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Varying cognitive targets and response rates to enhance the question-behaviour effect: An 8-arm Randomized Controlled Trial on influenza vaccination uptake

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ABSTRACT

Rationale: The question-behaviour effect (QBE) refers to the finding that survey questions about a behaviour can change that behaviour. However, little research has tested how the QBE can be maximized in behavioural medicine settings. The present research tested manipulations of cognitive targets (questions about anticipated regret or beneficence) and survey return rates (presence vs. absence of a sticky note requesting completion of the questionnaire) on the magnitude of the QBE for influenza vaccination in older adults.

Method: Participants ($N = 13{,}803$) were recruited from general practice and randomly allocated to one of eight conditions: control 1 (no questionnaire); control 2 (demographics questionnaire); intention and attitude questionnaire (with or without a sticky note); intention and attitude plus anticipated regret questionnaire (with or without a sticky note); intention and attitude plus beneficence questionnaire (with or without a sticky note). Objective records of subsequent influenza vaccination from general practice records formed the dependent variable.

Results: Intention-to-treat analyses indicated that receiving an influenza vaccination questionnaire significantly increased vaccination rates compared to the no questionnaire, $OR = 1.17$, 95% $CI = 1.01, 1.36$ and combined control conditions, $OR = 1.13$, 95% $CI = 1.01, 1.25$. Including the sticky note significantly increased questionnaire return rates, $OR = 1.25$, 95% $CI = 1.04, 1.50$. However, there were no differences in vaccination rates between questionnaires containing different cognitive targets, a sticky note or not, and no interactions. There were no significant differences in the per-protocol analyses, i.e. among respondents who completed and returned the questionnaires.

Conclusion: The QBE is a simple, low-cost intervention to increase influenza vaccination rates. Increasing questionnaire return rates or asking anticipated regret or beneficence questions in addition to intention and attitude questions did not enhance the QBE.

Asking questions about a behaviour can be sufficient to change that behaviour – a phenomenon termed the *question-behaviour effect* (QBE; Dholakia, 2010). Although the effect size is usually small ($d = 0.24$; Wood et al., 2016), the QBE is a low-cost intervention with high reach. The QBE could, therefore, form the basis of cost-effective interventions to promote health-related behaviours such as screening attendance and influenza vaccination (Conner et al., 2011) by including a questionnaire along with the invitation to participate. Although the effect is well established (Wood et al., 2016), relatively little research has tested how to maximize the QBE. The present research is novel in examining the impact of manipulating the cognitive targets (i.e., the particular questions asked in the survey) and the response rate to a

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questionnaire on the QBE. The test comprised an 8-arm Randomized Controlled Trial (RCT) with three levels of cognitive target (intention + attitude questions only or also including anticipated regret or beneficence questions), a manipulation of questionnaire response rate (a sticky note requesting participation, or not) compared to two control conditions (no questionnaire, demographics questionnaire) on influenza vaccination in older adults.

The QBE has also been called *measurement reactivity, self-erasing errors of prediction, self-generated validity*, the *mere measurement effect*, and the *self-prophecy effect* (Dholakia, 2010; Sprott et al., 2006) and been tested in various health behaviours. Most QBE studies test the impact of asking intention, self-prediction, and/or attitude questions (Wood et al., 2016). For example, Williams et al. (2006) showed that asking students about their intentions to exercise increased self-reported exercise rates from 14% to 26% two months later. Two main explanations for the QBE have been proposed (Dholakia, 2010). The attitude accessibility explanation assumes that completing behaviour-related questions activates the attitude underlying that behaviour; this enhanced accessibility of attitude, in turn, increases the likelihood that the person will perform the target behaviour. The cognitive dissonance explanation assumes that completing behaviour-related questions promotes dissonance that can be reduced by subsequently acting consistently with one's responses to the questions (i.e., by performing the behaviour that one has indicated one would perform).

In the present research, we tested whether supplementing intention/self-prediction and attitude questions with either anticipated regret or beneficence questions enhances the QBE. Such additional questions could enhance the accessibility of attitude towards the behaviour, or exacerbate cognitive dissonance in relation to the behaviour and so increase the QBE. Although the evidence concerning the impact of measuring anticipated regret on the QBE is mixed (Godin et al., 2010, 2014; Sandberg and Conner, 2009, 2011; Wood et al., 2016), there is evidence that including regret questions greatly enhances the QBE when participants complete and return the relevant questionnaire (Godin et al., 2010). Thus, anticipated regret questions were tested here both to add to the evidence base concerning anticipated regret, and to test potential interactions with a manipulation designed to increase response rates. The impact of including beneficence questions in enhancing the QBE has been little studied. Beneficence refers to doing good or demonstrating magnanimity, and has benefits both for the self and others. The desire to hold a favourable view of oneself is a powerful motive driving human behaviour (Sedikides and Strube, 1997), and Godin et al. (2014) observed that supplementing intention questions with positive self-image questions significantly increased the QBE for blood donation rates among lapsed donors (see also Ferguson et al., 2008). The present research thus tested whether including beneficence questions (tapping positive self-image plus benefit to self and others) in addition to intention/self-prediction and attitude questions increased the effectiveness of the QBE in relation to influenza vaccination.

