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Kathryn A. Robb, Anne Miles, John Campbell, Philip Evans and Jane Wardle
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Impact of Risk Information on Perceived Colorectal Cancer Risk

A Randomized Trial

KATHRYN A. ROBB

University College London, UK

JOHN CAMPBELL

Peninsula Medical School, UK

PHILIP EVANS

St Leonard's Research Practice, UK

ANNE MILES & JANE WARDLE

University College London, UK

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ADDRESS. Correspondence should be directed to:
KATHRYN ROBB PhD, Cancer Research UK Health Behaviour Research Centre,
Department of Epidemiology and Public Health, UCL, Gower Street,
London, WC1E 6BT, UK. [Tel. +44 (0)20 7679 6642;
Fax +44 (0)20 7813 2848; email: k.robb@ucl.ac.uk]



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Abstract

The study sought to modify comparative optimism about colorectal cancer in a community sample using a method of providing risk information found to be effective in a laboratory setting. The 3185 adults from General Practice lists were randomized to three groups: (1) control—no information; (2) risk information leaflet; (3) risk and screening information leaflet. Significant comparative optimism and high numeric estimates of absolute risk were found. Risk factor information did not reduce optimistic beliefs nor modify estimates of risk. Interest in screening was high overall and not influenced by the information. Comparatively optimistic risk perceptions appear resistant to change in community settings.

Keywords

- *colorectal cancer*
- *comparative optimism*
- *perceived risk*
- *risk factor information*

Introduction

RISK perception plays a pivotal role in disease prevention because unless people acknowledge there is a possibility of contracting a disease, they are unlikely to be motivated to take steps to protect against it (Rogers, 1975; Rosenstock, 1974; Weinstein, 1988). In practice, people are inaccurate judges of personal risk, and are more likely to believe themselves to be at lower-than-average risk than higher-than-average risk for a wide variety of negative events (Lek & Bishop, 1995; Perloff & Fetzer, 1986; Weinstein, 1980, 1987). This tendency was first described as 'unrealistic optimism' by Weinstein (1980), although it is now usually termed 'comparative optimism'.

In the cancer field, significant levels of comparative optimism have been observed. Between 43 to 50 percent of American women report themselves to be at lower-than-average risk for breast cancer (Aiken, Fenaughty, West, Johnson, & Luckett, 1995; Lipkus et al., 2000; Woloshin, Schwartz, Black, & Welch, 1999), while smokers appear to be equally optimistic about their risk of oral cancer (Hay et al., 2002). In the UK, 17 percent of a population sample of older adults participating in a trial of flexible sigmoidoscopy screening were comparatively optimistic about colorectal cancer (Robb, Miles, & Wardle, 2004) compared with 9 percent who estimated their risk to be above-average. Curiously, this tendency toward optimism in comparative judgments coexists with rather high estimates of absolute numeric risk. American women, for example, estimate their risk of breast cancer to be 34 percent, which is almost three times their actual lifetime risk (Lipkus et al., 2000).

While optimism about future health can have advantages for well-being (Taylor & Brown, 1988), and may promote healthier lifestyles (Robb et al., 2004), it has also been associated with lower rates of cancer screening, including mammography, PAP smears and faecal occult blood testing (McCaul, Branstetter, Schroeder, & Glasgow, 1996; Orbell, Crombie, & Johnston, 1996; Weller, Owen, Hiller, Willson, & Wilson, 1995). Given the vital role of early detection in reducing cancer mortality, comparative optimism in this context could have risky consequences. Interventions to reduce comparative optimism could therefore play a part in promoting cancer detection behaviors.

The present study is concerned with perceptions of risk for colorectal cancer. As the second leading cause of cancer death in the UK and the USA

(American Cancer Society, 2005; Quinn, Babb, Brock, Kirby, & Jones, 2001), colorectal cancer represents a significant health threat. Despite this, awareness of colorectal cancer is low in the UK (McCaffery, Wardle, & Waller, 2003). Effective screening strategies have been available in the USA for some time yet uptake rates are suboptimal (Centers for Disease Control and Prevention, 2001), and there is concern that the UK will witness a similar problem with the recent inclusion of colorectal cancer screening in the National Screening Programme (Wardle et al., 2000).

