.84) 38 0-14	3.81 (5.41) 42 0-24	4.60 (5.56); 40 0-24	-0.93 (-3.01 to 1.16) 0.07 (-1.22 to 1.36)	-0.71 (-2.86 to 1.45) -0.52 (-1.84 to 0.81)	-0.71 (-2.86 to 1.45) -0.52 (-1.84 to 0.81)	-0.79 (-2.89 to 1.31) 0.50 (-0.80 to 1.80)
6 months	5.00 (6.00) 42 0-24	3.63 (3.51) 38 0-16	3.98 (5.19) 41 0-18	2.66 (3.97) 38 0-22	2.34 (0.21 to 4.47) 2.76 (0.79 to 4.73)	0.97 (-1.21 to 3.16) 0.97 (-1.04 to 2.98)	0.97 (-1.21 to 3.16) 0.97 (-1.04 to 2.98)	1.32 (-0.82 to 3.46) 1.89 (-0.10 to 3.87)
GAD-7 (higher scores worse)								
Baseline	3.07 (4.06) 43 0-21	2.78 (3.42) 41 0-18	2.26 (3.43) 42 0-15	3.44 (4.14) 41 0-16	-	-	-	-
7 weeks	3.51 (4.61) 43 0-21	3.28 (3.51) 40 0-13	2.71 (4.20) 42 0-17	3.59 (4.42) 41 0-21	-0.07 (-1.89 to 1.74) 0.24 (-0.95 to 1.43)	-0.31 (-2.16 to 1.54) 0.21 (-1.00 to 1.42)	-0.31 (-2.16 to 1.54) 0.21 (-1.00 to 1.42)	-0.87 (-2.70 to 0.96) 0.12 (-1.08 to 1.32)
3 months	3.00 (4.36) 43 0-21	2.74 (3.50) 38 0-15	2.60 (4.10) 42 0-20	3.73 (4.18) 40 0-14	-0.73 (-2.49 to 1.04) -0.36 (-1.32 to 0.60)	-0.99 (-2.81 to 0.83) -0.52 (-1.51 to 0.47)	-0.99 (-2.81 to 0.83) -0.52 (-1.51 to 0.47)	-1.13 (-2.90 to 0.64) -0.04 (-1.01 to 0.93)
6 months	3.24 (4.71) 42 0-21	2.55 (3.33) 38 0-14	3.00 (4.36) 41 0-21	3.05 (4.15) 38 0-21	-0.19 (-1.67 to 2.04) 0.38 (-1.33 to 2.08)	-0.50 (-2.40 to 1.40) -0.23 (-1.98 to 1.51)	-0.50 (-2.40 to 1.40) -0.23 (-1.98 to 1.51)	-0.05 (-1.92 to 1.81) 0.50 (-1.22 to 2.23)