It has been suggested that receiving a questionnaire about a behaviour may be a necessary, but not a sufficient, condition for engendering a QBE (Conner et al., 2011). The QBE may only occur among people who actually complete (and perhaps return) the questionnaire and have positive intentions about performing the behaviour – because only for these participants is the underlying attitude towards the behaviour activated or dissonance induced about not following through on one's stated intentions. This pattern of results was observed in studies of blood donation (Godin et al., 2008, 2010), cervical screening (Sandberg and Conner, 2009), health screening (Conner et al., 2011; study 1), and influenza vaccination in health professionals (Conner et al., 2011; study 2). An important but untested implication of this analysis is that increasing response rates to a questionnaire should increase the magnitude of the QBE. Although several techniques to promote questionnaire returns have been tested (see Dillman, 2000), one simple but effective approach is the sticky note technique (Garner, 2005). Across four studies, Garner (2005) showed that attaching a sticky note (with a simple, handwritten request to help) to the front of a questionnaire significantly increased questionnaire return rates by 22–44%. We therefore tested the impact of this technique to increase questionnaire return rates and enhance the magnitude of the QBE for influenza vaccination.

The target behaviour in the present study was influenza vaccination in older adults (aged 65 years and older). Vaccination programmes are an important means of protecting people against a variety of infectious diseases. Vaccination against influenza is commonly offered to "at risk" individuals (e.g., pregnant women, the elderly, and those aged six months to under 65 in clinical risk groups) on an annual basis to take account of variations in influenza strains across time. For example, in the UK, annual influenza vaccination is offered by General Practices to their patients aged 65 + years at their next birthday. To be effective at a population level, it is important that high vaccination rates are achieved (>75%; Public Health England, 2016). Research has examined the predictors of influenza vaccination (e.g., Johnson et al., 2011) and explored interventions to improve uptake (Ahmed et al., 2004; see Thomas et al., 2010 for a review). However, influenza vaccination rates in this age group remain below optimum levels, with 66.7% in USA (Centers for Disease Control, 2015) and 72.8% in UK (Department of Health, 2015) vaccinated in winter 2014/15, despite the increased risk of mortality associated with influenza in this age group. The present research tested the QBE as a simple (and potentially cost-effective) means to increase influenza vaccination rates among older adults. We tested the effects of three question sets with different cognitive targets (intentions + attitudes vs. anticipated regret + intentions + attitudes vs. beneficence + intentions + attitudes) crossed with an intervention designed to increase questionnaire return rates (presence vs. absence of a sticky note) against two control conditions (no questionnaire, demographics-only questionnaire). We used an RCT design with objective measures of vaccination and intention-to-treat analyses. The research is unique in manipulating both the cognitive targets specified in the questionnaire and the response rate to the questionnaire to enhance the magnitude of the QBE in a large sample, in a field setting, for an important health behaviour.

1. Method

1.1. Study population and sampling procedure

Using the effect size ($d = 0.13$) from Conner et al. (2011) study of the QBE and influenza vaccination, G*Power indicated that 1539 participants per condition would provide 95% power to detect a significant effect at an alpha of 0.05 using a two-tailed test. We recruited seven General Practices in northern England who were not taking part in a centralized influenza vaccination invitation scheme in Fall/Autumn 2012. The study population consisted of all patients in each practice eligible for an influenza vaccination that year by being age 65 years or over at their next birthday. Patients were randomized individually to one of eight conditions by the second author using a random number generator but were not blinded to condition. A total of 15 patients were excluded (12 not randomized; 3 no vaccination data) to leave a final sample of 13,803 (there were no significant differences between the two groups on sex, age, or previous influenza vaccination). A total of 5095 completed questionnaires (42.2%) were returned from 12,076 distributed (conditions 2–8). Fig. 1 details the randomization,