In two experimental studies, simple, untailored, written information on risk factors for colorectal cancer was found to increase perceived risk (Lipkus et al., 1999; Lipkus, Green, & Marcus, 2003), whether indexed by a comparative measure or with absolute perceived risk. However, the generalizability of these results to community samples is limited by the fact that participants were recruited through newspaper advertisements, were predominantly white and highly educated, and had screening rates that were considerably higher than national estimates. The process of exposure to the risk information also took place under supervision: participants completed baseline measures over the telephone and were scheduled to visit the laboratory within two weeks where they were presented with the risk information and then completed the same measures as at baseline. The results were very promising, but in line with the RE-AIM framework (Glasgow, Lichtenstein, & Marcus, 2003), should be tested in a community context where the leaflet is given unsupervised, and there is no immediate testing to focus attention on the material. This would allow an examination of the impact of the risk information in a more natural, 'real-world' setting.

The present study describes the primary outcome of an investigation of the psychological impact of providing mailed information on colorectal cancer risk to a community sample of older adults. We have already shown in our secondary analyses that providing accurate risk factor information increased knowledge and did so without any increase in worry about cancer (Robb, Miles, Campbell, Evans, & Wardle, 2006). The present study examined the impact of the risk factor information on perceived risk of colorectal cancer. We hypothesized, based on Lipkus et al.'s (1999, 2003) results, that comparative optimism would be lower in those given the risk factor information. We also predicted that the impact of the intervention would be greater among

respondents whose risk status matched the risk factors mentioned in the information leaflet (i.e. men, older adults, and those with poorer health behaviors, no colorectal symptoms, or no family history). In addition, the study assessed the effect of including information on screening (in a third group) to explore whether any potentially adverse psychological effects of the risk information could be avoided if 'reassuring' information about a new screening program was presented at the same time, as would be predicted from the Fear-drive Model (Hovland, Janis, & Kelley, 1953); however this aspect of the study is described elsewhere (Robb et al., 2006).

Methods

Design

Participants were randomized by household using simple random allocation on Minitab to one of the following three groups: (1) control group: no information leaflet; (2) risk information group: leaflet on risk factors for colorectal cancer; (3) risk and screening information group: leaflet on risk factors for colorectal cancer plus information on colorectal cancer screening. Primary outcomes were absolute and comparative risk judgments; interest in screening was a secondary outcome.

With an expected response rate of 50 percent, we needed to contact at least 3000 people to yield a sample of 500 per group. With $\alpha = .05$, this gave 80 percent power to detect a difference in perceived risk of 0.13 (the average level of comparative optimism in a previous population study using a five-point measure of comparative risk of colorectal cancer).

Participants and procedure

Participants ($N = 3365$) were men and women aged between 45 and 66 years registered with one of two General Practices in south-west England. The age group was selected to approximately represent those who will be offered screening in the roll-out of the recently introduced colorectal screening service within the National Screening Programme (NSP) in the UK (NHS Cancer Plan—Department of Health, 2000). At the time of the study, none of the participants would have been screened because screening was not yet part of the NSP. General Practitioners (GPs) were asked to exclude individuals who had been diagnosed with cancer or were awaiting investigations, as well as any other 'vulnerable' individuals (e.g. very ill, recently bereaved, learning difficulties). Letters signed by the GP

invited potential participants to take part in a research study and enclosed the study questionnaire, which included the items on perceived risk. Participants who were randomized to the two intervention groups were also sent the colorectal cancer risk leaflet or the risk leaflet plus screening information along with instructions to read it before they completed the questionnaire. Non-responders were sent a reminder questionnaire with another copy of the information as appropriate after two weeks. Ethical approval was obtained from the North and East Devon Local Research Ethics Committee.

