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Promoting condom-related behaviours in a broad population: Evaluation of a LifeGuide-based intervention

Authors: Jude Hancock¹, Katherine Brown² & Martin Hagger³

Abstract

Objective: The present study aims to evaluate the use of LifeGuide to deliver an intervention promoting the performance of three condom-related behaviours in a broad population using persuasive messages.

Design: A 3 (intervention: control vs. positively-framed message vs. negatively-framed message) x 3 (time: pre-intervention, post-intervention, three-month follow-up) randomized controlled design was used to compare changes in behaviour and intention.

Methods: An online LifeGuide-based intervention was completed by 439 individuals aged between 13 and 85 years of age (females, $n = 310$, M age = 30.80, $SD = 12.75$). Pre-intervention, extended Theory of Planned Behaviour (TPB) psychological measures and self-report condom-related behaviour were completed. Immediately post-intervention, TPB measures were completed again. Three months later, all pre-intervention measures were completed.

Results: Intention to treat MANOVA analysis showed a main effect of time on the TPB measures ($F(36, 400) = 3.92, p = <.001, \eta_p^2 = .26$), but this did not differ by condition ($F(36, 836) = .70, p = .91, \eta_p^2 = .03$). Performance of condom-related behaviours did not significantly increase over time ($F(3, 433) = 1.28, p = .28, \eta_p^2 = .01$).

Conclusion: An online safer sex intervention aimed at a broad population can increase intentions to carry and use condoms, which may serve a protective function in the future. However, LifeGuide may not be the best platform for delivering safer sex interventions, due to lack of anonymity for users.

Keywords: Condom, Behaviour, Intervention, Intention, Safer sex, LifeGuide

Introduction

Safer sex

Sexual health is important across the lifespan (Nusbaum & Rosenfeld, 2004). Practicing safer sex is one aspect of good sexual health (The Centre for HIV & Sexual Health, 2011). Consequences of unsafe sex

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The intervention was created using the LifeGuide authoring tool and hosted on the LifeGuide server.

The research was undertaken as part of the lead authors PhD studies. Correspondence concerning this article should be emailed to Jude Hancock, E-mail: jude_hancock@hotmail.com

include unwanted pregnancies and sexually transmitted infections (STIs) (World Health Organisation [WHO], 2012a). Treating STIs and unwanted pregnancies is costly for health services (Terris-Prestholt *et al.*, 2006), and affects individuals' psychological and physical wellbeing (WHO, 2010). It is widely recognised that using condoms for oral and penetrative intercourse will prevent transmission of most STIs and unwanted pregnancy (e.g., Faculty of Sexual & Reproductive Health Care, 2007). However, condom use is only one of a series of condom-related behaviours required for the successful performance of safer sex with this method (Hill & Abraham, 2008; Moore, Dahl, Gorn, & Weinberg, 2006). Other condom-related behaviours occur "pre-use", such as, carrying (or storing) condoms (Armitage & Talibudeen, 2010), and negotiating condom use with one's sexual partner (Noar, Morokoff, & Harlow, 2002).

Recent United Kingdom (UK) STIs prevalence figures show a 2% rise in new diagnoses in 2011 (Health Protection Agency [HPA], 2012). Although younger individuals (aged under 25) experience the highest rates of STIs (HPA, 2012), there is evidence that new diagnoses of STIs are rising in individuals aged over 45 in the UK (Bodley-Tickell *et al.*, 2008). These data suggest that a novel approach promoting performance of multiple condom-related is required in a broader population than those typically targeted in current public health campaigns (Department of Health [DoH], 2011a; Newby, Wallace, & French, 2012).

Internet interventions

The Office for National Statistics (2011) estimate 82.2% of the UK population use the Internet, with over three-quarters of UK households having internet access at home (Ofcom, 2011). Widespread usage has prompted interest in developing internet interventions (Kraft & Yardley, 2009). Benefits of internet interventions include; convenience for users, the ability to reach geographically dispersed populations, potential accessibility for hard to reach groups, inexpensive administration, and may overcome treatment fidelity (Belleg *et al.*, 2004; Griffiths, Lindenmeyer, Powell, Lowe, & Thorogood, 2006; Hardeman *et al.*, 2008; Rice, 2010).

Safer sex interventions are well suited to online delivery as they can provide credible information that users can access without the embarrassment often experienced when discussing sexual health with a health care professional (Hightow- Weidman *et al.*, 2011; Quilliam 2011). Online safer sex interventions have been developed which promote, and increase condom use (e.g., Card *et al.*, 2011; Noar & Willoughby, 2012; Roberto, Zimmerman, Carlyle, & Abner, 2007). A meta-analysis exploring the effects of HIV-prevention interventions delivered offline reported an average effect size of $d = 0.18$ on condom use (Albarracín *et al.*, 2005). Yet a meta-analysis exploring the effects of HIV-prevention interventions delivered online reported an average effect size of $d = 0.26$ on condom use (Noar, Black & Pierce, 2009), suggesting that online safer sex interventions may be more effective at changing behaviour (Webb, Joseph, Yardley, & Michie, 2010).

Despite the benefits of online interventions, without computer programming skills they can be costly to develop (WHO, 2012b). In order to address this issue, LifeGuide software was developed as part of the national Digital Social Science programme funded by the UK Economic and Social Research Council (Hare *et al.*, 2009). LifeGuide enables individuals with no programming knowledge to develop and evaluate longitudinal randomised controlled online interventions (Williams, Yardley, Weal, & Willis, 2010). Developing and evaluating online interventions is important, as it allows researchers to determine intervention effectiveness over time at changing behaviour (Stephenson, Imrie, & Bonell, 2003). Small scale inexpensive exploratory trials provide evidence for larger scale public health scale studies (Craig *et al.*, 2008), and allow researchers to explore intervention effect sizes (Armitage & Talibudeen, 2010). To date, LifeGuide has been used to develop and deliver a range of interventions (Everitt *et al.*, 2010; Joseph *et al.*, 2009; Miller, Yardley, & Little, 2012). However, of the LifeGuide literature available, it appears that it has not yet been used to develop and deliver a safer sex intervention.

