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Short Communication

Do age-targeted messages increase cervical screening intentions in women aged 50–64 years with weak positive intentions? A randomised control trial in Great Britain

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ABSTRACT

Over 20% of women aged 50–64 in Britain have not attended cervical screening within the recommended 5-year interval. The aim of the present study was to investigate the impact of five messages, informed using strategies from the Behaviour Change Wheel, on strength of intention to attend cervical screening in women aged 50–64 with weak positive intentions to be screened when next invited. Women were randomised (2:2:1), into one of two intervention groups or a control group. The control group saw basic information about cervical screening. Intervention group 1 saw a social norms message and an outcome expectancy message. Intervention group 2 saw a risk reduction message and a response efficacy message. There was further randomisation within the two intervention groups (1:1) to test the effectiveness of message framing and age-targeted information. Lastly, both intervention groups were randomised (1:1) to see a message acknowledging the possible discomfort associated with screening and offering support, or the support message only. Data were included from 475 women, collected using an online survey in March 2022. Adjusting for baseline intention, social norms ($p = .84$), outcome expectancy ($p = .51$), risk reduction ($p = .19$), response efficacy ($p = .23$) and discomfort acknowledgement messages ($p = .71$) had no effect on intention strength. However, there was a significant increase in intention after reading multiple messages. These results suggest that although no single message has a significant impact on intentions, when combined, they may act together to increase intention strength. Further research will understand the impact of these messages when combined in information materials.

1. Introduction

Not attending cervical screening is associated with an increased risk of cervical cancer (Castañón et al., 2014). Women who are inadequately screened in their 50s and 60s have an elevated risk of cervical cancer into old age (Landy et al., 2016). It is therefore concerning that over 20% of women in Great Britain aged 50–64 have not attended cervical screening within the recommended 5-year period (Screening and Immunisations Team (NHS Digital), 2019; Public Health Scotland, 2021; Public Health Wales, 2019). Evidence shows reasons for cervical screening non-attendance vary by age. Research has found older women often believe their risk is lower than when they were younger (Waller et al., 2012), and they can find cervical screening more uncomfortable after menopause (Freeman et al., 2018). Therefore, an intervention for older women could be targeted to address age-specific barriers.

In Britain generic information, designed to facilitate informed choice, is sent to everyone invited to attend cervical screening e.g., (NHS Cervical Screening, 2019). However, targeting health communication to groups with similar characteristics, such as age and gender, can be more effective (Schmid et al., 2008). It enables individuals to link information to their personal experiences, increasing how actively and carefully they process it. Therefore, targeted messages are more likely to change behaviours compared with generic ones (Kreuter and Wray, 2003).

In our previous study (TARGET) we tested the impact of five messages on intention to attend screening among women aged 50–64 years who did not plan to be screened when next invited (Marlow et al., 2021). Age was used to determine targeted messages, as this is currently the only factor used to target communications in the national screening programme. The messages were a descriptive social norms message, a diagram illustrating the likelihood of screening outcomes, a response efficacy message, a risk reduction message and a message acknowledging the potential for discomfort during screening. The messages were

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developed using the education and persuasion strategies outlined in the Behaviour Change Wheel (Michie et al., 2011), addressing reflective motivation to attend screening. The theory and rationale for testing these messages is outlined in the TARGET protocol (https://osf.io/v94tb/). We found no single message increased intention to attend screening, but seeing multiple messages resulted in slightly higher intentions.

We highlighted that the messages might be more effective at increasing intention among women with weak positive intentions to participate. As the messages together increased intention we were keen to see if they worked better with a more positively inclined group as the information presented may reinforce their current (broadly positive) beliefs. Cognitive dissonance theory (Festinger, 1957) states individuals try to ensure consistency in their behaviour, attitudes and values, suggesting women who intend to be screened could be more receptive. A recent qualitative study also found that women interpreted information on cervical screening in light of their existing understanding (Byskov Petersen et al., 2020). There is value in increasing intention among those already inclined to participate, as participants with stronger positive intentions (i.e., say they will 'definitely' take part in screening) have been found to be significantly more likely to move from intention to action than those with weaker positive intentions (i.e. say they will 'probably' act) (Power et al., 2008).

We aimed to repeat our previous study (TARGET; (Marlow et al., 2021)) with women who had weak positive intentions to attend cervical screening, testing the same theory-informed messages.

Our primary objective was to test the impact of reading five messages on cervical screening intention strength in women aged 50–64 years with weak positive intentions to be screened when next invited.

Our secondary objectives were:

1. To test the impact of reading multiple messages on intention strength.
2. To calculate the proportion of women whose intention increased after reading multiple messages.
3. To explore the impact of the different messages on attitudes to screening.

Our specific hypotheses for each message can be found in Supplementary File 1.