Continued

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Table 4 Continued

Intervention group		Difference between intervention group-control group (mean 95% CI)					
GS (n=43)	DN (n=41)	IN (n=42)	CON (n=41)	GS	MD	DN	MD
Mean (SD) range	Mean (SD) range	Mean (SD) range	Mean (SD) range	AMD	AMD	AMD	AMD
EUROHIS-QOL (higher scores better)							
Baseline	28.14 (8.57) 43 9-40	29.07 (7.83) 41 9-40	29.36 (7.47) 42 10-40	28.66 (8.26) 41 7-39	-	-	-
3 months	29.21 (7.92) 43 5-40	29.32 (7.63) 38 8-40	31.07 (7.35) 42 5-40	28.68 (8.53) 38 8-40	0.53 (-2.88 to 3.95) 1.01 (-0.74 to 2.75)	0.64 (-2.88 to 4.16) 0.88 (-0.92 to 2.67)	2.40 (-1.04 to 5.83) 1.84 (0.09 to 3.60)
6 months	28.93 (8.45) 42 11-40	27.47 (7.54) 38 11-40	29.90 (7.84) 41 1-40	28.79 (7.80) 38 7-40	0.14 (-3.37 to 3.65) 0.47 (-2.75 to 3.70)	-1.32 (-4.91 to 2.28) -1.23 (-4.54 to 2.07)	1.11 (-2.41 to 4.64) 0.95 (-2.30 to 4.19)
EQ-5D-5L derived health index (higher scores better)							
Baseline	0.83 (0.22) 43 -0.09-0.99	0.82 (0.17) 41 0.21-0.99	0.79 (0.25) 42 -0.06-0.99	0.79 (0.22) 41 -0.03-0.99	-	-	-
3 months	0.83 (0.23) 43 -0.03-0.99	0.83 (0.20) 38 0.16-0.99	0.76 (0.27) 41 -0.06-0.99	0.75 (0.26) 40 -0.10-0.99	0.08 (-0.03 to 0.18) 0.03 (-0.03 to 0.09)	0.07 (-0.03 to 0.18) 0.05 (-0.01 to 0.11)	0.01 (-0.10 to 0.11) -0.00 (-0.06 to 0.05)
6 months	0.77 (0.29) 42 -0.15-0.99	0.80 (0.22) 38 0.03-0.99	0.80 (0.24) 41 0.04-0.99	0.82 (0.18) 38 -0.03-0.99	-0.05 (-0.16 to 0.06) -0.07 (-0.17 to 0.03)	-0.02 (-0.13 to 0.08) -0.03 (-0.13 to 0.07)	-0.02 (-0.13 to 0.08) -0.02 (-0.12 to 0.08)
EQ-5D-5L Thermometer (higher scores better)							
Baseline	78.60 (18.78) 43 20-100	75.83 (18.95) 41 32-100	73.07 (22.39) 42 20-100	73.54 (21.99) 41 10-100	-	-	-
3 months	80.79 (17.38) 43 21-100	76.86 (19.71) 37 17-100	74.69 (22.42) 42 8-99	72.45 (20.90) 40 10-95	8.34 (-0.41 to 17.09) 4.47 (-0.67 to 9.62)	4.42 (-4.67 to 13.50) 3.80 (-1.53 to 9.12)	2.24 (-6.56 to 11.04) 2.74 (-2.42 to 7.89)
6 months	77.00 (16.85) 42 21-100	75.74 (16.96) 38 30-100	75.02 (22.44) 41 4-100	73.28 (21.71) 39 12-97	3.72 (-4.92 to 12.36) 0.94 (-4.63 to 6.51)	2.46 (-6.40 to 11.31) 1.99 (-3.71 to 7.68)	1.74 (-6.95 to 10.43) 2.94 (-2.65 to 8.53)
QALY derived from EQ-5D-5L (higher scores better) (maximum possible QALY equals 0.5, assuming full health over 6 months)							
0.41 (0.10) 42	0.40 (0.08) 36	0.39 (0.11) 41	0.39 (0.11) 38				
ICECAP-A (higher scores better)							
Baseline	0.82 (0.15) 43 0.41-1.00	0.84 (0.15) 41 0.43-1.00	0.86 (0.13) 42 0.43-1.00	0.80 (0.18); 41 0.26-1.00	-	-	-
3 months	0.82 (0.16) 43 0.41-1.00	0.82 (0.16) 38 0.37-1.00	0.85 (0.15) 42 0.26-1.00	0.80 (0.18) 40 0.19-0.98	0.02 (-0.05 to 0.09) 0.00 (-0.05 to 0.04)	0.01 (-0.06 to 0.09) -0.00 (-0.04 to 0.05)	0.05 (-0.02 to 0.12) 0.00 (-0.04 to 0.05)
6 months	0.83 (0.17) 42 0.36-1.00	0.84 (0.16) 38 0.44-1.00	0.85 (0.17) 41 0.08-1.00	0.83 (0.18) 38 0.07-1.00	0.00 (-0.07 to 0.08) -0.00 (-0.08 to 0.07)	0.01 (-0.06 to 0.09) 0.00 (-0.07 to 0.08)	0.02 (-0.05 to 0.10) 0.01 (-0.07 to 0.08)

Data are shown as mean (SD); n, unless stated otherwise. For outcomes where a higher score is worse a negative difference favours the respective intervention group and for outcomes where a higher score is better a positive difference favours the respective intervention group.

AMD, adjusted mean difference; CON, control group; DN, descriptive norms; EQ-5D-5L, EuroQoL Five Dimensions Five Levels; GAD-7, Seven-Item Generalised Anxiety Disorder Questionnaire; GRCS, Gambling-Related Cognitions Scale; GS, goal setting; ICECAP-A, ICEpop Capability Measure for Adults; IN, injunctive norms; MD, mean difference; PGSI, Problem Gambling Severity Index; PHQ-8, Eight-Item Patient Health Questionnaire; QALY, quality-adjusted life-year.