The Theory of Planned Behaviour (TPB)

A meta-analysis by Webb, Joseph, Yardley, and Michie (2010) exploring the impact of theoretical basis on internet interventions, reported that “on average, interventions had a statistically small but significant effect on health related behaviour ($d = .16$)” (pp. e4). The authors noted that “interventions based on the TPB tended to have substantial effects on behaviour ($d = .36$)” (p. e4). The TPB has been widely applied to the study of condom behaviours (e.g., Albarracín, Johnson, Fishbein, & Muellerleile, 2001; Protogerou & Turner-Cobb, 2011; Sheeran & Taylor, 1999). The TPB proposes that an individual’s intention to perform a behaviour (e.g., use a condom) and perceived behavioural control (PBC), are the proximal determinants of the behaviour being performed in the future (Ajzen, 1991). Intention is assumed to be determined by three belief-based constructs: attitude, subjective norm (SN) and PBC (Ajzen, 1991). Attitudes reflect individuals’ beliefs about the outcomes associated with performing the behaviour, these beliefs may be positive, negative, or both. SN represents beliefs that salient others’ would wish the individual to perform the behaviour. PBC concerns the beliefs an individual holds of how easy or difficult the behaviour is to perform.

Whilst the psychological constructs of the TPB appear to consistently predict condom-related behaviours (e.g., Albarracín, Johnson, Fishbein, & Muellerleile, 2001), other psychological constructs such as affective attitudes (AA) (Norton, Bogart, Cecil, & Pinkerton, 2005), and moral norm (MN) (Godin, Gagnon, Lambert, & Conner, 2008), may significantly add to the prediction of condom-related behaviours beyond that of the typical TPB constructs. In order to use the TPB for intervention development, exploratory research in the target population is required to identify psychological constructs to target (Ajzen, 2006). Our initial research indicated that AA and MN beliefs, were most predictive of intention to carry, negotiate and use condoms, and therefore should be targeted in an intervention (Hancock, Brown, & Hagger, 2011).

Promoting condom-related behaviours

Typically, persuasive messages have been used to change antecedents of and actual behaviour (Ajzen, 2006). Persuasive messages are a brief, low-intensity behaviour change technique (Armitage & Talibudeen, 2010; Fishbein & Ajzen, 2010; Michie *et al.*, in preparation), and have been shown to engender safer sex behaviour change (Armitage & Talibudeen, 2010; DoH, 2011a; Hill & Abraham, 2008). However, the way these messages are framed needs to be carefully considered if they are to have the desired effect on changing risky behaviours (Gallagher & Updegraff, 2012).

The literature clearly advocates that safer sex messages based on fear-appeals have little impact on changing behaviour (e.g., Kok, Schaalma, Ruiter, Van Empelen, & Brug, 2004). A different approach is based on social and emotional persuasive messages (e.g., targeting AA and MN). The literature suggests these messages may be more effective at changing psychological antecedent of behaviour than traditional approaches highlighting the benefits of engaging in safer sex (e.g., Blanton *et al.*, 2001; Block and Keller 1995; Gallagher & Updegraff, 2012; Latimer, Salovey, & Rothman, 2007). For example, Blanton *et al.*, (2001) demonstrated that negatively-framed messages describing individuals who do not use condoms as less responsible than those that do, increased individuals’ intentions to use condoms more than positively-framed messages describing individuals who use condoms as more responsible, or a control message. Further exploration of social and emotional message-framing for multiple condom-related behaviours would be useful from a public health perspective. If negatively-framed messages are found to be more useful at changing condom-related behaviour cognitions and behaviours, these could easily be applied in future public health campaigns promoting safer sex.

The present study

Given the rise in new diagnoses of STIs, the fact that safer sex is important across the lifespan, successful performance involves a series of condom-related behaviours, and an extended TPB has been shown to be useful in predicting condom-related behaviours. This study aimed to develop and evaluate a randomised

controlled trial of a LifeGuide-based intervention promoting performance of multiple condom-related behaviours in a broad population. In addition, based on the recommendations of Blanton *et al.* (2001) we expected that (1) negatively-framed persuasive messages would increase self-reported performance of condom-related behaviours more effectively than positively-framed or control messages, and (2) negatively-framed persuasive messages would strengthen the constructs from an extended TPB more effectively than positively-framed or control messages with respect to the condom-related behaviours being measured.

Method

Design.

A 3 (intervention: control vs. positively-framed message vs. negatively-framed message) x 3 (time: pre-intervention, post-intervention, three-month follow-up) randomized controlled design was used to compare changes in behaviour and intention.

Power analysis. Faul, Erdfelder, Buchner and Lang's (2009) G*Power 3.1 program was used to calculate the sample size required to detect a small effect size ($d = .20$) of between-within interaction with 0.80 power and $\alpha = .05$ using MANOVA based on 18 predictor psychological constructs. This calculation has been previously used in a TPB-based condom carrying intervention (Armitage & Talibudeen, 2010). The calculation recommended a minimum total sample size of 335 participants.

Participants and procedure

Ethical approval was obtained from the Faculty of Health and Life Sciences at Coventry University before data collection commenced. Opportunistic sampling was used to recruit participants over three calendar months. This non-probability sampling method is widely used in health research (Russell & Shaw, 2009). Links to the online intervention were put on six websites;

- Facebook; www.facebook.com
- Studies in Adolescent Sexual Health; www.healthinterventions.co.uk
- Twitter; <https://twitter.com>
- SONA; <http://coventry.sona-systems.com>
- Online psychological research; www.onlinepsychresearch.co.uk
- MOODLE; <http://students.coventry.ac.uk>

Furthermore, 20 older people's forums listed on the Age UK website were contacted (www.ageuk.org.uk/get-involved/older-peoples-forums). Of these forums, three agreed to email the intervention link to their members.