2. Method

2.1. Design

Ethical approval for the study was granted by King's College London Research Ethics committee as a modification of TARGET (MOD-21/22–18,050; 18/11/21). The study had a 3-arm parallel design. The study methods, including eligibility and full sample size calculation are described here: https://osf.io/6wnhm.

2.2. Participants

Women aged 50–64 years living in Great Britain were recruited through an online panel (maintained by Dynata Global UK Ltd). The recruitment target was $n = 1000$ using sample size estimates calculated using analysis of covariance (ANCOVAs) and exploring fixed effects, main effects and interactions ($f = 0.18$, alpha $= 0.05$ and power $= 0.80$). Dynata emailed women and invited them to participate in an online study hosted on SurveyMonkey (survey available here: https://osf.io/zm29k/). Following informed consent, women completed eligibility questions. Women were considered to have weak intentions if they said they would 'probably' attend cervical screening when next invited, and those who would 'definitely' attend or 'not' attend were excluded.

2.3. Procedure

After completing initial questions, including baseline intention measures, women were individually randomised to one of three groups (2:2:1, with the intervention groups being twice the size of the control group). The control group saw basic information about cervical screening and the intervention groups saw the same basic information along with additional messages (see Table 2 for details). For some messages, women were further randomised (1:1) to test the effect of message framing and age-targeting. Intervention group 1 saw either an age-targeted or generic descriptive social norms message and an age-targeted or generic results diagram (showing possible outcomes of screening). Intervention group 2 saw a short–term or long-term risk reduction message (explaining how screening reduces cervical cancer risk) and an action antecedent positive consequent or an omission antecedent negative consequent message (explaining the impact of having or not having screening on cervical cancer risk). Within each intervention group the order of the messages was randomised. Lastly, participants in both intervention groups were subsequently randomised to either see a message acknowledging the possible discomfort associated with screening and offering support or the support message only. Intention was measured after each message exposure.

2.4. Measures

2.4.1. Intention

Intention was measured using three items: 'I intend to/I will try to/I am going to go for cervical screening when I am next invited' (Cooke and Sheeran, 2013; Sheeran and Orbell, 2000), using a 7-point scale from strongly disagree to strongly agree. These items were combined to create a mean intention score, from 1 to 7.

2.5. Statistical analysis

All analyses were carried out in SPSS version 27.0 using pre-written syntax. Deviations from the analysis plan in the protocol are described in a separate document on Open Science Framework (https://osf.io/fqycj). Participants were excluded if they completed the survey too quickly or too slowly, or if they failed a single-item attention check (after reporting intention). Normality of our dependent variables (intention) was inspected visually and by calculating the values of skewness and kurtosis. ANCOVA analyses and a *t*-test were used to compare the impact of the different versions of each message on intention strength, controlling for baseline intention in the ANCOVAs. Our secondary analyses tested the impact of the messages on attitudes to screening using descriptive statistics. To understand the proportion of women whose intention increased after reading multiple messages the difference between intention strength at baseline and after all messages was calculated. We used paired sample *t*-tests to explore if intention strength increased after exposure to each message.

3. Results

3.1. Sample characteristics

Overall, 3669 women clicked on the survey link and 551 were eligible and consented to take part (see Supplementary File 2). After accounting for dropouts and exclusions, data from 475 women were included in the analyses (control group $n = 89$; intervention group 1 $n = 191$; intervention group 2 $n = 195$). Sample characteristics are presented in Table 1.

3.2. Study hypotheses

Across the included sample, mean intention strength on the 7-point scale was 5.47 (SD: 0.69) at baseline and 5.69 (SD: 0.76) after the

Table 1
Sample characteristics (*n* = 475).