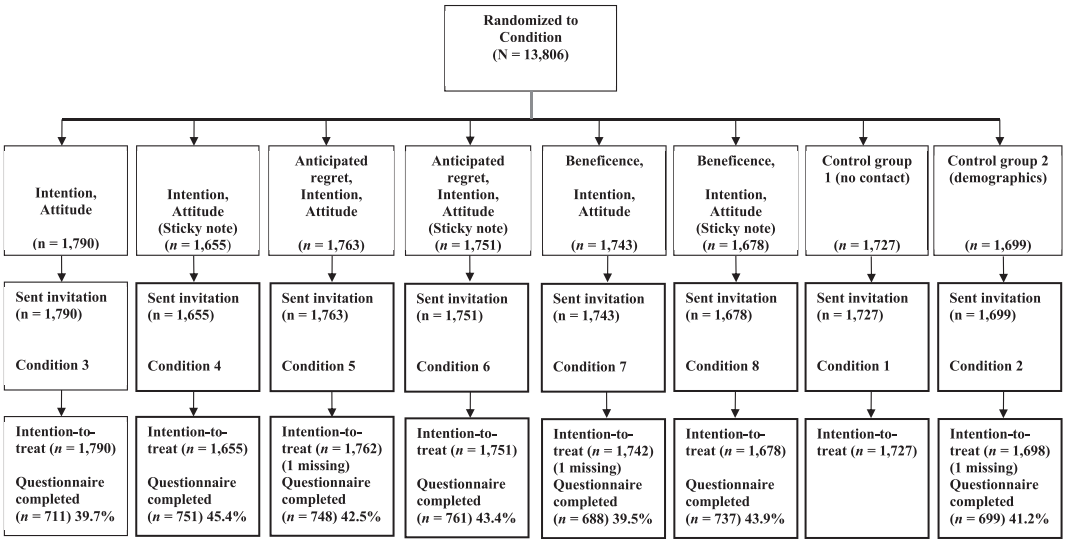

Fig. 1. Randomization flow diagram.

exclusions, and questionnaire return rates by condition. Examination of the samples sizes per condition indicates that our intention-to-treat analyses based on all respondents were appropriately powered. However, per-protocol analyses based on participants who completed and returned the questionnaires were underpowered.

This study received ethical approval from NHS Ethics, was registered retrospectively (ISRCTN16437731), and all standard ethical procedures were applied.

1.2. Interventions

Participants in control condition 1 (no questionnaire) did not receive a questionnaire. Participants in the control condition 2 (demographics questionnaire) received a questionnaire tapping whether they had children, their occupation, marital status, and ethnic origin. Participants in the other six conditions (3–8) received questionnaires tapping the same demographic questions *plus* questions about influenza vaccination: intention + attitude questions (both conditions 3 and 4); anticipated regret + intention + attitude questions (both conditions 5 and 6); beneficence + intention + attitude questions (both conditions 7 and 8). Conditions 4, 6 and 8 additionally had a sticky note attached to the front that included a message ("Please take a few minutes to complete this for us. Thank you!") printed in blue on a yellow (72 × 72 mm) sticky note but with the message appearing to be hand-written as used in previous research (Garner, 2005). Fig. 1 summarizes the differences between the conditions.

The QBE does not fit easily into extant taxonomies of behaviour change techniques. The closest categories from Michie et al. (2013) taxonomy for the QBE would seem to be prompts/cues (7.1) and review behavioural goals (1.5) and this would apply to conditions 3–8 with no behaviour change techniques applied in conditions 1 and 2. The sticky note manipulation does not appear to fit any of the specified behaviour change technique categories.

1.3. Procedure

Participants in all conditions received a letter from their General Practice informing them of the upcoming influenza drive and their eligibility to take part. In conditions 2–8 (where a questionnaire was distributed), participants also received a letter requesting them to complete the enclosed questionnaire and return it in the stamped addressed envelope. Those returning a questionnaire could tick a box to opt into a prize draw for £200 (approximately $250). A code number on each questionnaire allowed questionnaire data to be matched to patient records. After matching, the data were anonymized. Materials were sent out by each General Practice (Primary Care Center) approximately one month before the influenza vaccinations were made available.

Vaccination behaviour (i.e., getting an influenza vaccination or not) over the next four months (before reminders were sent) was the primary outcome variable and was obtained from patient records in a database maintained by each General Practice.

1.4. Questionnaire measures

Demographic questions tapped if participants had children, whether they supervised other employees, their occupation, marital status, and ethnic origin. Cognition items were generated based on published recommendations concerning the principle of correspondence (Conner and Sparks, 2015).