When participants clicked on the intervention link they were presented with the participant information sheet and consent form. After consenting, participants created a LifeGuide account by entering their email address, and creating a unique personal identifier. This served two functions; 1) it allowed data to be withdrawn if requested, and 2) allowed the LifeGuide software to send an automated email in three months time to collect follow-up data. The intervention consisted of four web-pages; pre-intervention measures, intervention materials, immediately-post intervention measures, and participant de-brief containing sources of sexual health advice. At three month follow-up, participants were required to log-in to LifeGuide using their email address and unique identifier and complete follow-up measures. Following completion of these measures participants were given a more detailed debrief. The flow of participants through the intervention study is illustrated in Figure 1. The attrition rates between time points in the present study are similar to other online safer sex interventions (Pequegnat *et al.*, 2007).

Measures

The full list of measures is available in Table 1. Measures were taken pre-, immediately-post, and three months following intervention participation. Briefly, demographic, and extended TPB single-item measures of intention, general attitude, SN, PBC, AA and MN were taken. Two self-reported measures of carrying, negotiating, and using behaviour in the past month were used (α 's pre-intervention = .63, .67, .84, three month follow-up α 's = .74, .87, .92, carrying, negotiating and using respectively). Behaviour and TPB constructs were scored on 7-point response scales, ranging from 1 to 7, and coded so higher scores represented more positive outcomes.

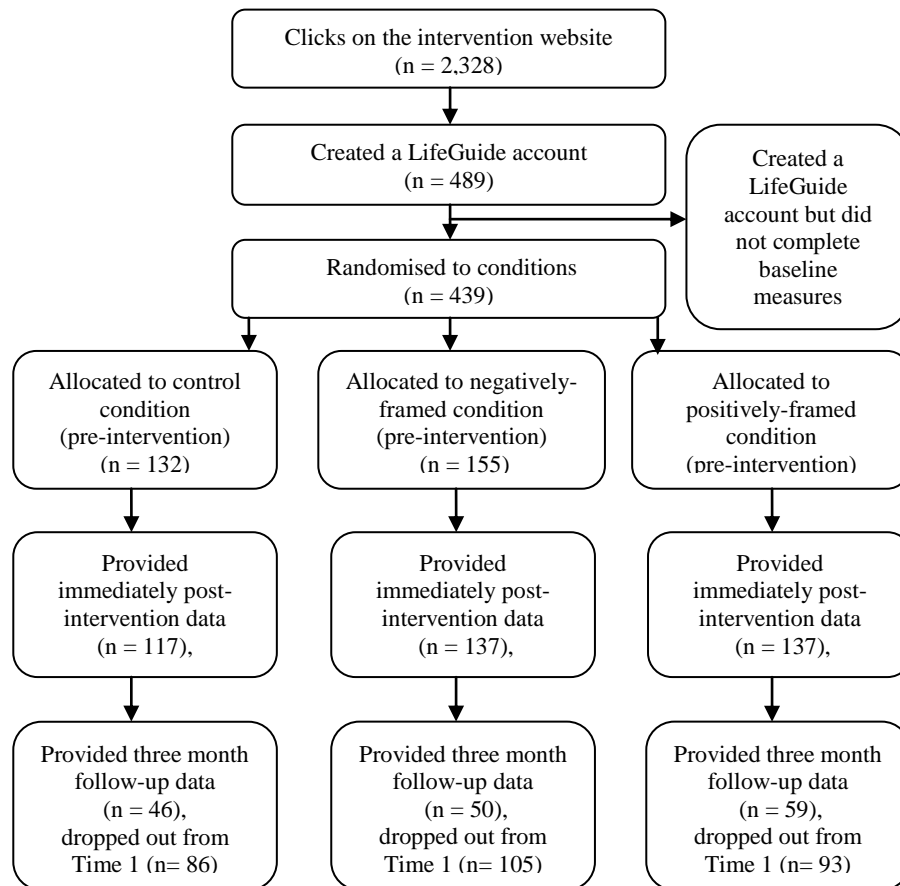


Figure 1: Flow of participants through the intervention

Intervention materials

Control group. Control intervention material developed by Armitage and Talibudeen (2010), which provided a brief history of the condom, was used. The material was shortened so that it was similar length to the intervention material (170 words). It was designed to avoid providing information that would potentially change the TPB constructs being measured or behaviour.

Table 1. Measures used at each time point

TPB construct	Items	Scale anchors	Measured
Intention	I intend to carry condoms in the future in case I have sex I intend to negotiate using condoms in the future I intend to use a condom every time I have sex in the future	1 (<i>strongly disagree</i>) and 7 (<i>strongly agree</i>)	Pre-intervention Post-intervention Three-months post
Affective attitude	Carrying condoms makes me feel responsible Negotiating condom use makes me feel trustworthy Using condoms makes me feel safe	1 (<i>not at all</i>) and 7 (<i>very much</i>)	Pre-intervention Post-intervention Three-months post
Moral norm	I think I should carry condoms I think I should negotiate with a partner to use condoms I think I should use condoms	1 (<i>strongly disagree</i>) and 7 (<i>strongly agree</i>)	Pre-intervention Post-intervention Three-months post
General attitude	For me to carry condoms in case I have sex is For me to negotiate using condoms before having sex is For me to use condoms during sexual contact is	1 (<i>extremely bad</i>) and 7 (<i>extremely good</i>)	Pre-intervention Post-intervention Three-months post
Subjective Norm	I feel social pressure to carry condoms I feel social pressure to negotiate using a condom I feel social pressure to use condoms	1 (<i>strongly disagree</i>) and 7 (<i>strongly agree</i>)	Pre-intervention Post-intervention Three-months post
Perceived Behavioural Control	It is up to me whether or not I carry condoms in case I have sex It is up to me whether or not I negotiate to use a condom before having sex It is up to me whether or not I use condoms during sexual intercourse	1 (<i>strongly disagree</i>) and 7 (<i>strongly agree</i>)	Pre-intervention Post-intervention Three-months post
Behaviour 1	How often in the past month have you carried condoms How often in the past month have you negotiated condom use How often in the past month have you used condoms	1 (<i>never</i>) and 7 (<i>every day</i>)	Pre-intervention Three-months post
Behaviour 2	How often in the past month have you been in the situation where carrying condoms was required? How often in the past month have you been in the situation where negotiating condom use was required? How often in the past month have you been in the situation where using a condom was required?	1 (<i>never</i>) and 7 (<i>every day</i>)	Pre-intervention Three-months post