	Overall (n = 475)	Control group (n = 89)	Intervention group 1 (n = 191)*	Intervention group 2 (n = 195)
Age in years (mean; SD)	56.05 (4.04)	56.20 (3.94)	56.41 (4.06)	55.62 (4.06)
Age group (n; %)				
50–54 years	183 (38.5)	32 (36.0)	68 (35.6)	83 (42.6)
55–59 years	183 (38.5)	37 (41.6)	70 (36.6)	76 (39.0)
60–64 years	109 (22.9)	20 (22.5)	53 (27.7)	36 (18.5)
Education (n; %)				
Low-level	168 (35.4)	31 (34.8)	68 (35.6)	69 (35.4)
Mid-level	147 (30.9)	29 (32.6)	53 (27.7)	65 (33.3)
High-level	155 (32.6)	29 (32.6)	67 (35.1)	59 (30.3)
Prefer not to say	5 (1.1)	0 (0.0)	3 (1.6)	2 (1.0)
Marital status (n; %)				
Single	77 (16.2)	15 (16.9)	33 (17.3)	29 (14.9)
Married/civil partnership/ cohabiting	299 (62.9)	55 (61.8)	116 (60.7)	128 (65.6)
Separated/divorced/widowed	98 (20.6)	19 (21.3)	42 (22.0)	37 (19.0)
Prefer not to say	1 (0.2)	0 (0.0)	0 (0.0)	1 (0.5)
Work status (n; %)				
Employed	302 (63.6)	60 (67.4)	116 (60.7)	126 (64.6)
Not working	172 (36.2)	28 (31.5)	75 (39.3)	69 (35.4)
Prefer not to say	1 (0.2)	1 (1.1)	0 (0.0)	0 (0.0)
Ethnic background (n; %)				
Any white	450 (94.7)	87 (97.8)	180 (94.2)	183 (93.8)
Mixed ethnic background	3 (0.6)	0 (0.0)	2 (1.0)	1 (0.5)
Any Asian background	14 (2.9)	2 (2.2)	4 (2.1)	8 (4.1)
Any black background	6 (1.3)	0 (0.0)	4 (2.1)	2 (1.0)
Other	2 (0.4)	0 (0.0)	1 (0.5)	1 (0.5)
Screening status (n; %)				
Up to date	288 (60.6)	53 (59.6)	113 (59.2)	122 (62.6)
Overdue	171 (36.0)	32 (36.0)	71 (37.2)	68 (34.9)
Non-attender	13 (2.7)	3 (3.4)	5 (2.6)	5 (2.6)
Prefer not to say	3 (0.6)	1 (1.1)	2 (1.0)	0 (0.0)

Note. Education: Low-level = No formal qualifications; GCSE or equivalent, Mid-level = AS, A Levels or equivalent; NVQ or equivalent; Apprenticeship; other, High-level = Degree or above.
* See Table 2 for details of the messages viewed by each intervention group.

first/control message exposure. A mean intention score between five and six corresponds to participants 'slightly agreeing' or 'agreeing' that they intend to/will try to/are going to go for screening. For participants in the intervention groups, mean scores were 5.79 (SD: 0.79) after the second message and 5.84 (SD: 0.78) after all three intervention messages. Mean intention scores by message exposure are presented in Table 2. After adjusting for baseline intention, none of the individual messages had a statistically significant effect on intention strength.

Across the sample there was a small but significant increase in intention strength from the beginning of the study to after each message i.e. from baseline to after the first message ($t(470) = -9.24$, *p* < .001); from after the first to after the second message ($t(385) = -4.82$, p < .001); from after the second to after the third message ($t(386) = -3.03$, *p* = .003). The number of women whose intention increased after reading multiple messages was 164 (42.7%). In comparison, the intention of 30 women (7.8%) decreased and 190 (49.5%) stayed the same. For those whose intention increased, the mean increase was 0.93 (SD = 0.54) on the 7-point scale. Scores for attitude items by message exposure group are shown in Supplementary File 3.

3.3. Post-hoc analyses

To understand whether the messages had a greater effect among those who spent longer reading them, a sensitivity analysis was conducted which excluded anyone in the intervention groups who took under the mean time (7 min) to complete the survey. The mean intention strength after message exposure was marginally higher in this analysis but still none of the messages had a significant effect (see Supplementary File 4).

4. Discussion

We found no evidence that any of the individual messages increased intention to attend cervical screening in women with weak positive intentions. This included social norms, outcome expectancy, risk reduction and response efficacy messages. Acknowledging discomfort of screening also had no impact on screening intentions. These findings suggest it is unlikely any single message can strengthen screening intentions for those with weak intentions to begin with and are similar to our previous study with women who did not intend to be screened (Marlow et al., 2021). The results of the present study contrast with cognitive dissonance theory (Festinger, 1957; Byskov Petersen et al., 2020) as we found no support that messages which were ineffective for women with negative intentions might work better for those who were more positively inclined towards screening (Marlow et al., 2021). There are important potential confounders associated with age, such as co-morbidity, that could impact screening behaviour, which would be useful to measure in a future study.

There was no significant difference between the age-targeted messages and generic messages. This was similar to the findings of our previous study (Marlow et al., 2021), but inconsistent with the theory that targeted messages are more effective than generic ones (Kreuter and Wray, 2003). We also tested different message formats (negative or positive framing of the response efficacy message and short- and long-term time frames for the risk reduction message), and neither were more effective. There is mounting evidence that message framing does not impact intention in the context of cancer screening. A recent study found framed messages increased intention to attend HPV testing compared to a control group, but there was no difference in the effect of gain or loss framed messages (Ogden et al., 2021).

Whilst none of the messages individually increased intention, there was a significant increase in screening intention after reading multiple

Table 2
Mean intention strength after message exposure and effect of each message.

