



Testing behavioral interventions to optimize participation in a population-based colorectal cancer screening program in Catalonia, Spain



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ABSTRACT

The aim of the study was to measure the effect of three cost-neutral behavioral interventions on participation compared to the standard invitation letter in a population-based colorectal cancer screening program in 2014. For that purpose, a four-arm randomized field trial was conducted among 5077 individuals aged 50 to 69 years. Over an 8-week period, each week was randomly allocated to the intervention or the control conditions. Individuals assigned to the intervention conditions additionally received a prompt to write down the date to pick up the screening test in a pharmacy. Two of the three intervention groups also included an additional paragraph in the invitation letter on either: 1) the high proportion of individuals participating regularly (social norms condition) or 2) the importance of regular participation (benefit condition).

We measured screening participation before and after receiving a reminder letter six weeks after the screening invitation. An overall 8.0 percentage point increase in CRC screening was achieved as a direct result of receiving a reminder letter; however none of the intervention strategies influenced participation. The only significant difference was found for newly invited individuals. There, participation rates decreased from 34.9% to 24.2% when the invitation mailing mentioned the importance of regular participation (OR: 0.60; 95% CI: 0.38–0.95).

While none of the intervention strategies improved participation rates we found that praising the benefit of regular screening may discourage individuals who have never been invited before as the continuous behavior may be perceived as a large request. Nevertheless, the reminder letter boosted participation rates independently of the intervention assigned.

1. Introduction

Reductions in mortality seen in randomized trials for colorectal cancer (CRC) screening can only be reproduced in the wider population if uptake is adequate (Weller et al., 2009). Low participation rates would dilute the intrinsic efficacy of CRC screening test, reducing the overall yield for advanced neoplasia in a population setting (Hassan et al., 2012).

Although participation in CRC screening varies widely between regions and countries, screening programs generally remain underutilized and participant numbers typically compare poorly with those for breast and cervical cancer screening (Klabunde et al., 2015). Participation rates in countries with organized screening programs based on faecal tests are low, ranging from 22.80% to 62.80% and with disparities

across socioeconomic groups (Karsa et al., 2008). There are some social inequalities that could influence the individual decision of participation (Solar and Irwin, 2007). Some studies shows that people with lower socio-economic status (SES) have less knowledge about the screening program and the disease and often have difficulty understanding written information, which hinders participation (Molina-Barceló et al., 2011). The inequalities could be reduced with interventions specifically addressed to elderly people, men, or low educational level, that are those who are identified that participate to a lesser extent (Baker et al., 2014; Javanparast et al., 2010).

Therefore, it is important to design new behavioral interventions for promoting screening. Given the highly constrained financial resources for screening promotion, it is essential for screening organisations to seek cost-effective interventions. Previous interventions featured

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additional mailings, such as pre-notification and reminder letters (Power et al., 2009). While these interventions proved to be cost-effective they are not cost-neutral. Thus, before introducing additional mailings, screening organisations should try to understand how to maximize the effectiveness of the existing mailings by manipulating their presentation and content. Studies have shown the screening decision is influenced by the way information is presented (Purnell et al., 2015). The individual judgement of CRC screening depends on whether individuals understand the importance and consequence of the screening importance. Low awareness of the benefits of screening is often found among non-participants (Garcia et al., 2011). Thus, highlighting the benefit of regular screening for early detection could improve individual attitudes about CRC screening and increase participation intentions (Purnell et al., 2015).

Similarly, including a message in the invitation letter that a large majority of individuals participate regularly in the screening program should increase participation rates. A recent study on men found that communicating high participation rates in CRC screening programs increases intentions to be screened (Senore et al., 2015). The rationale for this social norm effect is based on two consistent findings: (i) Individuals may underestimate the prevalence of screening participation, and (ii) individuals use the perceptions of their peer's behavior as a standard against which to compare their own intentions (Cialdini et al., 1990).