Intervention groups. In order to target MN and AA, two conditions, a positively- and a negatively-framed message were created, based on wording recommendations by Blanton *et al.*, (2001). In both intervention conditions the first line read “condoms come in three ‘types’, the male and female condoms which are used for penetrative sex and the dental dam used for oral sex.” Pictures of these three condoms were provided, along with an interactive online element. When participants hovered over the pictures more information about each of these condoms was provided (e.g., ‘the female condom is used for penetrative intercourse. It is a loose-fitting polyurethane sheath closed at one end that is inserted intravaginally before sexual intercourse. It is also called a femidom’). Each condition then had three paragraphs of information, one for each condom-related behaviour; carrying, negotiating and using respectively. Each paragraph contained a persuasive message designed to change AA and MN beliefs. The way these messages were framed depended on the intervention condition. In both conditions the opening line pertaining to the condom-related behaviour in question stated what the behaviour entailed (e.g., ‘negotiating with a partner to use a condom may be done verbally (e.g. do you have a condom) or non-verbally (e.g. getting a condom out). It is important to show you want to have safer sex’). The differences in the interventions were how the affective messages were framed, shown in Table 2. A statement then followed the affective messages to target the MN beliefs (e.g., ‘you may want to carry condoms’).

Table 2. Examples of positively- and negatively-framed messages

Behaviour	Positively-framed	Negatively-framed
Carrying	People who carry condoms are more responsible	People who do not carry condoms are less responsible
Negotiating	People who negotiate safer sex are more trustworthy	People who do not negotiate safer sex are less trustworthy
Using	People who use condoms are more safe	People who do not use condoms are less safe

Both intervention conditions were the same in terms of layout; pictures of the three ‘types’ of condoms were at the bottom of the page, Arial 10 point font was used, and each intervention condition contained five paragraphs of information, three of which contained the persuasive messages. Screen shots of the intervention materials may be viewed at http://www.healthinterventions.co.uk/documents/content/projects/screen_shots_of_intervention_conditions.pdf. The differences between conditions were the wording of the affective messages (positive or negative) and word count (negatively-framed condition = 192 words, positively-framed condition = 185 words).

Intention to treat analysis

Elliott and Armitage (2009, p. 113) argue that “the vast majority of previous TPB-intervention studies may have overestimated intervention effects” because intention to treat (ITT) analysis was not used. ITT analysis reduces bias that may be introduced through attrition (Tabachnick & Fidell, 1996). “Drop-outs” data are included in the final sample by using the last observation carried forward method (LOCF) (Shao & Zhong, 2003), in essence treating the “drop-outs” as “no changers.” Due to the high attrition rate from post-intervention to three month follow-up, LOCF ITT analyses were performed on the intervention data.

Results

Preliminary analyses

Representativeness check. The sample characteristics at the three data collection points are shown in Table 3. No differences were found in terms of gender ($\chi^2(1) = .99, p = .32$), ethnicity ($\chi^2(1) = 1.04, p = .31$), religious beliefs ($\chi^2(1) = .11, p = .75$), education ($\chi^2(1) = 2.51, p = .11$), sexual experience ($\chi^2(1) = .26, p = .61$), or relationship status ($\chi^2(1) = .74, p = .39$) between participants completing baseline measures only and those retained at follow-up. A larger proportion of individuals identifying themselves as gay did not complete the three month follow-up measures compared to heterosexual individuals (79.5% versus 63.3% respectively), $\chi^2(1) = 4.10, p = .04$. Participants who did not complete the three month follow-up measures tended to be significantly younger (mean = 29.82 versus 32.59 years respectively) than those who completed the measures, $t(437) = 2.19, p = .03, d = 0.22$.

Table 3. Sample characteristics of pre-intervention, post-intervention and three month follow-up completers

Demographic		Pre (n=439)	Post (n=391)	Three months (n=155)
Age	Mean	30.80 years	31.30 years	32.59 years
	SD	12.75 years	12.70 years	12.66 years
Gender	Female (%)	310 (70.6)	280 (71.6)	114 (73.5)
	Male (%)	129 (29.4)	111 (28.4)	41 (26.5)
Education	Degree level (%)	352 (80.2)	315 (80.6)	132 (85.2)
	Below degree (%)	87 (19.8)	76 (19.4)	23 (14.8)
Ethnicity	Caucasian (%)	375 (85.4)	336 (85.9)	136 (87.7)
	Non- Caucasian (%)	64 (14.6)	55 (14.1)	19 (12.3)
Sexual Orientation	Heterosexual (%)	400 (91.1)	360 (92.1)	147 (94.8)
	Gay (%)	39 (8.9)	31 (7.9)	8 (5.2)
Relationship status	In a relationship (%)	306 (69.7)	274 (70.1)	113 (72.9)
	Not in a relationship (%)	133 (30.3)	117 (29.9)	42 (27.1)
Religiosity	No religious beliefs (%)	232 (52.8)	205 (52.4)	81 (52.3)
	Religious beliefs (%)	207 (47.2)	186 (47.6)	74 (47.7)

