Influencing optimism in smokers by giving information about the average smoker

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Abstract

Using an experimental manipulation embedded in a national survey, this study investigated the effect on smokers’ risk judgments of receiving accurate information about the cigarette consumption of the average smoker. It was hypothesized that this information would reduce smokers’ estimates of the risk of lung cancer faced by the average smoker (‘other’s risk’) and hence influence their comparative risk judgments. As predicted, the information made lighter smokers more optimistic and heavier smokers less optimistic. However, the experimental manipulation had no effect on intention to give up smoking. The difference score (other’s risk minus own risk) correlated 0.52 with the single-item comparative risk measure. The former measure showed a small but significant optimistic bias whereas the latter measure showed a small but significant pessimistic bias. The findings are discussed in terms of measurement issues and the implications for interventions designed to influence risk perceptions.

Research on risk perception has identified a tendency for people to estimate their personal risk of experiencing a given hazard or health problem as being lower than that of the average person (e.g. Perloff and Fetzer, 1986; Hoorens, 1994; Weinstein, 1980, 1983, 1984, 1987). This phenomenon has been labelled ‘optimistic bias’ or ‘unrealistic optimism’ – unrealistic because not everyone can be at lower than average risk. Optimistic biases may have some positive benefits, for example in helping to maintain self-esteem, but they may also have negative consequences; in particular, they may reduce the likelihood of adopting recommended protective actions, such as wearing condoms or quitting smoking. For this reason and prompted by theoretical concerns, several studies have investigated the effect of manipulations aimed at reducing bias. Weinstein and Klein (1995) examined four such attempts. None of the manipulations was consistently effective and in some cases they actually increased the bias. In contrast, earlier studies showed that giving student subjects information about the risk factor status of other students reduced or eliminated optimistic bias (Weinstein, 1980, 1983; Weinstein and Lachendro,

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1982). This approach seems worth investigating further, especially as it is one that can easily be applied in large-scale mass media campaigns.

The present study investigated a variant of this approach in which smokers were told the cigarette consumption of the average smoker. The effect of this information on smokers’ risk judgments was tested using an experimental manipulation embedded in a national survey. In two previous surveys on similar national samples (Sutton, 1999), smokers showed a clear tendency to regard themselves as smoking less (fewer cigarettes a day) than the average smoker; in other words, they showed a self-favoring bias with respect to their cigarette consumption. The mean cigarette consumption reported by smokers in these surveys was 15 cigarettes a day, but they estimated the consumption of the average smoker to be 22 per day. This suggests that providing accurate information about the consumption of the average smoker might influence smokers’ estimates of the lung cancer risk faced by the average smoker and hence their comparative risk judgments (their estimate of their own risk of getting lung cancer relative to the average smoker). Smokers would be expected to respond differently to such information depending on whether they themselves smoked more or less than the stated average consumption. In particular, it was hypothesized:

1. that providing accurate information about the cigarette consumption of the average smoker would reduce smokers’ estimates of the risk of lung cancer faced by the average smoker (‘other’s risk’);
2. that, since other’s risk is one component of the comparative risk judgment, the information would also influence comparative risk estimates, particularly among the heavier smokers (those who smoked more than the stated average) who would show reduced optimism/increased pessimism; but
3. that there would be no effect on own risk estimates, since no personal risk information was being provided, at least not directly.

The studies that demonstrated successful debiasing interventions (Weinstein, 1980, 1983; Weinstein and Lachendro, 1982) all used single-item comparative risk measures. It was not possible to tell, therefore, whether the manipulations worked by influencing subjects’ estimates of their own risk or other’s risk. To examine this question, the present study used separate ratings of absolute risk to self and the average smoker in addition to a single-item comparative risk measure. This also enabled a comparison to be made between two frequently used methods of assessing optimistic bias: direct (based on a single item) and indirect (based on the difference between own risk and other’s risk). Only a handful of studies to date have compared these methods (Hahn and Renner, 1998; Otten and van der Pligt, 1996; Renner, cited by Schwarzer, 1994; Weinstein, 1989; Welkenhuysen et al., 1996).

