Leavitt, F., & Garron, D. Validity of a back pain classification scale for detecting psychological disturbance as measured by the MMPI. *Journal of Clinical Psychology,* 1980, *36,* 186–189.

McCreary, C., Turner, J., & Dawson. E. Principal dimensions of the pain experience and psychological disturbance in chronic low back pain patients. *Pain,* 1981, *11,* 85–92.

Melzack, R. The McGill Pain Questionnaire: Major properties and scoring methods. *Pain,* 1975, *1,* 277–299.

Melzack, R., & Torgerson, W. S. On the language of pain. *Anesthesiology,* 1971, *34,* 50–59.

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Reducing Unrealistic Optimism About Illness Susceptibility

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This experiment examined an intervention designed to eliminate unrealistic optimism, the tendency for people to claim that their chances of suffering from various problems are less than the chances of others around them. College students were the subjects in the study and 11 different health and safety risks were included. The experimental treatment was based on previous suggestions (Weinstein, in press) about the mechanisms producing unrealistic optimism. Subjects rated themselves on risk factors relevant to a problem and received information about the standing of a typical student on these risk factors before making comparative risk judgments. As predicted, the treatment eliminated optimistic biases for problems that normally evoke biased judgments, but did not affect judgments concerning problems that do not normally evoke unrealistic optimism. Unexpectedly, subjects who rated themselves on risk factors but did not receive information about peers became substantially more unrealistic. Treatment effects on self-reported worry and interest in precautions were also examined.

Most theoretical treatments of health behavior and illness behavior include the individual's perception of his or her vulnerability to harm as a central explanatory variable (see Cummings, Becker, & Maile, 1980, for a summary of these theories). There is also supportive data showing that perceived susceptibility is a predictor of many health-protective behaviors (e.g., Becker, Haefner, Kasl, Kirscht, Maiman, & Rosenstock, 1977; Cummings Jette, Brock, & Haefner, 1979). Although we know little about how such

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perceptions originate, there is considerable evidence that beliefs about personal vulnerability are often systematically in error; they are unrealistically optimistic (Harris & Guten, 1979; Kirscht, Haefner, Kegeles, & Rosenstock, 1966; Larwood, 1978; Robertson, 1977; Weinstein, 1980, in press).

For many health and safety threats, though not all, people tend to believe that they are less at risk than others around them. If a man says his chances of developing a particular disease are less than average, he may be perfectly correct. But not everyone can be below average in risk. If the people who claim their chances are below average greatly outnumber those who say their chances are above average, the group as a whole is demonstrating an optimistic bias. In general, it seems that excessive optimism arises because people give themselves credit for factors in their favor (perhaps exaggerating these factors of showing bias in the factors they consider) but fail to give similar credit to others.

Two recent studies attempted to reduce these optimistic biases. In one (Weinstein, 1980), subjects listed all the factors that they thought influenced their chances of experiencing six negative life events. When such lists were read by a second group of subjects, the amount of unrealistic optimism shown by this second group decreased significantly. In the second study (Weinstein & Lachendro, 1982), merely having subjects think about the risk status of their peers—without providing any information about these other people—reduced unrealistic optimism. Although unrealistic optimism was reduced in both investigations, substantial and significant biases remained. Apparently, these biased beliefs about susceptibility to harm are not loosely held. Getting people to acknowledge their vulnerability, especially getting them to admit that they may be at greater risk than most others around them, is not an easy task (cf., Baric, 1969).

The present investigation was designed to test how strongly people resist acknowledging their illness susceptibility. It employed a blunt and hopefully powerful treatment in an attempt to eliminate optimistic biases. The treatment was designed to counteract three processes that may contribute to exaggerated optimism in comparative risk judgments (Weinstein, in press): (1) selective recall of factors that reduce one's risk rather than factors that increase one's risk; (2) lack of information about the self-protective activities of others; and (3) a failure to think very carefully about others' risk status because of egocentrism.

The experimental treatment employed a list of the known and suspected risk factors for each health and safety threat under study. College students were asked to describe where they stood on each risk factor, and at the same time were given information about the status of a typical, same-sex person on the identical risk factors. Subjects were then asked to compare their own chances of experiencing the problem with the chances of their peers. A net tendency for subjects to claim that their risk was below the risk of their peers would indicate an optimistic bias. At first glance, it might seem that students in this condition had no alternative but to become realistic in their comparative risk judgments. Yet, it was possible that students would distort their standing on the risk dimensions in order to justify their optimism or might selectively emphasize those risk dimensions on which they looked best in arriving at their comparative risk judgments.

Subjects in one control condition described themselves on the same risk factors as did experimental subjects, but did not receive any information about peers. This procedure should reduce biases arising from the first process mentioned earlier, but should not affect the second or third. Another control group made their comparative risk judgments without reading the list of risk factors, describing themselves, or receiving information about the risk status of their fellow students.

The experimental treatment was intended to correct an optimistic bias, not to make everyone more pessimistic. Therefore we expected that it would reduce unrealistic optimism for those risks associated with an optimistic bias, but would have no effect on risks that do not normally evoke unrealistic optimism.

Two other variables, worry about the threat and self-reported interest in adopting new precautions to reduce one's risk, were also incorporated into the study. In previous work (Weinstein, in press), significant associations were found between comparative risk judgments and both of these variables. These results suggested that believing one is less at risk than others decreases worry and that both worry and comparative risk judgments influence the motivation to take precautions. The inclusion of worry and interest in precautions in the present experiment permitted a test of these causal interpretations. Nevertheless, it was clearly a limited test, restricted by the self-report nature of the variables, the limited duration of the treatments, and other restrictions common to laboratory research.