Randomization checks. A MANOVA with intervention condition as the independent variable and age, pre-intervention TPB measures, and behaviour as the dependent variables was performed to ensure that randomization had been successful. The MANOVA suggested that there were no significant differences between conditions at baseline, $F(44,826) = .72, p = .91, \eta_p^2 = .04$. There were equivalent numbers of males and females ($\chi^2(2) = 1.94, p = .38$), ethnic backgrounds ($\chi^2(2) = 1.28, p = .53$), individuals of different sexual orientations ($\chi^2(2) = 1.60, p = .45$), religious and non-religious individuals ($\chi^2(2) = 5.19, p = .08$), and sexual experience ($\chi^2(2) = 2.28, p = .32$), in the three conditions. However, a larger proportion of individuals educated below degree level ($\chi^2(2) = 10.13, p = .01$), were allocated to the negatively-framed message condition. Similarly a larger proportion of individuals in a relationship ($\chi^2(2) = 8.38, p = .02$), were allocated to the positively-framed message condition.

Table 4. Means \pm SD for participants' scores on TPB measures across all three intervention time points by condition of intervention

Measure	Condom Behaviour	Control group			Negatively-frame message group			Positively-frame message group		
		Pre	Post	3-Month	Pre	Post	3-Month	Pre	Post	3-Month
Affect	Carrying	4.59 \pm	4.65 \pm	4.67 \pm	4.51 \pm	4.40 \pm	4.74 \pm	4.74 \pm	4.72 \pm	4.74 \pm
	Negotiating	1.99	2.06	1.95	1.91	2.07	1.92	2.04	2.10	1.98
	Using	4.42 \pm	4.61 \pm	4.54 \pm	4.40 \pm	4.33 \pm	4.66 \pm	4.53 \pm	4.59 \pm	4.52 \pm
		2.07	2.14	1.98	1.85	2.04	1.82	1.95	2.08	1.96
		4.83 \pm	5.18 \pm	5.27 \pm	5.22 \pm	5.03 \pm	5.35 \pm	5.32 \pm	5.20 \pm	5.45 \pm
Moral Norm		2.12	2.10	1.85	1.74	1.96	1.72	1.93	2.06	1.80
	Carrying	4.17 \pm	4.05 \pm	4.34 \pm	4.03 \pm	4.25 \pm	4.14 \pm	4.28 \pm	4.30 \pm	4.18 \pm
	Negotiating	2.29	2.33	2.19	2.15	2.03	2.16	2.22	2.32	2.26
	Using	4.58 \pm	4.41 \pm	4.61 \pm	4.49 \pm	4.71 \pm	4.62 \pm	4.63 \pm	4.66 \pm	4.59 \pm
		2.31	2.36	2.24	2.24	2.14	2.24	2.26	2.31	2.25
Directly-measured Attitude		4.97 \pm	4.85 \pm	5.14 \pm	4.72 \pm	4.81 \pm	4.69 \pm	4.95 \pm	4.81 \pm	4.84 \pm
		2.33	2.32	2.19	2.17	2.11	2.17	2.23	2.32	2.69
	Carrying	5.17 \pm	5.04 \pm	5.17 \pm	5.16 \pm	4.81 \pm	5.16 \pm	5.11 \pm	5.00 \pm	5.05 \pm
	Negotiating	1.94	2.02	1.90	1.75	1.83	1.69	1.82	1.88	1.79
	Using	5.18 \pm	5.23 \pm	5.20 \pm	5.34 \pm	5.05 \pm	5.39 \pm	5.37 \pm	5.28 \pm	5.28 \pm
Directly-measured SN		1.88	1.88	1.81	1.76	1.81	1.76	1.65	1.68	1.64
		5.67 \pm	5.59 \pm	5.70 \pm	5.44 \pm	5.19 \pm	5.49 \pm	5.59 \pm	5.37 \pm	5.46 \pm
		1.64	1.67	1.64	1.76	1.86	1.69	1.66	1.78	1.65
	Carrying	2.51 \pm	2.80 \pm	2.87 \pm	2.75 \pm	2.95 \pm	2.85 \pm	2.41 \pm	2.75 \pm	2.40 \pm
	Negotiating	1.63	1.79	1.78	1.66	1.74	1.72	1.78	1.96	1.78
Directly-measured PBC	Using	2.80 \pm	3.05 \pm	3.11 \pm	2.96 \pm	3.05 \pm	3.10 \pm	2.72 \pm	2.95 \pm	2.79 \pm
		1.82	1.96	1.94	1.72	1.72	1.83	1.88	1.96	1.92
		3.06 \pm	3.16 \pm	3.30 \pm	3.11 \pm	3.18 \pm	3.22 \pm	2.93 \pm	3.13 \pm	2.97 \pm
		1.96	2.06	2.00	1.75	1.84	1.82	2.05	2.12	2.01
	Carrying	6.18 \pm	6.19 \pm	6.37 \pm	6.16 \pm	5.83 \pm	6.16 \pm	6.36 \pm	6.21 \pm	6.37 \pm
Intention	Negotiating	1.39	1.38	1.12	1.35	1.57	1.43	1.27	1.53	1.29
	Using	6.03 \pm	5.99 \pm	6.11 \pm	5.73 \pm	5.73 \pm	5.79 \pm	6.00 \pm	5.90 \pm	5.98 \pm
		1.47	1.50	1.38	1.66	1.62	1.54	1.58	1.82	1.62
		5.81 \pm	6.00 \pm	5.98 \pm	5.48 \pm	5.69 \pm	5.59 \pm	5.84 \pm	5.78 \pm	5.84 \pm
		1.67	1.49	1.54	1.85	1.68	1.77	1.78	1.96	1.77
Behaviour	Carrying	3.79 \pm	4.10 \pm	4.04 \pm	3.57 \pm	3.97 \pm	3.80 \pm	3.89 \pm	4.16 \pm	3.80 \pm
	Negotiating	2.34	2.38	2.22	2.21	2.17	2.22	2.41	2.25	2.36
	Using	4.06 \pm	4.10 \pm	4.11 \pm	3.96 \pm	4.32 \pm	4.19 \pm	4.00 \pm	4.18 \pm	3.95 \pm
		2.46	2.47	2.38	2.32	2.28	2.27	2.33	2.36	2.32
		3.87 \pm	4.24 \pm	4.06 \pm	3.83 \pm	4.29 \pm	4.08 \pm	3.84 \pm	4.08 \pm	4.01 \pm
Behaviour		2.44	2.45	2.39	2.23	2.24	2.29	2.39	2.42	2.34
	Carrying	1.82 \pm	N/A	1.85 \pm	1.72 \pm	N/A	1.82 \pm	1.76 \pm	N/A	1.78 \pm
	Negotiating	1.38	N/A	1.40	1.25	N/A	1.40	1.34	N/A	1.39
	Using	1.52 \pm	N/A	1.50 \pm	1.59 \pm	N/A	1.62 \pm	1.65 \pm	N/A	1.68 \pm
		.89		.84	.99		1.06	1.13		1.25
	1.97 \pm		1.91 \pm	1.91 \pm		1.94 \pm	2.00 \pm		2.04 \pm	
	1.43		1.35	1.47		1.45	1.53		1.62	