The intervention materials

The leaflet with the risk factor information (available from first author) was developed specifically for the study and consisted of a four-page, A5-sized leaflet entitled 'Bowel cancer': The facts'; designed to be similar in appearance to other cancer information leaflets (Department of Health, 2002). The leaflet was developed to be readable by people with low literacy skills, and used bar charts to convey information because these have been found to be a useful tool (Lipkus & Hollands, 1999; Stone, Yates, & Parker, 1997). The key messages were derived from epidemiological evidence for some of the most important risk factors for colorectal cancer (Colditz et al., 2000; Quinn et al., 2001). They included: 'older people are at higher risk of getting bowel cancer' (with bar chart showing the association between age and bowel cancer mortality); 'men are at slightly higher risk of developing bowel cancer than women' (with chart showing bowel cancer deaths for men and women); 'absence of a family history does not mean low risk'; 'people without symptoms may still be at risk'; and 'people with a less healthy lifestyle are at higher risk' (specifically, diet high in red meat, not exercising, smoking, and being overweight or obese). The leaflet also stated that bowel cancer is the second most common cause of cancer death, with over 16,000 individuals dying each year from the disease in the UK, and that it develops from polyps. Participants randomized to receive additional information about screening (an extra 120 words) were given information on faecal occult blood testing and flexible sigmoidoscopy.

The Flesch Reading Ease formula was used to assess the readability of the leaflet. The score obtained was 75.5 for both versions of the leaflet (scores between 60 and 70 are considered acceptable with higher scores indicating greater readability (Vahabi & Ferris, 1995)). The Flesch-Kincaid

Grade level was 4.9, suggesting that a child of around the age of 10 should understand the leaflet.

Measures

Manipulation check Participants in the two intervention groups were instructed on the first page of the questionnaire to: 'Please read the enclosed leaflet "Bowel cancer: The facts" before filling out the questionnaire'. The first item on the questionnaire asked, 'Have you read the leaflet "Bowel cancer: The facts"?' (yes/no).

Perceived risk The comparative risk question was the one used by Weinstein (1987): 'Compared to others of the same sex and age, my chances of getting bowel cancer are: much below average; below average; average; above average; much above average'. In line with other researchers in this area (Lipkus et al., 1999, 2003; Weinstein, 1987), we treated this as a continuous variable and used parametric analyses although the same results were obtained using non-parametric tests. Responses were scored from -2 for 'much below average' to +2 for 'much above average'; negative scores therefore represented comparative optimism and positive scores comparative pessimism. Responses were also categorized into groups reflecting ratings of comparative risk as average, below-average (termed comparative optimists), and above-average (termed comparative pessimists).

The absolute risk measure asked: 'As a percentage, what do you think your chances are of getting bowel cancer? From 0 percent to 100 percent where 0 means you definitely won't be diagnosed with cancer and 100 means you definitely will be diagnosed with cancer' (from Lipkus et al., 1999). A blank space was provided for participants to enter their estimated percentage.

Demographic characteristics Age and gender were known from lists provided by the GPs. Simple items were used to assess ethnicity and marital status. Postcode data were used to link area of residence to information from census enumeration districts to get an index of neighborhood-level socioeconomic deprivation (the Townsend Material Deprivation Index; Townsend, Phillimore, & Beattie, 1988) using data from the 1991 census (Crown Copyright, 1991). A score of zero represents the national average and negative values represent below-average deprivation. It was therefore possible to compare respondents and non-respondents on age, gender, and deprivation.

Health behaviors Health behaviors were assessed to identify individuals with less healthy lifestyles using measures based on items from the European Health Survey (Wardle & Steptoe, 1991). They included smoking ('Please tick the box that best describes your smoking habits: never-smoker/non-smoker; ex-smoker; smoker'), fruit and vegetable intake ('On a typical day how many servings of the following would you eat: Fruit (fresh, frozen or canned); Vegetables (including salad, but excluding potatoes)?'), and physical activity ('During the past seven days, on how many days did you: engage in vigorous activity that caused you to breathe much harder than normal and sweat (e.g. jogging, football) or moderate activity that caused you to breathe somewhat harder than normal (e.g. cycling, dancing)?') Respondents also recorded the number of minutes per day they engaged in physical activity. They were categorized in terms of smoking status, whether they ate five helpings of fruit and vegetables a day and whether they met UK activity recommendations (three days a week of at least 20 minutes of vigorous activity, or five days a week of at least 30 minutes of moderate activity; Department of Health, 2004).