Although, individuals may judge the screening program useful, they may still fail to participate as they face program organizational barriers. Possible interventions aimed at reducing such barriers focus mainly on improving access by reducing the required participation effort (Brouwers et al., 2011a, 2011b). Possible examples are mailing out test kits to eligible individuals and offering additional information about the screening program. While sending out test kits with the invitation letter reduces the required effort for participation it is not cost-efficient as not all individuals have intentions to get screened. Up to date, the Catalan CRC screening program uses therefore an alternative procedure in which eligible individuals can pick up a free FIT kit from a pharmacy engaged to the program. This procedure may be cost-effective but present a potential barrier for participants as they have to get the test kit themselves. Individuals may be interested to participate in the screening program but unwilling to go to the pharmacy or procrastinate the pick-up. A recent study demonstrated that prompting individuals to develop a plan for when to perform the desired behavior is enough to increase immunization behavior (Milkman et al., 2011). Such prompts to form an implementation intention has been shown to be effective in promoting the initiation of goal striving for individuals who have problems with action control or over-extend their capability to regulate their behavior (Gollwitzer, 1999; Gollwitzer and Sheeran, 2006). If the desired behavior consists of a time-consuming goal, such as picking up a FIT kit from a pharmacy, then simply forming the respective goal intention could facilitate its achievement. The prompt to plan the pick-up by writing down the desired date on the list of the eligible pharmacies can help individuals to achieve it. Similarly, sending out a reminder letter helps individuals remembering the request (Senore et al., 2015).

Furthermore, in the present study we analyse the effectiveness of the interventions for three distinctive groups; newly invited, never screened and previous screened. These groups differ in their screening experience, attitude and knowledge of CRC screening, and have been stratified taking into account the published literature (Bulliard et al., 2014; Klabunde et al., 2015).

The present study was designed to evaluate the effectiveness of such an intention prompt with and without an additional message that either highlights the benefit of regular screening or the social norm. The study describes the effects of these three cost-neutral behavioral interventions on the uptake rate before and after the standard reminder letter in a randomized field trial.

We hypothesized that the implementation prompt would facilitate

the pick-up of the test kit and reducing the perceived barriers. Highlighting the high prevalence and importance of regular screening should mainly increase screening attendance among individuals who have refused previous screening invitations or were invited for the first time. We expect therefore the lowest effect for individuals who have participated in a previous screening round as they were already convinced of the program's purpose.

2. Methods

2.1. Screening procedure

In 2000, a biennial faecal occult blood test-based CRC screening program was launched in L'Hospitalet de Llobregat, an industrial city in the metropolitan area of Barcelona (Catalonia, Spain). The target population includes all men and women aged 50–69 years who lived in the city (average of 65,000). From 2010, a quantitative Faecal Immunochemical Test (FIT) has been used as a primary screening tool (OC-Sensor, Eiken Chemical Co., Japan). Up to date, The FIT is distributed and collected through community pharmacies.

Demographic data on this population was gathered from the Primary Healthcare Information System. L'Hospitalet is divided into 12 basic healthcare areas and each individual is uniquely allocated to a general practitioner in one of these areas. Screening invitations were sent personally and sequentially to eligible population assigned to each one of the Basic Healthcare Areas.

Subjects who did not meet the inclusion criteria for CRC screening were excluded according to the following criteria: personal history of CRC or adenomas, familial CRC cancer, inflammatory bowel disease, colonoscopy in the previous 5 years or faecal occult blood test (FOBT) in the previous 2 years, terminal disease or severe disabling condition. Subjects with an invalid mailing address and removals from the screening area registry were also excluded because they could not be invited to screening.

Eligible subjects were invited by a personal letter offering a test completely free, a leaflet with information regarding CRC and the screening process and a list of the nearest pharmacies participating in the program. A reminder letter was sent out if no response was obtained after six weeks of the initial invitation.

A detailed description of the FIT performance is provided elsewhere (Garcia et al., 2015). Briefly, participants collected one sample of feces from one bowel movement and a 100 ng Hb/ml cut-off (20 mg Hb/g feces) was used as the threshold for test positivity. Those individuals with a positive test were offered a colonoscopy for diagnostic confirmation.