Intentions were tapped by two items (My intention to attend for the seasonal flu jab in the next few weeks is … not at all strong-very strong; I will attend for the seasonal flu jab in the next few weeks, strongly disagree-strongly agree; $r = 0.868$) and *attitudes* by three items (For me, attending for the seasonal flu jab in the next few weeks would be … not worthwhile-worthwhile, bad-good, not beneficial-beneficial; *alpha* = 0.969).

Anticipated regret was tapped by two items (If I did not attend for the seasonal flu jab in the next few weeks I would feel regret, definitely no-definitely yes; If I did not attend for the seasonal flu jab in the next few weeks I would later wish I had, strongly disagree-strongly agree; $r = 0.892$).

Beneficence was tapped by four items (If I attended for the seasonal flu jab in the next few weeks, it would benefit both me and the people I know, strongly disagree-strongly agree; I'd feel good about myself if I attended for the seasonal flu jab in the next few weeks, definitely no-definitely yes; Attending for the seasonal flu jab in the next few weeks is the responsible thing for me to do, strongly disagree-strongly agree; Attending for the seasonal flu jab in the next few weeks will protect the health of people I care about, strongly disagree-strongly agree; $\alpha = 0.912$). All these items were responded to on 7-point scales with higher numbers indicating

more positive reactions to influenza vaccination.

Demographic questions appeared first, followed by anticipated regret or beneficence questions (where included) and then intentions and finally attitude questions. Sex, age, deprivation status, and influenza vaccination during the current drive (before any reminders sent) were retrieved from patient records. Our deprivation measure used the Townsend (1987) index derived from postcode (zip code) data linked to the 2011 UK Census. The Townsend index taps material deprivation that has been shown to be related to vaccination rates (Johnson et al., 2011). Higher scores indicate greater deprivation.

1.5. Data analysis

Data were analyzed in SPSS (version 20, SPSS Inc) and HLM (version 7, SSI). Our analyses focused on the full sample (intention-to-treat analyses) but also reports per-protocol analyses on the sub-sample returning questionnaires. First, a randomization check compared the eight conditions on sex, age, deprivation status, and previous influenza vaccination taken from GP records. No missing data imputation was performed since the primary outcome was assessed objectively. Second, multilevel modelling analyses (using random effects, the Bernoulli model, and centring predictor variables around the group mean) that controlled for the fact that participants were clustered within one of seven General Practices examined the impact of condition on rates of vaccination controlling for any differences across conditions. For each predictor we report unstandardized coefficients, standard errors, odds ratios and 95% confidence intervals (based on the population-average model). We initially examined if receiving a demographics questionnaire (condition 2) compared to no questionnaire (condition 1) increased vaccination rates. We then examined whether receiving a questionnaire on vaccination (conditions 3–8) compared to control (condition 1 plus also conditions 1 + 2) increased vaccination rates. Next we examined differences in vaccination rates among the six conditions (conditions 3–8) receiving questionnaires on vaccination. We dummy coded whether the condition only included questions about intention and attitudes (conditions 3 and 4) or not (conditions 5–8); anticipated regret, intentions and attitudes (conditions 5 and 6) or not (conditions 3, 4, 7, 8); beneficence, intentions and attitudes (conditions 7 and 8) or not (conditions 3, 4, 5, 6); whether a questionnaire was sent with a sticky note (conditions 4, 6 and 8) or not (conditions 3, 5, and 7); and interactions between different sets of questions and inclusion of a sticky note. These dummy coded variables were included as predictors of vaccination rates. The final analyses assessed the effect of condition on questionnaire return rates.

Our per-protocol analyses focused on the sub-sample who returned questionnaires and broadly replicated the intention-to-treat analyses. A randomization check compared the seven questionnaire conditions (conditions 2–8) on sex, age, deprivation status, previous influenza vaccination, self-reported having children, being retired or not, being married or not, and being white British or not. Subsequent per-protocol analyses examined the impact of condition on rates of vaccination controlling for any differences across conditions again using multilevel modelling. We assessed whether receiving, completing and returning a questionnaire on vaccination (conditions 3–8) compared to a demographics questionnaire (condition 2) increased vaccination rates. We then examined whether different sets of questions and inclusion of a sticky note or not (all dummy coded) and the interactions between the two influenced vaccination rates. Finally, we examined variations in intentions, attitudes, anticipated regret and beneficence among participants who completed and returned the questionnaires about vaccination.