Health-related factors Family history was assessed with the question: 'Have any members of your family (blood relatives, not relatives by marriage) had bowel cancer?'; response options were mother; father, son(s); daughter(s); sister(s); brother(s) (from Wardle et al., 2000). Any family history was recorded as positive. Colorectal symptoms over the past three months were assessed by asking whether respondents had never, occasionally, or frequently had any of the following symptoms: constipation, diarrhoea, haemorrhoids, wind, pains in abdomen, incontinence, blood in stools (from Wardle et al., 2000). A total symptom score (range 0-7) was calculated by totalling the number of symptoms experienced occasionally or frequently.

Interest in screening Interest in screening was assessed with the item: 'If you were invited to have a bowel screening test, would you take up the offer?' (Yes definitely/Yes probably/Probably not/Definitely not) as used by Wardle et al. (2000).

Masking

Participants could not be blinded to their group allocation. GPs were blind to group allocation.

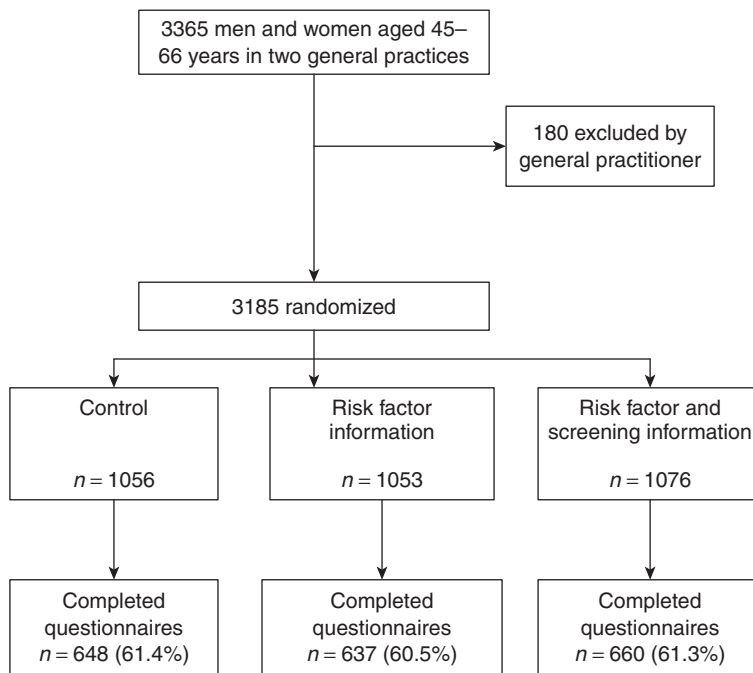


Figure 1. Trial profile.

Analysis of results

Results were analyzed using SPSS (Version 10.1). Independent-samples *t*-tests and chi-square tests were used to compare respondents and non-respondents on age, gender, and socioeconomic deprivation. Chi-square tests and ANOVAs were used to check the success of the randomization (in terms of demographic and behavioral differences between groups). One-sample *t*-tests were used to detect comparative optimism in perceived risk with a significant deviation from the midpoint 0 (the score representing average risk). Spearman's rho was used to assess the degree of association between the comparative and absolute measures of perceived risk. Chi-square tests and ANOVAs were used to test the hypothesis that the intervention groups would have higher levels of perceived risk. The Variance Ratio *F* Test was employed to determine whether variances differed between the control and intervention groups.

All participants were included in the analyses whether they indicated that they had read the leaflet or not. This approach was taken to assess the likely impact of the intervention as a public health tool.