Note. SN = Subjective Norm. PBC = Perceived Behavioural Control. 3-Month = three months follow-up.

Main analysis

Effect of intervention on condom-related behaviours. A 2 (time) x 3 (condition) MANOVA was conducted on the dependent variables of self-reported condom-related behaviours. Using Wilks' Lambda statistic, findings suggested there was no main effects for condition, ($\Lambda = .99$, $F(6, 866) = .79$, $p = .58$, $\eta_p^2 = .005$), time ($\Lambda = .99$, $F(3, 433) = 1.28$, $p = .28$, $\eta_p^2 = .009$), and no time by condition interaction effect ($\Lambda = .99$, $F(6, 866) = .82$, $p = .55$, $\eta_p^2 = .006$). The mean number of self-reported performances for each condom-related behaviour by intervention group is reported in Table 4.

Effect of intervention on TPB constructs. A 3 (time) x 3 (condition) MANOVA was conducted on the six measured TPB constructs (intention, AA, MN, attitude, SN and PBC). To clarify, there were six measured TPB constructs for each of the condom-related behaviours, so in total 18 TPB constructs were entered into the MANOVA. Using Wilks' Lambda statistic, findings suggested there was a main effect of time ($\Lambda = .94$, $F(36, 400) = 3.92$, $p = .0001$, $\eta_p^2 = .26$), but no main effect of condition ($\Lambda = .74$, $F(36, 836) = .70$, $p = .91$, $\eta_p^2 = .03$) and no interaction of time by condition ($\Lambda = .81$, $F(72, 800) = .82$, $p = .08$, $\eta_p^2 = .10$). The mean scores for the TPB constructs for each intervention group are reported in Table 4.

Separate 3 (behaviour) x 1 (TPB construct) univariate tests showed a main effect of time for carrying intention ($F(2, 870) = 11.91$, $p = .0001$, $\eta_p^2 = .03$), using intention ($F(2, 870) = 13.54$, $p = .0001$, $\eta_p^2 = .03$), using affect, ($F(2, 870) = 7.17$, $p = .001$, $\eta_p^2 = .02$), carrying attitude ($F(2, 870) = 8.66$, $p = .0001$, $\eta_p^2 = .02$), using attitude ($F(2, 870) = 7.83$, $p = .001$, $\eta_p^2 = .02$), carrying SN ($F(2, 870) = 10.34$, $p = .0001$, $\eta_p^2 = .02$), negotiating SN ($F(2, 870) = 5.60$, $p = .006$, $\eta_p^2 = .02$), and carrying PBC ($F(2, 870) = 7.71$, $p = .0001$, $\eta_p^2 = .02$). Table 5 shows the pairwise comparisons of where the changes in TPB constructs occurred. These results suggest that participating in the intervention regardless of condition significantly increased intention to carry and use condoms, improves general attitudes toward carrying and using condoms, improves SN toward carrying and negotiating behaviours, strengthens PBC toward carrying, and strengthens the belief that using condoms would make an individual feel safe.

Table 5. Significant (p) values for pairwise comparisons of TPB constructs contributing to the main effect of time for condom-related behaviours

Behaviour	TPB construct	T1-T2	T2-T3	T1-T3
Carrying	Intention	<.001	.03	.06
Carrying	Directly-measured attitude	.001	.01	1.00
Carrying	Directly-measured SN	<.001	.01	.23
Carrying	Directly-measured PBC	.04	.01	.39
Negotiating	Directly-measured SN	.01	1.00	.01
Using	Intention	<.001	.16	.001
Using	Affective attitude	.01	.01	1.00
Using	Directly-measured attitude	.01	.02	1.00

Note. All effects signify significant increases in the TPB construct.

SN = Subjective Norm. PBC = Perceived Behavioural Control.