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Table 5 Summary of progression criteria

Description of progression criteria	Progression criteria met?	Assessment	Findings
Uptake ($\geq 35\%$ randomised of those screened as eligible)	Yes	Screening, recruitment and randomisation records	Of 488 screened as eligible, 167 were randomised (34.2%). While this did not quite meet the threshold of $\geq 35\%$ we consider we met the criterion because we exceeded our original recruitment target of 140 participants.
Adherence to the interventions ($\geq 75\%$ of participants read at least 4/6 social norms messages in social norms arms or set at least 4/6 goals in goal setting arm).	Yes	Study records	41/42 (97.6%) of participants in the IN group viewed at least 4/6 messages. 40/41 (97.6%) of participants in the DN group viewed at least 4/6 messages. 40/43 (93.0%) of participants in the GS group set 6 goals.
Participant retention in the study ($\geq 70\%$ of participants with outcomes at 6-month follow-up)	Yes	Study records	Overall, retention was 95.2% with 8 participants lost to follow-up (see CONSORT diagram)
CONSORT, Consolidated Standards of Reporting Trials; DN, descriptive norms; GS, goal setting; IN, injunctive norms.			

DISCUSSION

Consistent with the aims of a feasibility study,^{25 37 39} this four-arm randomised controlled feasibility study set out to assess the feasibility and acceptability of three text-based SG interventions (GS, DN messages and IN messages) rather than to formally test their effectiveness. As the study was not powered to detect treatment effects, the quantitative results should be interpreted with caution.²⁵

Reductions in gambling severity, psychological distress and improvements in quality of life were observed across some of the intervention groups as well as in the control group. While some outcomes showed small effect sizes favouring intervention groups at specific time points, similar or greater improvements were also seen in the control group. AMDs were generally small with wide 95% CIs that included zero.

Improvements in the control group may partly reflect the influence of the prerandomisation social norms ascertainment questions, which all participants completed. Although intended to inform the content and tailoring of the social norms interventions, these questions may have prompted reflection or behaviour change across all arms, functioning as a minimal intervention. While all participants received these questions, assessment reactivity^{40 41} may have diluted potential differences between conditions.

Although results for the secondary outcomes were mixed, the study demonstrated strong feasibility across key domains. Recruitment targets were exceeded, with 167 participants randomised, and all prespecified feasibility progression criteria were met. Most participants were willing to share their gambling data and control group participants generally found the 6-month delay acceptable. Qualitative feedback further supported the acceptability of study procedures and the interventions.³⁰

A key strength of this study is its novelty. To our knowledge, it is the first to assess the feasibility of an injunctive

social norms intervention for gambling, and the first to compare the feasibility of injunctive and descriptive norms in the context of online gambling. The high participant retention and low rates of missing data suggest that study procedures were acceptable and feasible, likely facilitated by the use of brief and engaging intervention materials, clear communication throughout the study (reported in interviews) and the structured and timely use of reminders and monetary incentives.⁴²

This study also contributes to the emerging field of using operator data to validate self-reported gambling activity. Almost all participants in the GS group shared their self-reported gambling data with the research team. The correlation between self-reported and operator data was considerably higher than in previous studies.^{43 44} This may be due to the use of a 7-day recall period, which likely reduced recall bias compared with the 30-day period used in previous research. It may also reflect the influence of the GS intervention itself, which encouraged participants to monitor and report their gambling expenditure.

We were only able to obtain data from a single operator, despite over 90% of participants reporting multiple operator accounts (with nearly half indicating six or more). Operator data were available for only 30% of those in the GS arm and fewer than half of submitted goals could be verified. These challenges highlight the need for more effective systems for accessing multi-operator or centralised gambling data in future trials. Delivering interventions directly through gambling operators may help, although such an approach would not address the issue of people having accounts with multiple operators.

We also identified several areas for improvement in aspects of data collection. Some participants expressed uncertainty about the purpose and relevance of measures such as the EQ-5D-5L and the ICECAP-A. Providing brief explanations during the enrolment process may improve understanding and engagement. In addition,

resource use and productivity items were sometimes left blank where a zero response was likely intended. Making responses mandatory may lead to disengagement. Instead, behavioural strategies (such as providing clear explanations about the importance of complete responses during recruitment, in the PIS and in pre-questionnaire instructions; applying skip logic to streamline questionnaires; and including prompts to flag or confirm missing entries) may improve data quality while minimising burden. Such refinements will strengthen the feasibility of a future economic evaluation.