Results

GPs excluded 180 individuals prior to questionnaire distribution (see Fig. 1). A total of 1945/3188 (61%) questionnaires were returned. Respondents (mean age 55.0 years) were slightly older than non-respondents (mean age 54.4 years; $t(3183) = 2.9, p < .001$), and came from less deprived neighborhoods (Townsend Deprivation score -1.44 (SD = 2.58) vs 0.97 (SD = 2.73); $t(3102) = -4.79, p < .001$). They were predominantly white (98%) and married or cohabiting (78%), reflecting the population served by the Practices. The three intervention groups (control, risk factor, risk factor plus screening) did not differ in gender, age, ethnicity, marital status, deprivation, health behaviors, family history of colorectal cancer, or colorectal symptoms.

Manipulation checks

Sixty-nine percent of the respondents who were given risk information indicated that they had read the leaflet prior to completing the questionnaire, 4 percent indicated that they had not read the leaflet and 27 percent left the question blank.

Table 1. Participants' characteristics and risk perceptions

| | Control <i>n</i> = 648 | Risk factor information <i>n</i> = 637 | Risk factor and screening information <i>n</i> = 660 | Significance of difference |
|---|---------------------------|--|---|---|
| Age <i>M</i> (SD) | 54.80 (5.75) | 54.80 (5.87) | 55.42 (5.69) | $F(2, 944) = 2.54, p = .079$ |
| Gender (% female) | 53.2 | 49.3 | 53.9 | $\chi^2(2, n = 1945) = 3.24, p = .198$ |
| Townsend score <i>M</i> (SD) | -1.44 (2.56) | -1.38 (2.73) | -1.49 (2.46) | $F(2, 1886) = .32, p = .722$ |
| Comparative perceived risk <i>M</i> (SD) | -0.19 (.67) ^a | -0.14 (.71) ^a | -0.19 (.72) ^a | $F(2, 1902) = 1.16, p = .314$ |
| Comparative perceived risk three-point scale % | | | | |
| Below average | 24.8 | 27.6 | 29.2 | |
| Average | 66.0 | 56.5 | 58.2 | |
| Above average | 9.1 | 15.9 | 12.6 | $\chi^2(4, n = 1903) = 19.24, p = .001$ |
| Absolute perceived risk <i>M</i> (SD) | 33.4 (20.9) | 34.7 (21.0) | 34.4 (20.8) | $F(2, 1804) = 0.59, p = .553$ |
| Interest in screening (% interested) | 93.5 | 92.1 | 92.6 | $\chi^2(2, n = 1923) = 1.01, p = .603$ |

Note: ^a = Significant comparative optimism (deviates below zero) at $p < .001$

Impact on risk perceptions

All three groups showed comparative optimism on average, with mean scores in each group deviating significantly below zero, see Table 1. In terms of absolute judgments, the risk of colorectal cancer averaged 34 percent, representing a substantial overestimate. However, the correlation between the two risk judgments was 0.46, ($p < .001$).

The difference in either mean levels of comparative perceived risk or absolute perceived risk between the groups was not significant (see Table 1). The two intervention groups had slightly higher standard deviations for the comparative risk judgments (SD = 0.71 and SD = 0.72) than the control group (SD = 0.67) indicating a difference in variance of response, but this was only significant between the control group and the risk and screening information groups ($p < .05$). The number of comparative optimists was slightly higher in those given risk (28%) or risk and screening information (29%) than in the control group (25%), but so also was the number of 'comparative pessimists' (those describing their risk as 'higher-than-average') (16% and 13% vs 9%). Risk factor information appeared to slightly polarize risk judgments leading fewer to select the 'average' option (56% and 58% vs 66%) (see Table 1).

The three groups did not differ significantly on the mean levels of the absolute measure of perceived risk (see Table 1) nor were there any differences in standard deviations.