T1-T2 = pre- to immediately-post intervention. T2-T3 = immediately-post intervention to three month follow-up. T1-T3 = pre-intervention to three month follow up

Discussion

The present study reports a LifeGuide-based intervention, which aimed to increase intentions to perform and performance of three condom-related behaviours in a broad population, using persuasive messages based on psychological constructs of an extended TPB. We expected that negatively-framed messages would increase self-reported performance of condom-related behaviours, and strengthen the constructs from an extended TPB more effectively than positively-framed or control messages. However, findings from this intervention study were mixed. Of the TPB constructs, there were significant improvements over time in intentions toward carrying and using condoms, general attitudes toward carrying and using condoms, AA toward using condoms, SN toward carrying and negotiating condoms, and carrying PBC. There was no effect of the intervention condition on these psychological constructs, and no significant effect of the intervention condition or time on self-reported behaviour toward these three condom-related behaviours. Therefore, findings suggest that from a public health perspective, promoting condom-related behaviours through awareness raising messages that nudge individuals to consider their future behaviour, may be sufficient to change cognitive antecedents of behaviour (Marteau, Ogilvie, Roland, Suhrcke, & Kelly, 2011). Aligning these findings to the assumptions of the TPB, this suggests that increased intentions to carry and use condoms may serve a protective function in the future, as intentions are likely to be translated into actual behaviour when required providing the opportunities and resources are available (Ajzen, 1991; Fishbein & Ajzen, 2010; Webb, & Sheeran, 2006).

Exploring the lack of change in self-reported behaviour

In many committed mutually exclusive sexual relationships, condom use is often discontinued to signify trust in the relationship (Ames, Atchinson, & Rose, 1995; Bolton, McKay, & Schneider, 2010; Willig, 1994). As a method of contraception, condoms are often perceived to interfere with the sexual act (Crosby, Milhausen, Yarber, Sanders, & Graham, 2008). Consequently, women often opt for long-acting reversible methods of contraception or an oral contraceptive (Huber & Ersek, 2009). However, even in committed heterosexual relationships where the woman is using a non-barrier method for birth control, there may be times where the use of a condom is necessary. For example, when one partner has a yeast infection, when the female is taking antibiotics, or when the woman is breastfeeding (Faculty of Family Planning and Reproductive Health Care, 2005). Arguably therefore, the lack of change in self-reported condom-related behaviours in the present study may be explained by the high proportion of individuals in a relationship in the current sample (Table 3). Although promoting performance of condom-related behaviours is important across populations, logical decision-making not to perform condom-related behaviours may lie behind the null effects on behaviour when evaluating the outcomes of such promotion.

Exploring the null effect of message framing on targeted psychological constructs

The present study did not find a significant effect of message-framing on condom-related behavioural antecedents. This finding is consistent with other safer sex intervention research reporting that the intervention condition(s) work no better than a control (Brown, Hurst, & Arden, 2011; Henderson *et al.*, 2007; Sanderson & Jemmott, 1996). Block and Keller (1995) argue that for behaviours where an individual knows the outcome of not performing a behaviour, the framing of the message is less important because an individual needs to process the message less when the outcome is more certain. In the context of the present study, individuals are likely to be aware of the consequences of not performing condom-related behaviours such as contracting an STI and/or unwanted pregnancy (Newby, Wallace, & French, 2012; Norton, Bogart, Cecil, & Pinkerton, 2005).

A further explanation for the increases in the psychological antecedents of behaviour regardless of intervention condition would be a mere measurement effect (Godin, Sheeran, Conner, & Germain, 2008). The mere measurement effect was first demonstrated by Sherman (1980), whilst exploring the prediction of socially desirable or undesirable behaviours. Sherman (1980, p. 220) argued that if individuals “consider

beforehand what their behaviour might be in a situation involving moral behaviour, their actual behaviour in that situation will be more socially desirable, acceptable, and moral than if they had not made initial predictions.” Condom-related behaviours arguably have a strong moral element, as not performing these behaviours may lead to a STI for oneself and one’s sexual partner, and for heterosexual woman possible unwanted pregnancy (Stephenson, Imrie, & Bonell, 2003). In addition, asking about intentions may reinforce the accessibility of an individual’s attitude toward the behaviour, which subsequently increases the likelihood that the behaviour will be performed in the future (Morwit & Fitzsimons, 2004). Previous research also suggests that completing TPB questionnaires on multiple occasions, whilst only completing the intervention components on one occasion can alter cognitions (Ogden, 2003). In essence, the questionnaire itself is acting as an intervention (Brown, Hurst, & Arden, 2011).

Additionally, the novelty of the control message may have contributed to the null effect of message-framing (Dahl, Frankenberger, & Manchanda, 2003; Vinokur & Burnstein, 1978). Changing antecedents toward complex safer sex behaviours using a simple brief persuasive message-based intervention that individuals are exposed to only once, may be sufficient to alter cognitions, if the message presented to individuals is novel (Latimer, Salovey, & Rothman, 2007). Internet users reading safer sex messages are reported to prefer straightforward and accurate information (Mimiaga *et al.*, 2010), with pictures (Lang, Chung, Lee, & Zhao, 2005). Each message presented in the present study adhered to these recommendations. However, across the lifespan, practising safer sex is more relevant to some individuals than others due to factors such as relationship status, wish to start a family and for women, the use of other contraceptives to avoid pregnancy. Therefore message framing to change behaviour in broad population may not be as important as it would be for more targeted populations (Noar, Benac, & Harris, 2007). Reading a message about the history of the condom may be interesting and relevant to all individuals across the lifespan; it is possible that it was sufficient to support change in cognitions but not behaviour in the short-term (Webb & Sheeran, 2006).

These findings suggest that well formed brief safer sex messages with accompanying pictures of the barrier methods which have been designed from previous exploratory research in the target population, alongside asking about future intentions may be sufficient to serve to strengthen intentions in the short-term. These positive changes in intention may serve a protective function in the future if, for example, a long-term relationship breaks down and a new sexual relationship is formed.