	Mean intention score*	Standard error	ηp2 or Cohen's d	F* or t	p*
Intervention group 1					
Descriptive social norm message			0.001	F (2, 266) = 0.178	0.84
Control group (n = 89)	5.64	0.053			
Age targeted: 8 out of 10 women aged 50–64 years who are invited get screened (*n* = 91)	5.63	0.052			
Generic: 7 out of 10 women who are invited get screened (*n* = 91)	5.67	0.052			
Outcome expectancy message			0.005	F (2, 267) = 0.672	0.51
Control group (n = 89)	5.64	0.055			
Age-targeted: Diagram showing results for 100 women aged 50–64 screened (6 will test HPV+) (*n* = 85)	5.71	0.055			
Generic: Diagram showing results for 100 women screened (13 will test HPV+) (*n* = 98)	5.63	0.052			
Intervention group 2					
Response efficacy message			0.011	F (2, 270) = 1.489	0.23
Control group (n = 89)	5.70	0.053			
Action antecedent: If you get screened, your chance of getting CaCx will be much lower (*n* = 82)	5.83	0.056			
Inaction antecedent: If you don't get screened, your chance of getting CaCx will be much higher (*n* = 103)	5.77	0.050			
Risk reduction message			0.012	F (2, 269) = 1.652	0.19
Control group (n = 89)	5.70	0.058			
Short term risk reduction: If you are screened every 5 years between the ages of 50 and 64, you are much less likely to get cervical cancer in your 50s and 60s (n = 86)	5.83	0.059			
Long term risk reduction: If you are screened every 5 years between the ages of 50 and 64, you are much less likely to get cervical cancer in your 70s and 80s (n = 98)	5.73	0.055			
Both intervention groups					
Discomfort acknowledgment message			−0.041	t (329) = −0.369	0.71
Present with support message: Some women find screening more uncomfortable after menopause, but the nurse can suggest ways to make it easier (n = 182)	5.80	0.044			
Absent (support message only): If you are worried about screening you can call [number] (n = 202)	5.86	0.042			

* Adjusted mean varied slightly for control group for each analysis. Intention was measured immediately following each exposure. CaCx: Cervical cancer (spelled in full in the survey).

messages. Additional work is needed to see whether this increased intention translates into higher screening uptake. However, this finding is consistent with a reason-based conception of choice, which theorises that people make decisions based on weighing up arguments for and against (Shafir et al., 1993). After reading multiple reasons to attend cervical screening, participants may have had more reason to attend, increasing their intention. The proportion of women whose intention increased by at least one point on the 7-point scale after reading multiple messages was 24.7%. This might suggest a meaningful shift but the translation into a change in screening behaviour remains to be seen. It is possible that this increase could be due to social desirability bias. However, it is also possible that presenting all five messages at the same time, such as in an infographic, could be effective at improving intention. This will be tested in a future study.

4.1. Limitations

Using an online survey provided a convenient way to randomise participants. However, this meant it was only available to people with technology to access it. Additionally, conducting the survey in English meant only women who were proficient in English could take part. These factors could have reduced the generalisability of the findings. We did not reach the pre-planned sample size of 1000 participants as a relatively small proportion of women expressed weak positive screening intentions and recruitment was difficult. Conducting post-hoc power calculations showed we would have needed more than 500 additional participants for the observed effect size to be statistically significant. Therefore, we did not attempt to recruit more participants as the small effect size may lack real-world significance. The messages would likely have been more effective if they were targeted based on multiple socio-demographic factors. In the future, more nuanced targeting may be possible, for example by using new IT systems. Lastly, as previous negative experience of screening can be a strong barrier to re-attendance among older women, it would have been useful to measure perceived discomfort at baseline.

5. Conclusion

Our aim was to test the impact of five theory-informed messages designed to increase intention to attend cervical screening among 50–64-year-old women who had weak positive intentions to be screened, extending our previous work (Marlow et al., 2021). We found no single message was superior in increasing intention to attend cervical screening, although small but significant increases were observed after exposure to three messages. Future research will investigate the impact of these messages when presented together as an infographic.

Author contributions

Jo Waller (Conceptualization; Funding acquisition; Methodology; Supervision; Writing – review & editing) Laura Marlow (Conceptualization; Formal analysis; Investigation; Methodology; Project administration; Writing – review & editing) Martin Nemec (Methodology; Project administration) Frances Waite (Formal analysis; Writing – original draft; Writing – review & editing).

CRediT authorship contribution statement

Frances Waite: Formal analysis, Writing – original draft, Writing – review & editing. **Laura A.V. Marlow:** Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Writing – review & editing. **Martin Nemec:** Methodology, Project administration. **Jo Waller:** Conceptualization, Funding acquisition, Methodology, Supervision, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data is available on Open Science Framework: https://osf.io/84ymf

Appendix A. Supplementary information

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ypmed.2022.107322.

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