Impact on risk perceptions in targeted sub-groups

We explored whether the intervention impacted differentially on subgroups whose risk status was specifically targeted in the information leaflet (i.e. men, older adults, and those with worse health behaviors, no family history and no colorectal symptoms) by analyzing these groups separately. However, there were still no significant differences in mean levels of comparative or absolute risk between the intervention and control groups when analyses were restricted to the targeted sub-groups.

Impact on screening interest

Screening interest was high for all levels of perceived risk. There was a significant association between comparative perceived risk and interest, with 96 percent of those in the perceived higher risk category being interested in attending, compared with 93 percent in the average risk group and 90 percent in the below-average group $\chi^2(1, n = 1896) = 9.18, p = .002$. People who were interested in screening also had a higher absolute perceived risk ($M = 34.71$ (SD = 20.85) than those who were not interested ($M = 25.77$, SD = 20.27; $F(1787) = 21.98, p < .001$). However, there were no significant differences between the three intervention groups in screening interest.

Discussion

This study was designed to replicate, in a community setting, Lipkus et al.'s (1999; 2003) finding that

giving accurate, untailed, risk factor information could reduce comparative optimism. In relation to this, it was unsuccessful: participants who were sent risk factor information, despite scoring significantly higher on knowledge (Robb et al., 2006), were no less comparatively optimistic than the control group.

One explanation for the differences between our results and those of Lipkus et al. (1999, 2003) could be the method of recruitment. Lipkus et al. recruited their participants through newspaper advertisements, which might have attracted individuals who were more susceptible to influence (possibly because they were more interested in health issues), whereas our participants responded to a survey sent to a community sample reached through primary care. Lipkus et al. also used a within-subjects design; assessing participants before and after exposure to risk factor information which could have promoted change. We opted not to do this because of the difficulty of giving people good enough reasons for repeating the questionnaire in a community setting to achieve good follow-up rates. Third, the participants in Lipkus et al.'s studies read the leaflet under supervision, whereas we wanted to be able to generalize our results to the more naturalistic setting of receiving a risk information leaflet in daily life, so our leaflets were sent through the post.

Risk perceptions showed an interesting pattern. As a group the respondents were *comparatively* optimistic, in that, on average, they felt less at risk than the average person. But in terms of absolute risk, they could only be described as pessimistic if their estimate is interpreted literally, because they reported having a one in three chance of developing colorectal cancer—almost seven times higher than their actual risk. Of course, numerous studies have shown that absolute numeric risk judgments are poor in absolute terms (e.g. Black, Nease, & Tosteson, 1995; Woloshin et al., 1999), so the results are not entirely surprising. Also we do not know how participants perceived average absolute risk for colorectal cancer, so it is not clear whether this represents an optimistic or a pessimistic bias. However, in this study, the two forms of risk estimate were moderately correlated ($r = 0.46$), which suggests that they may be assessing a similar underlying construct despite the mean levels being so different.

The negative result of our intervention is consistent with earlier work from Weinstein and Klein (1995) who found that risk perceptions were resistant to 'debiasing' procedures. Like us, they employed a between-subjects design, and it is possible that this

design minimizes the effect of information on risk judgments compared with a situation where participants complete the baseline measures, read the information, and then complete a post-intervention measure. Indeed, even studies that have provided tailored, risk-factor feedback have failed to consistently modify perceptions of risk for colorectal cancer (Lipkus et al., 2004; Weinstein et al., 2004). This suggests that methods that have been shown to influence risk perceptions in the laboratory context (Lipkus et al., 1999, 2003; Lipkus & Klein, 2006) are not easily translated into a more ecologically valid setting.