The use of LifeGuide to deliver a safer sex intervention

Findings from this study suggest that because LifeGuide interventions require users to create a LifeGuide account, this platform may not be appropriate for future broad population safer sex interventions (Pequegnat *et al.*, 2007). The intervention appeared to be of interest to a number of individuals, however, of those who clicked on the intervention link only 20% created a LifeGuide account enabling them to participate in the intervention (Figure 1). In terms of click-through rates this is a high percentage (Konstan, Rosser, Ross, Stanton, & Edwards, 2005). But this also suggests that some individuals interested in participating in online safer sex interventions may wish for greater anonymity than a LifeGuide-based intervention can provide. Lack of anonymity is one reason that individuals report in their reluctance to approach health care professionals with sexual health concerns (Quilliam, 2011; Nusbaum & Rosefeld, 2004). New ways of delivering safer sex interventions from a public health perspective may be required where less demographic information is collected, and participants do not ‘sign-up’ to an online intervention, but would be given the option at the end of the intervention to leave their email address if they would be happy to be contacted in the future. Although this method would make it difficult for long-term monitoring of behaviour, it would potentially increase exposure to safer sex interventions (Keller & Brown, 2002; Pequegnat *et al.*, 2007).

Future promotion of condom-related behaviours

Findings from the present study have important implications for future public health approaches to promoting safer sex. Results indicate that targeted messages about condom-related behaviours, or a brief message outlining the history of the condom, are sufficient to increase intentions and other cognitive antecedents toward carrying and using behaviours in a broad range of individuals. This suggests that mass media public health messages of this nature could be delivered to promote condom-related behaviours (Crutzen, de Nooijer, Candel, & de Vries, 2008; Keller & Brown, 2002; Sznitman *et al.*, 2011). Such messages should highlight the importance of these behaviours for all sexually active individuals (Hill & Abraham, 2008; Nusbaum & Rosenfeld, 2004), and the long history the condom has had in STI and unwanted pregnancy prevention (Khan & Anjum, 2012). Furthermore, health care professionals should be encouraged to raise awareness of the importance of safer sex during health checks (DoH, 2011b). Regular questioning may strengthen the effects of any mass media campaign. Individuals may not need the safer sex information at the time of contact, but the information provided may be useful in the future (NHS Midlands & East, 2012; NHS Yorkshire & the Humber, 2008; The Marmot Review, 2010). Yzer, Siero and Buunk (2000) evaluated the effects of a Dutch campaign 'I have safe sex or no sex' which targeted the TPB constructs. The campaign was run for two consecutive years: 1994 and 1995. In 1996 the campaign was not run and the evaluation was undertaken in 1997. Findings demonstrated that in a broad sample the TPB constructs "became less positive with respect to safer sex in the period in which no campaign was conducted" (p. 349). Our study further suggests that constructs of the TPB can be made more positive in a broad population with a brief intervention.

Strengths and limitations

Our study has several major strengths. First, it is the first online safer sex study to use brief messages to attempt to change intentions and performance of three condom-related behaviours in a broad population. This approach has addressed promotion of condom-related behaviours in populations often overlooked in safer sex interventions (e.g., Bodley-Tickell *et al.*, 2008; Bowleg, 2011; Card *et al.*, 2011; Nusbaum & Rosenfeld, 2004). Furthermore, taking an online approach allows individuals to access the intervention at a time convenient to them (Kraft & Yardley, 2009), read the messages at their own pace (Pequegnat *et al.*, 2007), and avoid potential embarrassment when discussing safer sex with a health care professional (Quilliam, 2011). Second, as far as we are aware this study is the first trial of a LifeGuide-based safer sex intervention. Findings will be useful to other researchers on limited financial budgets designing and delivering interventions. Third, the use of a randomised controlled, longitudinal design applying ITT analysis meant that all individuals who completed pre-intervention measures were included in the final analyses. Elliott and Armitage (2009, p. 113) argued that although ITT analysis "provides conservative estimates of intervention effects, those conservative estimates are likely to be more valid than are estimates based on just those participants for whom all data are available." Therefore, the effects of the intervention are likely to be generalisable to the wider population.

This study has limitations. First, the sample of participants self-selected to complete the intervention may not be representative of a broad population (Hartman, Forsen, Wallace, & Neely, 2002). However, it is likely that the significant findings obtained in this study with regard to the increase in intentions to carry and use condoms, would be applicable to all individuals who are currently sexually active or plan to be in the future. Second, the reported effect sizes for the changes in TPB psychological constructs are small. These findings are consistent with Fife-Schaw and Abraham's (2009) argument that magnitude of change that can be expected from TPB-based interventions in relation to condom use is likely to be small. Yet, these small effect sizes have the potential to accumulate into larger effects if intentions to *not* practice maladaptive behaviours, such as unsafe sex, are successfully changed and maintained long-term, which results from this intervention suggests occurred (Crosby & Rothenberg, 2004).

Conclusion and future directions

In conclusion, safer sex behaviours are complex, and the positive changes that occurred from participating in the intervention, regardless of intervention condition are encouraging for future public health approaches aiming to reduce the incidence of STIs and unwanted pregnancies. As the internet is a medium that at low cost can reach a wide audience (Noar, Black, & Pierce, 2009; White, 2006); future promotion of safer sex on a public health level should consider delivering safer sex messages on the internet. However, LifeGuide as a platform for this promotion may not be suitable due to the need for individuals to register to participate in interventions. Further longitudinal research which monitors performance of condom-related behaviours and psychological constructs in relationship to these behaviours, in a broad sample would be very useful, to aid our understanding of changes over time with minimal input post-intervention.

Implications for practice

- Brief messages promoting condom-related behaviours are an easy method to increase individuals' intentions to carry and use condoms.
- Online interventions are useful for promoting multiple condom-related behaviours in a broad population.
- LifeGuide may not be a suitable platform for hosting future safer sex interventions

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