1. Method

PARTICIPANTS, DESIGN AND PROCEDURE

A cross-sectional survey of adults aged 16 or over living in private households in Great Britain was conducted in April 1995 through the OPCS Omnibus, a monthly survey which yields about 2,000 interviews (including about 600 smokers). Respondents were interviewed in their homes by professional interviewers. For
sampling details see Sutton (1999). The response rate was 77 per cent. Smoking status was ascertained by the following question: ‘Do you smoke cigarettes at all nowadays?’ There were 564 current cigarette smokers, a smoking prevalence of 28 per cent. This figure is the same as in the two previous surveys and identical to the estimate from the 1992 General Household Survey, the most authoritative source of such information for Britain (Thomas et al., 1994). The sample comprised 348 women and 216 men, the mean age was 43 (SD 17, range 16–95) and the mean cigarette consumption was 15 cigarettes a day (SD 9, range 0–60, where zero means less than one per day on average).

After providing demographic information and stating their cigarette consumption but before being asked the risk questions, respondents living at odd-numbered addresses (the Information condition) were read the following statement: ‘According to recent surveys, the average male cigarette smoker in this country smokes about 16–17 cigarettes a day, and the average female cigarette smoker smokes about 14 cigarettes a day. So that is 16–17 cigarettes a day for men and 14 cigarettes a day for women.’ This information was based on the cigarette consumption reported by 1,162 smokers in the two previous surveys (Sutton, 1999); the figures are consistent with those reported in the General Household Survey (Thomas et al., 1994). Respondents living at even-numbered addresses were not given this information and served as the Control condition. Thus this simple procedure used systematic assignment to effect a between-groups experimental manipulation with approximately equal numbers of participants in each condition. There were no significant differences between the resulting two groups on sex, age or cigarette consumption.

**DEPENDENT MEASURES**

As a direct measure of comparative risk, respondents were asked, ‘Compared with the average … (male/female) … cigarette smoker in this country, do you think your own chances of getting lung cancer at some time in your life are … Much higher (coded 1)/Higher (2)/A bit higher (3)/About the same (4)/A bit lower (5)/Lower (6)/Much lower (7)’? Men were asked about men and women were asked about women. As an aid, respondents were shown a card listing the seven possible responses. Immediately following this question were the two absolute risk questions. Respondents were asked, ‘If you had to put a figure on it, what would you say are your own chances of getting lung cancer at some time in your life?’ They were asked to rate their chances out of a hundred by choosing a number between 0 and 100. To help them they were shown a card depicting a vertical line labelled: ‘0 per cent – No chance of getting it’ at the bottom and ‘100 per cent – Certain to get it’ at the top. They were then asked to rate the chances for ‘the average … (male/female) … cigarette smoker’ in the same way. The difference score (other’s risk minus own risk) was used as an indirect measure of comparative risk. Finally, respondents were asked, ‘Are you intending to give up smoking altogether in the next 6 months?’ (Yes/No).

**2. Results**

The data were analyzed using hierarchical multiple regression. In the earlier surveys, the single-item measure of comparative risk was related to cigarette
consumption, heavier smokers being less optimistic/more pessimistic than lighter smokers (Sutton, 1999). Furthermore, there was evidence that the relationship was non-linear and that the non-linearity could be adequately described in terms of quadratic curvature. Consequently, in the analyses conducted for the present paper, both cigarettes per day and its square were used as predictors/covariates together with a dummy variable representing the experimental manipulation and terms representing the interaction between the manipulation and the linear and quadratic components of cigarette consumption. The terms were entered in the analysis in the order specified using forced entry. Separate regression analyses were run for each of the risk measures and for intention. The term representing the interaction between the experimental manipulation and the quadratic component of cigarette consumption did not approach significance in any of the analyses but the linear interaction term was significant in several cases. Figure 1 summarizes the results for the risk measures in terms of the best-fitting curves derived from the regression analyses.

**Figure 1** Best-fitting regression curves showing the relationship between cigarette consumption and various measures of risk perception, by experimental condition. (The Information condition is indicated by a continuous line, the Control condition by a dashed line.)