2.2. Randomized field trial

We conducted a four-arm randomized field trial to investigate the efficacy of the implementation of an intention prompt and the additional messages.

2.2.1. Invitation mailing conditions

As behavioral interventions are most likely to influence screening if they target more than one factor, we combined the implementation prompt in two experimental conditions with either the message about the high prevalence or importance of regular screening (Power et al., 2009; Camilloni et al., 2013; Senore et al., 2015).

The control group was the standard invitation letter used in the other screening areas. In addition, the three intervention conditions prompted recipients to write down the date they planned to pick up their test kit and two of them included additional information about injunctive social norms or benefit of early detection. A standard reminder letter was sent out if no response was obtained after six weeks of the initial invitation.

The intention prompt on top of the sheet with the engaged

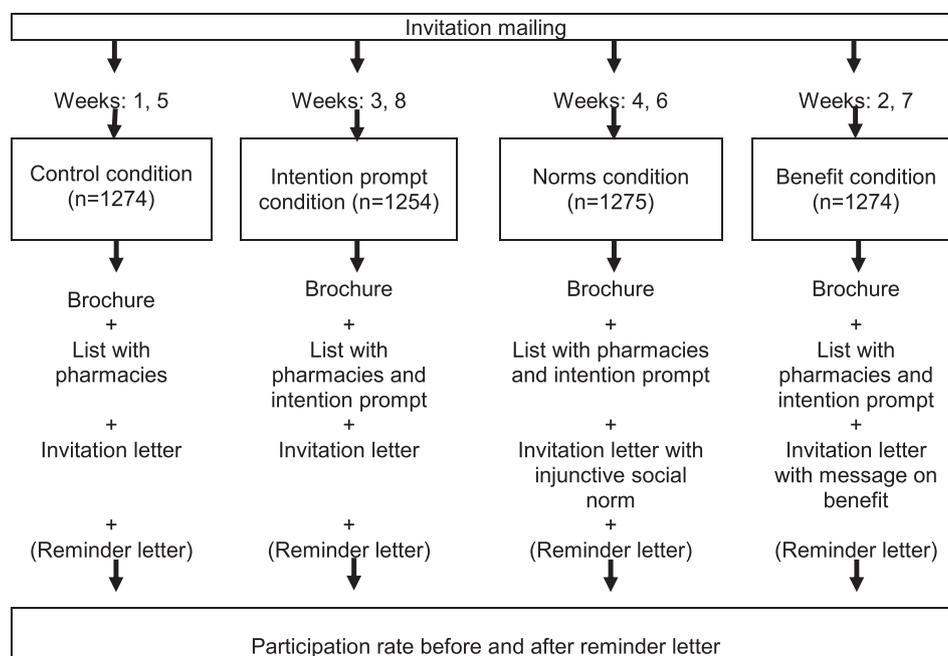


Fig. 1. Component of the invitation mailers.

pharmacies was adapted from a previous study and contained the sentence: “The majority people find it helpful to write down the date they want to pick up their test kit” (Milkman et al., 2011). The normative message on the social norms condition stated the proportion of individuals who engage in the desired behavior (Jemmott et al., 1986). The sentence said: “The majority of people participating for the first time continue in the program later on. Follow their example and participate now.” The benefit condition added the following sentence to the invitation letters: “Regular participation in the screening program increases the chance of early detection and facilitates treatment.” The reminder letter was sent out six weeks after the initiation letter and was identical for all experimental conditions.

2.2.2. Study population

Our study population was 5077 inhabitants (from a basic healthcare area) eligible for the sixth biennial CRC screening program of L’Hospitalet de Llobregat. These subjects were invited from the 12th of May to the 4th of July 2014.