With the exception of Kreuter and Strecher's (1995) study in which they provided participants with computer-generated individualized risk-feedback, the present report is unique in describing the impact of an intervention on the distribution of comparative risk responses rather than just the mean (Lipkus et al., 1999, 2003; Weinstein & Klein, 1995). This allowed us to examine changes in the patterning of risk perceptions. We found that respondents in the intervention groups had higher proportions both of comparative optimists and pessimists than the control group, suggesting that the information leaflets did something to the respondents that made them less likely to view their risk as 'average', but we cannot explain why it apparently caused some to become more comparatively pessimistic and others more optimistic. It seems likely the response 'average risk' is sometimes used by respondents who simply do not know which risk to choose, in which case providing risk factor information enables them to make a judgment one way or the other. However, it remains a puzzle why those individuals who have just learned that they are at higher risk (i.e. men, older adults, those with poor health behaviors), did not show a consistent tendency to increase their perceived risk. Possibly people focused their attention more on the modifiable behavioral risk factors, which are also open to self-serving interpretations, in drawing conclusions about their risk. Thus, a participant may belong to an 'at risk' subgroup such as being male, but they will use their membership to other subgroups (not smoking, exercising regularly) to discount their personal risk. Future research should be directed to understanding how people draw personal conclusions from generic risk factor information.

Both comparative optimism and absolute risk were associated with interest in screening, which was extremely high across all three groups. Even among the comparative optimists, 90 percent indicated that

they would be interested in attending screening compared with a striking 96 percent of comparative pessimists. With such high numbers of comparative optimists interested in screening, there must be some doubt about the practical benefits of changing risk perceptions—even if we could figure out how to do it. It has been suggested that optimists come in two subtypes: ‘active optimists’, who take steps to reduce their risk and so actively maintain and justify their optimistic beliefs, and ‘passive’ optimists, who are optimistic without consideration of their own risk behaviors and do not feel the need for self-protective behaviors (Armor & Taylor, 1998; Schwarzer, 1994; Wallston, 1994). Active optimists might be over-represented among respondents to surveys such as this which allude to new opportunities for early detection of cancer, and this could explain why so many were interested in screening despite perceiving their risk to be ‘below average’. Research is needed to understand the differences between active and passive optimists and not least how to identify these two different types. A further challenge will be to investigate non-responders to surveys, especially if they represent the ‘passive optimists’ with whom health educators need to engage. However, one implication of these results is that harnessing optimism to make people’s optimistic beliefs more warranted could be an appealing goal if it successfully increased health behavior while simultaneously making people feel more positive about their future health.

There are limitations to the study. As discussed, we used a between-subjects design because of the practicalities of community research, where a stronger design may have been a within-subjects design, although the randomization ensured there were no chance differences between groups. It could be argued that sending a questionnaire along with the information caused participants to pay more attention to the information than if they had simply been sent the information leaflet alone. However, if so, this should have strengthened the impact of the information because respondents would read it more carefully—knowing they were required to subsequently complete a questionnaire. Given we found no differences across groups, we do not regard this as a significant limitation. The response rate was only 61 percent, and although this is comparable to other primary care surveys (e.g. Walsh, 1994), we acknowledge that there is a substantial group of non-responders whose risk estimates and reactions to risk information are unknown.

The study was unique in looking at the impact of risk information in a population sample. It showed that comparatively optimistic beliefs remain common even after people have been informed of the risk factors. Ours is not the first study to find that comparative optimism is resistant to change (see Weinstein & Klein, 1995), and it may be time to consider not how to reduce optimistic beliefs but how to encourage people to engage in health-protective behaviors that make their optimistic beliefs more warranted.

Note

1. Bowel cancer was used rather than colorectal cancer because it is the usual British term.

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Author biographies

KATHRYN ROBB received her PhD in Health Psychology from University College London in 2005, and is currently a Cancer Research UK Post-doctoral Fellow at the Health Behaviour Research Centre at University College London.

JOHN CAMPBELL is Professor of General Practice and Primary Care at Peninsula Medical School, Exeter.

PHILIP EVANS is a GP in Exeter and a Senior Clinical Research Fellow in the Peninsula Medical School

(Primary Care). He is also Director of the Primary Care Research Network (South West).

ANNE MILES is a Senior Research Associate at the Health Behaviour Research Centre at University College London.

JANE WARDLE is Professor of Clinical Psychology and Director of the Cancer Research UK Health Behaviour Research Centre in the Department of Epidemiology and Public Health at University College London.