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1. In the Information condition, different figures were given for the cigarette consumption of the average male and female smoker. Furthermore, men were asked to compare themselves with men and women with women. For these reasons, an additional set of regression analyses was conducted in which gender and its interactions with the other predictors were included along with the terms specified. However, there were no significant main effects or interactions involving gender so, to simplify the presentation, only the set of analyses omitting gender is reported.
COMPARATIVE RISK MEASURE

Consistent with earlier findings (Sutton, 1999), the direct comparative risk measure correlated $-0.47\,(p < 0.001)$ with cigarette consumption, indicating that the lighter smokers were more optimistic than the heavier smokers. The quadratic term added significantly to the prediction, increasing the multiple correlation ($R$) from 0.47 to 0.51 [$F(1,518) = 30.3,\, p < 0.001$]. The experimental manipulation had no significant overall effect but its interaction with the linear component of cigarette consumption was significant [$R$ increased from 0.51 to 0.52; incremental $F(1,516) = 4.3,\, p < 0.05$], indicating that the effect of the manipulation on comparative risk judgments depended on cigarette consumption. As Figure 1 (left-hand panel) shows, the information manipulation made the lighter smokers more optimistic and the heavier smokers less optimistic/more pessimistic.

ABSOLUTE RISK MEASURES

Approximately 10 per cent of respondents had missing information on the absolute risk questions, suggesting reluctance on the part of smokers to give numerical estimates of risk. However, there was no difference in this respect between the two experimental conditions. The regression analysis for the difference score (other's risk minus own risk) showed a similar pattern of results to that obtained for the direct comparative risk measure: a significant linear relationship with cigarette consumption ($r = -0.41,\, p < 0.001$); a significant quadratic effect of consumption [$R$ increased from 0.41 to 0.44; incremental $F(1,466) = 14.5,\, p < 0.001$]; a non-significant main effect of the manipulation; and a significant interaction between the manipulation and the linear component of cigarette consumption [$R$ increased from 0.44 to 0.45; incremental $F(1,464) = 5.0,\, p < 0.05$]. Figure 1 (middle panel) shows that, as with the comparative risk measure, the information made lighter smokers more optimistic and heavier smokers less optimistic.

The right-hand panel of Figure 1 shows the results for the two separate components of the difference score i.e. own risk and other's risk. Other's risk showed only a significant main effect for the manipulation [incremental $F(1,465) = 5.0,\, p < 0.05$]; the relationship with cigarette consumption was non-significant and there were no significant interactions.\(^2\) Thus, as predicted, information about the average smoker reduced respondents' estimate of the risk faced by the average smoker and the effect was the same irrespective of respondents' own cigarette consumption. Own risk had a significant association with cigarette consumption ($r = 0.29,\, p < 0.001$), the quadratic effect was significant [$R$ increased from 0.29 to 0.34; incremental $F(1,466) = 14.7,\, p < 0.001$], the main effect of the manipulation was not significant, and the interaction between the manipulation and cigarette consumption (linear component) was marginally significant [$R$ increased from 0.34 to 0.35; incremental $F(1,464) = 3.1,\, p = 0.079$]. As Figure 1 (right-hand panel)

\(^2\)Although other's risk showed only a significant main effect for the manipulation, the curves shown in Figure 1 are based on a model that included cigarette consumption, its square, the manipulation, and the interaction between the manipulation and the linear component of cigarette consumption. This means that the curves for the difference score shown in the middle panel of Figure 1 can be derived directly from the curves shown in the right-hand panel by subtracting own risk from other's risk.
shows, there was a tendency for the manipulation to reduce own risk estimates among the lighter smokers but not among the heavier smokers.