A quarter of the population was assigned to each experimental condition (n = 4). Intervention and control groups were randomized along the 8 week-period to prevent summer break effects. Fig. 1 shows the component of the mailer that varied across the four conditions and the distribution of invitations throughout the period of study. There were no differences in the distribution of individuals between the four mailing conditions in terms of sex (p = 0.78), age (p = 0.64) and CRC screening experience (p = 1.00).

The study protocol was approved by the Clinical Research Ethics Committee of the Bellvitge University Hospital, and all involved parties followed the ethical requirements set forth in the Spanish Organic Law on Protection of Personal Data (15/1999 of December 13).

The outcomes of interest were participation rates according to each experimental condition before and after the reminder letter.

We performed a logistic regression with random intercept analysis to compare each mailing condition versus the standard invitation letter, adjusting for sex and age group. We included the invitation week as random effects intercept to account for the cluster variability. We stratified the model by previous screening behavior. We reported the odds ratio (OR) adjusted for age and sex and 95% confidence intervals (95% CI). This study had 80% power to detect differences in

participation of 5.5% between control and experimental groups.

3. Results

The overall participation in the CRC screening program was 34.6%. From those individuals who picked-up the FIT at the pharmacies, 96.8% completed and returned it (data not shown).

Table 1 shows the effect of reminder letter on participation rates according to previous screening behavior. An overall 8.0 percentage point increase in CRC screening was achieved, which translates to an additional 409 individuals who were screened, as a direct result of receiving a reminder. Differential rates were statistically significant in all groups (newly invited, never screened and previous screened).

Table 2 presents participation rates according to the different behavioral interventions. Overall, participation rates among those individuals allocated in the prompt and the benefit conditions were lower than those in the control and norms condition.

Multivariate logistic regression analysis showed that the odds for completing a screening test were significantly lower for two subgroups (Table 3). Newly invited individuals were less likely to hand in their stool samples if they were in the benefit condition (OR: 0.60; 95% CI: 0.38–0.95). On the other hand, individuals who had been previously screened might be less likely to participate when they were allocated in the prompt condition compared to those who got the standard invitation letter. Although after adjusting for the cluster effect the differences

Table 1
CRC screening uptake before and after the reminder letter.

	Initial participation (before reminder)		Final participation (after reminder)	
	%	95%CI	%	95%CI
Never screened (n = 2856)	7.1	6.22–8.11	11.4	10.3–12.6
Newly invited (n = 738)	18.6	15.9–21.5	30.8	27.5–34.2
Previously screened (n = 1483)	67.4	64.9–69.7	80.6	78.5–82.5
Overall (n = 5077)	26.4	25.2–27.6	34.4	33.1–35.7

Table 2
Participation rates among individuals invited for CRC screening according to behavioral interventions.

	Final participation		
	No	Yes	%
All participants (n = 5077)			
Control	817	457	35.9
Prompt	850	404	32.2
Social norms	816	458	35.9
Benefit	846	429	33.6
Newly invited (n = 738)			
Control	121	65	34.9
Prompt	128	52	28.9
Social norms	121	65	34.9
Benefit	141	45	24.2
Never screened (n = 2856)			
Control	632	84	11.7
Prompt	636	73	10.3
Social norms	623	93	13.0
Benefit	639	76	10.6
Previously screened (n = 1483)			
Control	64	308	82.8
Prompt	86	279	76.4
Social norms	72	300	80.6
Benefit	66	308	82.4

were not statistically significant (OR: 0.68; 95% CI: 0.40–1.17).

4. Discussion

While none of our three experimental conditions increased screening behavior, we found that highlighting the benefit of continuous behavior may discourage individuals to adapt. The results of this study demonstrate a clear demotivating effect of praising the benefits of regular participation on individuals who had never been invited before. In designing invitation mailings, one should be very cautious in stating the desired behavior, because repeated behavior may be perceived as a large request. Studies have shown that individuals are more likely to agree to a small than a large request (Freedman and Fraser, 1996; Dolin and Booth-Butterfield, 1995). Essentially, the more an individual goes along with small requests, like participating in a screening program one time, the more likely is it that the individual participates also in future programs. In this sense, the newly invited individual may have felt obligated to participate regularly.