2. Results

2.1. Intention to treat findings

2.1.1. Randomization check and descriptive statistics for full sample

The sample was 56.3% female with a mean age of 75.7 years ($SD = 7.95$), mainly lived in areas of low deprivation (Townsend score $M = -1.47$, $SD = 2.93$), and the majority (83.4%) had previously received an influenza vaccination. The 8 different conditions were equivalent on sex, age, and previous influenza vaccination rates (ps > 0.11) but significantly different on deprivation (Table 1; $p < 0.01$). Subsequent analyses of condition on influenza vaccination rates for the full sample therefore controlled for deprivation.

2.1.2. Effect of type of control condition

In total, 10,598 participants (76.8%) were vaccinated against influenza during the vaccination campaign (see Table 1). Multilevel modelling controlling for deprivation indicated that vaccination rates did not differ between the two control conditions (condition 1 vs. 2), $B = 0.058$, $SE = 0.081$, $p = 0.50$, $OR = 1.06$, 95% $CI = 0.87, 1.29$. Thus, receiving a demographics questionnaire was not sufficient to increase behaviour.

2.1.3. Overall question-behaviour effect

Multilevel modelling controlling for deprivation indicated that vaccination rates (Table 1) were significantly higher when participants received an influenza vaccination questionnaire compared to when participants did not receive a questionnaire, $B = 0.160$,

Table 1
Samples sizes, deprivation scores (Townsend index), influenza vaccination rates, and questionnaire return rates by condition.

Group		Deprivation		Vaccinated		Returned questionnaire	
	N	*M*	*SD*	*n*	%	*N*	%
Control conditions							
Control 1 (no questionnaire)	1727	−1.46	2.88	1290	74.7	–	–
Control 2 (demographics)	1698	−1.40	3.01	1286	75.7	699	41.2
Intention + attitude conditions							
Questionnaire only	1790	−1.44	2.95	1375	76.8	711	39.7
Questionnaire + sticky note	1655	−1.66	2.87	1281	77.4	751	45.4
Regret + intention + attitude conditions							
Questionnaire only	1762	−1.44	2.94	1361	77.2	748	42.5
Questionnaire + sticky note	1751	−1.32	2.96	1367	78.1	761	43.3
Beneficence + intention + attitude conditions							
Questionnaire only	1742	−1.49	2.94	1345	77.2	688	39.5
Questionnaire + sticky note	1678	−1.57	2.85	1293	77.1	737	43.9
Total	13,803			10,598		5095	

$p = 0.04$ (see Table 2 for regression findings). Vaccination rates were also significantly higher in the flu questionnaire conditions compared to the two control conditions that did not receive a questionnaire about influenza vaccination (conditions 1 and 2 combined), $B = 0.119$, $p = 0.04$. Using the conversion formula suggested by Chinn (2000), this effect represents a QBE of small magnitude ($d = 0.09$ and 0.07, respectively).

2.1.4. Effect of cognitive target and response rate manipulations

Multilevel modelling controlling for deprivation indicated that neither the cognitive target manipulation (intention + attitude questions vs. intention + attitude + anticipated regret questions vs. intention + attitude + beneficence questions) nor the response rate manipulation (presence vs. absence of a sticky note) influenced vaccination rates (Tables 1 and 2). The interaction terms also were not significant.

2.1.5. Impacts on questionnaire return rates

Multilevel modelling controlling for deprivation indicated that receiving an influenza vaccination questionnaire (condition 3–8) did not influence return rates compared to a demographics only questionnaire (condition 2), $B = 0.014$, $SE = 0.057$, $p = 0.81$, $OR = 1.01$, 95% $CI = 0.88, 1.17$. The response rate manipulation (a sticky note; conditions 3, 5, and 7 vs. 4, 6, and 8) significantly increased questionnaire returns, $B = 0.222$, $SE = 0.075$, $p = 0.03$, $OR = 1.25$, 95% $CI = 1.04, 1.50$. Questionnaire return rates were not significantly influenced by the cognitive target manipulations, $Bs = -0.015, 0.086$, $SEs = 0.085, 0.095$, $ps = 0.40, 0.86$, $OR = 0.98, 1.09$, 95% $CI = 0.80, 1.38$, nor by the interaction between the cognitive target and response rate manipulations, $Bs = -0.016, -0.153$, $SEs = 0.107, 0.108$, $ps = 0.20, 0.89$, $ORs = 0.86, 0.98$, 95% $CI = 0.66, 1.28$.