AGREEMENT BETWEEN DIFFERENT MEASURES OF OPTIMISM

The difference score correlated $r = 0.52 \ (p < 0.001)$ with the single-item comparative risk measure. Collapsing each of the two measures into three categories ('optimists', 'neutrals', 'pessimists') and cross-tabulating them revealed several important discrepancies (Table 1). More than half (59.2 per cent) of those who were pessimistic (rated themselves as at higher risk than the average smoker) on the direct comparative risk measure were neutral or optimistic when asked to give estimates of absolute risk. Of those who were neutral on the direct measure (rated themselves 'about the same' as the average smoker), most (72.0 per cent) were also neutral on the absolute risk measures (i.e. gave exactly the same answer to the questions on own and others' risk); however, of those who changed, three times as many became optimistic as became pessimistic. Overall, there was a shift in the direction of greater optimism. Pessimists outnumbered optimists on the direct measure (34.7 per cent vs. 16.6 per cent) but the reverse was the case on the indirect measure (22.3 per cent vs. 31.3 per cent). Moreover, using the standard method for detecting an optimistic bias in a group of individuals, the direct measure showed a significant pessimistic bias [$t(469) = 2.6, \ p < 0.01$] whereas the indirect measure showed a significant optimistic bias [$t(469) = 5.8, \ p < 0.001$]. Effect sizes (based on the difference between the observed mean and the expected mean divided by the standard deviation) were 0.12 and 0.27 respectively. These are 'small' according to Cohen's (1988) guidelines.

INTENTION

Intention was analyzed in the same way as the risk measures using hierarchical multiple regression. Since this measure is dichotomous, the results were checked using logistic regression. The only significant effect was for cigarette consumption. Compared with heavier smokers, lighter smokers were more likely to say that they

Table 1. Cross-tabulation of direct and indirect measures of optimism.

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<th>Directa</th>
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<tr>
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<td>Neutrals</td>
<td>Optimists</td>
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<tr>
<td>Column total</td>
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<td>229</td>
<td>163</td>
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*aFor the direct measure, pessimists are those who said that their chances were higher than the average smoker, neutrals are those who said 'about the same', and optimists are those who said that their chances were lower than the average smoker.

*bFor the indirect measure, pessimists are those who gave a higher figure for their own risk than for the average smoker, neutrals are those who gave exactly the same figure for their own risk and for the average smoker, and optimists are those who gave a lower figure for their own risk than for the average smoker. There is no assumption in either case that the optimists were unrealistic in their judgments.
intended to quit smoking in the next 6 months (r = 0.12, p < 0.025); only the linear component was significant. The experimental manipulation had no effect on intention, and there were no significant interactions. Point-biserial correlations between intention and the risk measures were all small (< 0.06 in absolute value) and non-significant.

3. Discussion

Confirming results from an earlier study (Sutton, 1999), lighter smokers were more optimistic than heavier smokers about their own lifetime risk of getting lung cancer. This was the case whether risk was assessed comparatively or in absolute terms. Thus, smokers can be said to be relatively accurate in their risk estimates (Weinstein and Nicolich, 1993) in the sense that those who smoke more acknowledge that they are at higher risk. Gauging the extent to which smokers are unrealistically optimistic or pessimistic in their risk judgments is more difficult, and in this study different measures pointed to different conclusions (see below). By contrast to the own risk measures, other’s risk was unrelated to cigarette consumption: lighter smokers and heavier smokers gave similar estimates of the risk faced by the average smoker.

Lighter and heavier smokers were expected to respond differently to the information manipulation which simply involved telling some smokers but not others the number of cigarettes a day smoked by the average smoker. The results supported this prediction. On both the comparative risk measure and the difference score, there was a significant interaction between the experimental manipulation and cigarette consumption. The information made lighter smokers more optimistic and heavier smokers less optimistic.

Obtaining separate estimates of own risk and other’s risk enabled the basis of this effect to be examined. The results suggested that, as predicted, the information reduced smokers’ estimates of the risk faced by the average smoker and that this did not depend on the recipient’s own cigarette consumption. Thus, telling smokers that the average smoker smoked less than they thought reduced both lighter smokers’ and heavier smokers’ estimates of the risk faced by the average smoker. In addition, there was a marginally significant tendency for the manipulation to reduce own risk estimates among the lighter smokers but not among the heavier smokers. Figure 1 shows how these separate effects for own risk and other’s risk (right-hand panel) combined to produce the curves for the difference score in the middle panel. For heavier smokers, the reduction in optimism produced by the information seemed to be largely due to the reduction in other’s risk. On the other hand, there was a tendency for the lighter smokers to respond to the information by reducing not only their estimates of the risk faced by the average smoker but also their own risk estimates. The net effect of this was that the lighter smokers maintained, or even increased, the distance between their own risk and other’s risk. This is reminiscent of Klein and Kunda’s (1993) finding that when people are given the average person’s frequency of performing risky behaviors, they decrease their own frequency estimates in such a way that they maintain a favorable comparison with the average person on those behaviors. An important difference between the two studies is that participants in the present study were asked to report their own cigarette
consumption before they were given the average person’s consumption. This suggests the interesting possibility that if our subjects had reported their own consumption after receiving the information, they might have responded to the information by reducing their self-reported consumption instead of by changing their risk perceptions.