The insignificant impact of the implementation prompt suggests that individuals do not have problem to plan the pick-up of their test kit. Note, that this result does not contradict the positive finding of the implementation prompt in the context of vaccination. It may be that getting a flu shot is more time consuming and therefore more difficult to plan than passing by a pharmacy to pick up the test kit. This argument is supported by the finding of the original study that the implementation prompt had a larger impact at one-day clinic sites than at multi-day clinic sites (Milkman et al., 2011). The authors believe that the implementation intentions prompts are most effective when the

opportunity for participation is fleeting. In our case, the pharmacies are at least as easily accessible as multi-day clinics and the implementation prompt may therefore not be needed.

Differently, the insignificant effect of the social norms treatment may have been caused by the vague description of the participation rate. Stating that the majority of individuals participating for the first time continue in the program later on does not give individuals a clear picture of the social norm. It may be that individuals think that only slightly > 50% of the individuals continue with the program. A future study should therefore investigate whether communicating the observed 80% participation rate of individuals who have participated previously affects screening behavior.

Finally, we found that the neutral reminder letter increased screening rates, independently from the individual's experience with the screening program (p < 0.01). This positive effect of the reminder letter is persistent with previous research (Senore et al., 2015; Brouwers et al., 2011a; Brouwers et al., 2011b; Sabatino et al., 2012).

A systematic review study showed that an advance notification letter, postal mailing, written reminders increase uptake of faecal tests for CRC screening uptake and could be easily implemented (Rat et al., 2018). Some studies assessed the effect of different frames of invitation messages (varying presentation and content of the written information). They showed increases in uptake, on the basis of a leaflet containing information on FOBT or an 'implementation intention' technique (Rat et al., 2018).

Previous research supports that the low prevalence of screening for colorectal cancer appears to be due to lack of awareness and inadequate provider counseling rather than poor patient acceptance for screening. Systematic counseling about colorectal cancer screening will likely improve screening rates and reduce disparities by race/ethnicity and education (Gilbert and Kanarek, 2005; Wee et al., 2005). Nevertheless, communication interventions to improve CRC screening rates must therefore be appropriate in terms of cognitive and health literacy demands (Smith et al., 2015). Feedback between the CRC screening program and primary health care professionals is essential to ensure the quality of the screening program and consistent monitoring criteria (Benito et al., 2016).

This study has some limitations, we could not randomize at individual level because of the CRC screening invitation process. CRC screening territory is divided according to healthcare basic areas, and individuals are invited sequentially. As cluster randomization is more prone to bias than individual randomization we included the invitation week as a random effect in the model to account for that variability.

Although the impacts of our experimental conditions were mostly insignificant, our study shows that importance of proof-of-concept experiments to generate reliable evidence of the interventions. Implementation prompts have been used successfully in the context of vaccination (Milkman et al., 2011), but they did not work in a setting where participation was less time consuming. It is therefore important to provide reliable evidence of the impact of behavioral interventions for each application. A basic requirement for scientific integrity is the ability to replicate the results of research and apply them to different settings. These proof-of-concept studies are particularly important to generalize findings.

Table 3
Multivariate logistic regression models to evaluate CRC screening uptake according to three behavioral interventions and stratified by previous screening behavior.

	Overall		Newly invited		Never screened		Previously screened	
	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)
Control	1		1		1		1	
Prompt	0.85	(0.75–1.08)	0.76	(0.49–1.18)	0.86	(0.62–1.20)	0.68	(0.40–1.17)
Social norms	1.00	(0.83–1.20)	1.00	(0.65–1.53)	1.12	(0.82–1.54)	0.86	(0.50–1.47)
Benefit	0.90	(0.75–1.08)	0.60	(0.38–0.95)	0.89	(0.64–1.23)	0.95	(0.55–1.64)

Models adjusted for sex and age.

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Declaration of conflicting interests

The authors declared no potential conflict of interest with respect to the research, authorship and/or publication of this article.

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