2.2. Per protocol findings

2.2.1. Randomization check and descriptive statistics for questionnaire returners

The sub-sample returning questionnaires ($N = 5095$) was 55.9% female with a mean age of 75.1 years ($SD = 7.40$). The sub-sample was mostly retired (94.7%), white British (96.8%), married (62.7%), had children (84.9%) and mainly lived in areas of low deprivation (Townsend score $M = -1.84$, $SD = 2.73$). A majority (93.1%) of the sub-sample had previously received an influenza vaccination. The 7 different conditions were equivalent on sex, being white British, being married, age, previous influenza vaccination rates and deprivation status ($ps > 0.07$) but significantly different on being retired ($p = 0.02$) and having children ($p = 0.03$). Subsequent analyses examining the effect of condition on influenza vaccination rates in the sample returning questionnaires therefore all controlled for having children and retired status.

2.2.2. Overall question-behaviour effect

Multilevel modelling indicated that vaccination rates (Tables 2 and 3) were not significantly higher in the influenza vaccination questionnaire conditions compared to the demographics questionnaire condition, $B = 0.068$, $SE = 0.137$, $p = 0.64$, $OR = 1.07$, 95% $CI = 0.77, 1.50$. Findings were equivalent controlling for having children or not and being retired or not.

2.2.3. Effect of cognitive target and response rate manipulations

Multilevel modelling indicated that vaccination rates (Tables 2 and 3) were not influenced by the cognitive target or response

Table 2
Multilevel regressions of vaccination rates on the question-behaviour effect, and manipulations of cognitive target and response rate for intention to treat and per-protocol analyses.

Analysis and variables	B	*SE*	*p*	*OR*	95% *CI*
Intention-to-Treat Analyses (these control for deprivations scores)					
Overall Question-Behaviour Effect:					
Flu questionnaires (conditions 3–8) vs. No questionnaire (condition 1)	0.160	0.061	0.04	1.17	1.01, 1.36
Flu questionnaires (conditions 3–8) vs. No flu questionnaires (conditions 1 + 2)	0.110	0.044	0.04	1.13	1.01, 1.25
Attitude + intention flu questionnaires (conditions 3–4) vs. other flu questionnaires (conditions 5–8)					
Effect of target manipulation	−0.061	0.078	0.46	0.94	0.78, 1.14
Effect of sticky note manipulation	0.018	0.059	0.77	1.02	0.88, 1.18
Effect of interaction between target and sticky note manipulation	0.018	0.138	0.90	1.02	0.73, 1.43
Attitude + intention + regret flu questionnaires (conditions 5–6) vs. other flu questionnaires (conditions 3–4 and 5–8)					
Effect of target manipulation	0.016	0.089	0.86	1.02	0.82, 1.27
Effect of sticky note manipulation	0.022	0.073	0.77	1.02	0.86, 1.22
Effect of interaction between target and sticky note manipulation	0.012	0.129	0.93	1.01	0.74, 1.39
Attitude + intention + beneficence flu questionnaires (conditions 7–8) vs. other flu questionnaires (conditions 3–6)					
Effect of target manipulation	0.044	0.044	0.35	1.04	0.94, 1.16
Effect of sticky note manipulation	0.040	0.035	0.30	1.04	0.96, 1.13
Effect of interaction between target and sticky note manipulation	−0.046	0.052	0.41	0.96	0.84, 1.09
Per-Protocol Analyses (these control for having children and being retired.)					
Overall Question-Behaviour Effect					
Flu questionnaires (conditions 3–8) vs. No flu questionnaire (condition 2)	0.068	0.137	0.64	1.07	0.77, 1.50
Attitude + intention flu questionnaires (conditions 3–4) vs. other flu questionnaires (conditions 5–8)					
Effect of target manipulation	0.047	0.234	0.85	1.05	0.59, 1.86
Effect of sticky note manipulation	0.120	0.149	0.45	1.13	0.78, 1.62
Effect of interaction between target and sticky note manipulation	−0.071	0.314	0.83	0.93	0.43, 2.01
Attitude + intention + regret flu questionnaires (conditions 5–6) vs. other flu questionnaires (conditions 3–4 and 5–8)					
Effect of target manipulation	−0.435	0.275	0.17	0.65	0.33, 1.27
Effect of sticky note manipulation	0.019	0.159	0.91	1.02	0.69, 1.51
Effect of interaction between target and sticky note manipulation	0.182	0.307	0.57	1.20	0.57, 2.54
Attitude + intention + beneficence flu questionnaires (conditions 7–8) vs. other flu questionnaires (conditions 3–6)					
Effect of target manipulation	0.325	0.178	0.12	1.38	0.89, 2.13
Effect of sticky note manipulation	0.080	0.115	0.51	1.08	0.82, 1.43
Effect of interaction between target and sticky note manipulation	−0.011	0.218	0.63	0.90	0.53, 1.53

Table 3
Overall influenza vaccination rates in full sample and sub-samples not returning and returning questionnaires.