The sample lacked demographic diversity, with over 90% identifying as White, more than 80% as male, and over half holding a university degree. Although gambling prevalence is lower among women and some minority communities, over 20% of individuals from minority communities score ≥ 1 on the PGSI,⁴⁵ indicating at least some potential for gambling harm. High levels of stigma may be a barrier to participation among minority groups.⁴⁶ Furthermore, most participants were recruited through a gambling operator specialising in horse racing. A future trial should include broader recruitment strategies to reach underserved populations and include a range of gambling types, particularly as recent research has demonstrated that electronic gaming machines (slots) and casino games are more likely to be associated with risks of harm than sports betting.⁴⁷

Fidelity of the GS intervention could also be enhanced. Although participants were provided with a video and example goal, many submitted goals that were not fully SMART and only around half set money-based goals. Requiring goals to be money-based could have increased the proportion of goals set that were SMART. In addition, the intervention did not specify whether goals should be updated weekly, and many participants did not revise them. Providing more structured guidance on goal formulation and revision may enhance intervention fidelity. Previous research found that a brief in-person goal-setting intervention reduced gambling spending in individuals at moderate or high risk of experiencing gambling harm, but not low risk.¹⁵ In our study, participants found the GS intervention acceptable and almost 90% of goals were self-reported as met or partially met.

Although previous studies have demonstrated the effectiveness of social norms in reducing short-term alcohol frequency and symptom severity,²² many such studies have focused on university students and have only tested DN. Very few RCTs have evaluated the effectiveness of social norms interventions for promoting SG, and those that do exist have largely focused on university student populations²¹ or individuals experiencing problematic levels of gambling.^{22 48} None have tested the effectiveness of IN in general population gamblers. This may be due to the recognition that IN is based on perceived peer attitudes, which are not directly observable as behaviour in relation to DN.⁴⁹ This gives IN an additional layer of complexity and can make it more challenging to both measure these norms and to create persuasive social norms interventions.¹⁹ Participants in our study found the

social norms messages interesting, though not always personally relevant. The post-intervention qualitative interviews revealed that many felt the social norms messages would have greater utility if tailored to specific types of gambling, such as sports betting and casino games. Similar issues have been reported in previous studies^{21 22 48} and highlight the importance of tailoring social norms interventions to the population in question. This can, however, create challenges in sample sizes, as there needs to be a sufficiently large number of people who engage in each type of gambling surveyed, so that meaningful social norms intervention messages about the norm in the population can be created.

The GS and social norms interventions also differed substantially in the level of participant engagement required. While the social norms interventions involved passive exposure to normative information in the form of brief messages (though we did ask for feedback on the messages), the goal-setting intervention required active reflection on behaviour, to set, monitor and maintain goals throughout the week. This difference should be considered when interpreting findings across conditions. Given the simplicity and scalability of the social norms intervention and their potential for integration into gambling operator systems, we propose they should be the focus of a future definitive trial.

Overall, findings from this study support the feasibility of a future large-scale RCT, with severity of gambling (PGSI) as a potential primary outcome. Potential refinements include broader and more inclusive recruitment strategies, improvements in aspects of data collection, better tailoring of social norms messages, targeting individuals at low or moderate risk (those with PGSI scores of 1–7, excluding those with scores of 0), and further exploration of possible mechanisms through which reductions in risk of experiencing gambling-related harms may occur.

CONCLUSIONS

This four-arm randomised controlled feasibility study was the first to assess the feasibility of an IN intervention for promoting SG, as well as to compare injunctive and DN interventions delivered via text message. It was also one of the first studies to attempt to use operator data to validate self-reported gambling activity. Progression criteria related to uptake, retention and intervention adherence were met. Given that the interventions are low cost, have the potential to be implemented widely, and were broadly considered acceptable to participants, the next step is to proceed to a full-scale RCT of the social norms interventions to determine effectiveness and cost-effectiveness.

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Contributors JM and EA-C conceived the study and wrote the initial grant application. JM designed the social norms interventions and EA-C designed the goal-setting arm. ST provided methodological advice and input. RB-E coordinated the study with support from AH-F. RB-E and EA-C oversaw qualitative data collection; EA-C, RB-E and ST designed the qualitative topic guides; EA-C and RB-E conducted the qualitative interviews. ST and RB-E performed the quantitative data analysis. EA-C, RB-E and AH-F conducted the qualitative analysis with input from the PPI representatives. EA-C coordinated patient and public involvement activities. EA-C, ST, RB-E and JM led drafting of the manuscript. RW, SH, EB, KP and AH-F provided feedback on manuscript drafts. EA-C, ST and RB-E contributed equally to this manuscript and are joint first authors. All authors critically reviewed and approved the final version. JM is the guarantor of the study. ChatGPT was used to support reducing the word limit of the draft and to check the formatting of the reference section.

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