From a practical viewpoint, this approach seems worth investigating further and has potential for application in health education campaigns and materials where information about the average smoker can easily be included. Generalizing beyond smoking to other risky behaviors, the findings would suggest that, to the extent that people overestimate the standing of the average person on a relevant risk factor, then providing accurate information about the risk factor status of the average person may reduce optimism or increase pessimism among those who are above average on that factor.

In the present study, lighter smokers showed an effect in the opposite direction (i.e., increased optimism) and, as a consequence, the manipulation had no overall effect. In any practical application it would therefore be important to target heavier smokers or, more generally, those who are above average on the relevant risk factor.

Two caveats should be mentioned. First, more research is needed on the stability and behavioral consequences of such effects. Giving people information about the average person may have only transient effects on risk judgments. The effects may simply reflect changes in responding influenced by demand effects rather than genuine changes in beliefs. It is noteworthy that the experimental manipulation had no effect on intention to give up smoking. This may be because it requires time for changes in risk judgments to influence behavioral intentions or simply because the effects were too weak.

The second caveat relates to an additional aim of the study which was to examine the relationship between two commonly used ways of assessing optimistic bias: a direct comparative risk measure and an indirect measure based on the difference score. The two measures correlated 0.52, which suggests that they are not interchangeable. Furthermore, the direct measure showed a significant pessimistic bias whereas the indirect measure showed a significant optimistic bias. Thus, depending on which measure was emphasized, it would be possible to conclude either that smokers in Britain are unrealistically pessimistic about their lifetime chances of getting lung cancer or that they are unrealistically optimistic. Inspection of the inconsistencies revealed that some smokers who had said on the comparative risk question that their risk was higher than average were reluctant to give numerical estimates of risk that were higher for themselves than for the average smoker. Moreover, many of those who rated their risk as ‘about the same’ as the average smoker on the direct measure preferred to be optimistic rather than pessimistic when pressed to give an exact numerical risk estimate.

A number of other studies have compared the two methods. Weinstein (1989) asked members of two different psychology classes to rate the same 16 hazards; one class used the direct method, the other used the indirect method. Across hazards, the mean scores correlated 0.84, ‘… demonstrating that the amount of bias associated with a given problem is insensitive to the measurement method used’ (p. 150). Renner (cited by Schwarzer, 1994) found a correlation of 0.76 (presumably across individuals) between the two measures but concluded from other analyses that they were distinct. In the study by Hahn and Renner (1998), the correlations over
individuals between the direct and indirect measures ranged between 0.35 and 0.62; both measures showed a significant optimistic bias for each of six health-related problems. Welkenhuyzen et al. (1996) found a correlation of only 0.22 between their direct and indirect measures, but the questions referred to a different comparison group and were not directly comparable; both measures showed a significant optimistic bias, but the bias was greater with the indirect measure. Finally, contrary to the finding obtained in the present study, Otten and van der Pligt (1996) reported that the direct measurement procedure produced more optimism than the indirect procedure.

Like some other studies (e.g. Hoorens and Buunk, 1993), Otten and van der Pligt (1996) found an order effect: there was less optimism if own risk was estimated before other’s risk rather than vice versa. This suggests that there might have been even more of a discrepancy between the direct and indirect measures in the present study if participants had been asked to assess other’s risk first.

The vast majority of studies on unrealistic optimism have used either the direct or the indirect methods for assessing optimistic bias. Very few studies have used both procedures, and, as shown above, these have yielded somewhat inconsistent findings regarding the comparison between the two methods. The present study revealed systematic differences between the direct and indirect measures. Further comparisons between the two methods are needed, and, more generally, future research on unrealistic optimism should devote more attention to measurement issues.

References