Group	Intention to treat			No Questionnaire returned				Questionnaire returned			
		Vaccinated				Vaccinated				Vaccinated	
	N	*n*	%	*N*	%	*n*	%	*N*	%	*n*	%
Control conditions											
Control 1 (no questionnaire)	1727	1290	74.7	–	–	–	–	–	–	–	–
Control 2 (demographics)	1698	1286	75.7	999	58.8	642	64.3	699	41.2	644	92.1
Intention + attitude conditions											
Questionnaire only	1790	1375	76.8	1079	60.3	716	66.4	711	39.7	659	92.7
Questionnaire + sticky note	1655	1281	77.4	904	54.6	589	65.2	751	45.4	692	92.1
Regret + intention + attitude conditions											
Questionnaire only	1762	1361	77.2	1014	57.5	675	66.6	748	42.5	686	91.7
Questionnaire + sticky note	1751	1367	78.1	990	56.7	663	66.9	761	43.3	704	92.5
Beneficence + intention + attitude conditions											
Questionnaire only	1742	1345	77.2	1054	60.5	699	66.3	688	39.5	646	93.9
Questionnaire + sticky note	1678	1293	77.1	941	56.1	606	64.4	737	43.9	687	93.2

rate manipulations or their interaction. Not covarying for having children or being retired did not alter these findings.

Table 3 indicates that vaccination rates were substantially lower among participants not completing questionnaires (65.7%) compared to those who completed a questionnaire (92.6%). Receiving an influenza vaccination questionnaire or not, varying the cognitive target, or the presence versus absence of a sticky note had no effect on vaccination rates among participants who did not return the questionnaire ($ps > 0.15$).

2.2.4. Variations in measured cognitive targets

Examination of the mean scores on the measured variables for participants that returned completed questionnaires revealed positive overall reactions to influenza vaccination on all measured variables (intention: $M = 6.60$, $SD = 1.12$; attitude: $M = 6.68$, $SD = 1.00$; anticipated regret: $M = 6.25$, $SD = 1.45$; beneficence: $M = 6.38$, $SD = 1.06$). There was no evidence that the cognitive target or response rate manipulations influenced scores on these cognitive measures ($ps > 0.20$).

3. Discussion

The intention-to-treat analyses demonstrated that sending a questionnaire tapping cognitions about influenza vaccination significantly increased influenza vaccination in older adults compared to two control conditions (no questionnaire, demographic questions only). The observed QBE was equivalent to increasing vaccination rates by approximately 3%, or 414 additional vaccinations among our sample size of 13,806 participants. Sending a demographics questionnaire did not generate a significant increase in vaccination rates compared to not sending a questionnaire. Importantly, there was no evidence that including questions about different cognitive targets (i.e., intentions + attitudes vs. anticipated regret + intentions + attitudes vs. beneficence + intentions + attitudes) enhanced the QBE. In addition, although our manipulation of questionnaire response rates (a sticky note requesting help) produced a significant increase in response rates, that increase in response rates did not generate a reliable increase in influenza vaccination rates. There was also no interaction between our manipulation of cognitive targets and response rates on influenza vaccination rates. Thus, the present study indicates that the QBE can be used to improve influenza vaccination rates among older adults, but also shows that asking questions about anticipated regret or beneficence, or including a sticky note that increases response rate, does not enhance the magnitude of the QBE for influenza vaccination.

The present findings replicate and extend previous work on using the QBE to promote influenza vaccination in health professionals (Conner et al., 2011; study 2), although the effects observed here were smaller (3% versus 6% change in vaccination rates; $ds = 0.09$ versus 0.13). In the UK context, such improvements in vaccination rates could ensure that the current influenza vaccination programme achieves the current target of at least 75% vaccinated despite only 71% being vaccinated in 2015/16 (Public Health England, 2016). Only in the no-questionnaire control condition (condition 1) did that vaccination rates fall below this 75% target.

Although the effect sizes for the QBE intervention observed here was small, the practical importance of even a small effect can be substantial given the reduction in episodes of severe illness, hospitalization and deaths that might be avoided in this high-risk group through even a modest increase in influenza vaccination rates (see Godin et al., 2008 for similar evidence for blood donation). The effect size observed here is comparable to that reported in a review of 57 RCTs designed to increase influenza vaccination rates in the over 60s (Johnson et al., 2011). It is worth noting that, in general, these other interventions to increase influenza vaccination rates were more intensive and expensive to administer. The relatively modest costs and simplicity of the present QBE intervention may add to the appeal of the QBE as an additional behaviour change strategy for improving public health. Although no formal cost-effectiveness analyses were conducted, it is notable that the additional costs would be relatively modest if the questionnaires were sent out with screening invitations.

The lack of significant differences in vaccination rates between conditions with different cognitive targets suggests that the QBE is mainly driven by asking intention and attitude questions. Adding anticipated regret or beneficence questions to intention and attitude questions did not affect the magnitude of the QBE. Our research also indicated that attaching a sticky note with a request for help to the front of a questionnaire significantly increased questionnaire return rates. This finding supports Garner (2005) analysis of "the sticky note effect" though the increase in return rates observed here (3.6% increase) was much smaller than the improvement in return rates reported by Garner (2005; 22–44%). This difference may be due at least in part to our using a printed request for help (in handwritten style) rather than the handwritten request that Garner used. It appears that the modest increase in return rate obtained here was not sufficient to increase the overall magnitude of the QBE. Thus, in our per-protocol analyses, we failed to find support for a key implication of previous analyses showing that the QBE is greater among participants who complete and return the questionnaire (Conner et al., 2011; Godin et al., 2008, 2014; Sandberg and Conner, 2009). Even a statistically significant increase in response rate did not serve to improve vaccination rates here in the intention to treat analyses despite

respondents being generally positive about influenza vaccination. Research that attempts to *simultaneously* increase positive reactions to the target behaviour (e.g., Ayres et al., 2013) and promote questionnaire completion and return in those with positive reactions may be more likely to promote a QBE.

3.1. Limitations

The present research has several strengths and weaknesses. Strengths include the use of a strong RCT design in a large sample that was powered a priori and included an objective primary outcome measure. One important weakness was the fact that the per-protocol analyses were underpowered in relation to the small effect size that we expected to observe, which limited the conclusions that can be drawn from the present data and our ability to explore how the use of a sticky note could increase questionnaire return rates but not affect vaccination rates. The present research suggests that manipulating return rates was not sufficient to increase vaccination rates, although it would be useful to confirm this with manipulations that produced larger effects on return rates (e.g., financial incentives for questionnaire return may double questionnaire return rates; Edwards et al., 2005; Edwards et al., 2009). It may also be the case that it is necessary to increase questionnaire return rates mainly among participants who are favourably disposed towards the behaviour to observe an impact on behaviour. Increasing rates of return among those less favourably disposed may have no effects on the behaviour or could even lead to less behaviour (Conner et al., 2011; Morwitz and Fitzsimons, 2004). Further research might usefully explore different means of manipulating questionnaire response rates (see Dillman, 2000) especially when it is known that a substantial proportion of the sample favour performing the behaviour. Testing manipulations that increase response rates to on-line surveys would be another fruitful direct for QBE research given that postal questionnaires are becoming less frequently used.

Another limitation of the present research is that the sample already had a high rate of influenza vaccination. Improving vaccination rates for such a group may be more difficult than for groups with lower rates and, perhaps, offers a stern test of the QBE. Nevertheless, it is just such groups that are routinely offered influenza vaccination in the UK and elsewhere. Combining the QBE with other effective methods such as messages to promote intentions to vaccinate (Li et al., 2016) or financial incentives to get vaccinated (Bronchetti et al., 2015) may be a useful direction for research to promote influenza vaccination.

A final limitation of the present work is that it provides little contribution to our understanding of the mechanisms underlying the QBE. For example, Wood et al. (2016) review presented evidence in relation to attitude accessibility and cognitive dissonance as the main mechanisms underlying the QBE. Nonetheless, it is notable that neither mechanism has received unequivocal support across studies included in that review, and the present research did not offer evidence either way concerning these mechanisms.

3.2. Conclusions

In conclusion, the present study targeted an important preventive health behaviour (influenza vaccination) and offered a strong test of the QBE by recruiting a large, at-risk sample ($N = 13{,}803$), using an RCT design, and deploying objective measures of behaviour and intention-to-treat analyses. Findings indicated that survey questions about influenza vaccination improve vaccination rates, supporting the QBE. The present research thus corroborates previous studies that used the QBE to change influenza vaccination rates in health professionals (Conner et al., 2011) but also offers novel evidence that adding questions tapping anticipated regret and beneficence or improving questionnaire return rates do not enhance the QBE. Although the manipulations of cognitive targets and response rates tested here did not improve vaccination rates, the present study offers insights that should prove valuable in informing future efforts to enhance the QBE in behavioural medicine settings.

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