METHOD

Subjects

Participants in this study were 88 college students from an introductory psychology course at Rutgers University, 32 males and 56 females, who received a small amount of extra credit for their assistance.

Measures

Comparative risk judgments. Comparative risk judgments were obtained for 11 health and safety risks: diabetes, heart attack, drinking prob-

lem, attempting suicide, lung cancer, other forms of cancer, mugging, injury in an auto accident, high blood pressure, tooth decay, and ulcer. The first five of these problems were designated "high-optimism" risks because they had evoked substantial optimistic biases in past research (Weinstein, in press). The other six "low-optimism" risks had evoked little or no bias.[1] Comparative risk judgment questions were phrased: "Compared to other Rutgers students of my sex, my chances of developing...are: much below average, below average, slightly below average, average for Rutgers students, slightly above average, above average, much above average." For purposes of analysis, these seven responses were assumed to form an equal-interval scale and were assigned the values −3 (much below average) to +3 (much above average). Thus a group mean of zero would indicate an absence of bias. The 11 health and safety risks appeared in random order.

Worry about risks. Worry was assessed by questions which asked: "How worried do you feel about developing...?" The response options were: 1—not at all worried; 2—slightly worried; 3—moderately worried; 4—very worried; 5—extremely worried. For each risk, the question about worry immediately followed the comparative risk judgment.

Interest in precautions. A student's interest in adopting new precautions to reduce risk was determined in a separate questionnaire which included 19 risks, the original 11 interspersed with eight others. Students were asked: "If a new precaution became available that would reduce your risk, but it might take some effort to carry out this precaution, would you be interested in adopting this precaution?" Their four choices were: (1) not at all interested; (2) slightly interested; (3) moderately interested; and (4) very interested.

Risk factors. For each of the 11 risks a set of known and possible risk factors was developed. For example, the risk factors for heart attack were: cigarettes smoked per week, number of family members (parents, grandparents, brother, and sisters) with heart disease, easy-going vs. hard-driving personality, hours of exercise per week, number of eggs eaten per week, and number of meals per week at which red meat is eaten. There were an average of four risk factors for each health or safety problem, and each risk factor was presented in the form of a question or scale so that a student could indicate his or her standing on that factor.

[1]The differences between risks that evoke unrealistic optimism and those that do not are discussed fully by Weinstein (1980, in press). One of the most important factors is the perceived controllability of the risk. Risks that are perceived to be controllable are usually associated with substantial optimistic biases; events that are regarded as uncontrollable do not evoke unrealistic optimism.

Procedure

Experimental sessions were conducted with small groups of students; students worked individually. There were three experimenters and each led all three experimental conditions. The investigation was described to participants as a study of the beliefs people have about health and safety problems that might happen to them in the future.

The first control group (Group C, $n = 31$) completed the comparative risk judgments and worry questions for each risk and then the interest in precautions questionnaire. The second or own risk factors control group (Group OR, $n = 29$) received additional instructions. They were told that they would be asked about "various factors that influence the risk of health and safety problems. In some cases these risk factors are well-established; in other cases it's not clear and they are only possible risk factors." They then described their own standing on the risk factors relevant to a given problem before indicating their comparative risk judgments and worry for this problem.

The experimental or information group (Group I, $n = 28$) differed from Group OR in one respect. They were told: "Each of the questions about risk factors has a red arrow [for questions employing a fixed-choice format] or number which shows the response of a typical Rutgers male or female based on data we gathered earlier this semester." These arrows or numbers were based on data that had been collected in three other introductory level social science courses ($n = 88$). The median response on each risk factor was calculated separately for males and females, and the data provided to information conditions subjects were matched to their sex.

RESULTS

The mean comparative risk judgments for each condition are shown in Table 1 for high-optimism risks, for low-optimism risks, and for each risk separately. A mean value significantly less than zero indicates an optimistic bias; the more negative the value, the stronger the bias.

It is apparent from column one of the table that the initial classification of the risks was generally borne out: high-optimism risks did evoke significant biases (except in one case); low-optimism events generally did not.

Treatment Effects on Comparative Risk Judgments

Since it was hypothesized that the experimental treatment would decrease and perhaps eliminate optimistic biases on high-optimism risks, but that it would not change comparative risk judgments for low-optimism events, an

TABLE 1
Mean Comparative Risk Judgments in Different Treatment Groups

Risk	Treatment Group		
	Control[a]	Own Risk[b]	Information[c]
High-optimism risks	−1.04***	−1.58***	− .35
Diabetes	−1.07***	−1.36***	− .38
Heart attack	− .95***	−1.30***	.29
Drinking problem	−1.37***	−2.00***	−1.07***
Suicide	−1.41***	−1.95***	− .55
Lung Cancer	− .41	−1.27***	− .05
Low-optimism risks	− .30	− .85***	− .18
Other forms of cancer	− .29	− .54*	− .26
Ulcer	− .61*	− .30	.12
Tooth decay	− .27	− .89**	− .33
High blood pressure	.12	−1.15***	.31
Auto accident injury	− .20	−1.10***	− .57*
Mugging	− .52*	−1.13***	− .36

Note. Comparative risk judgments could range from −3 (much below average) to +3 (much above average). Asterisks within the table indicate whether the group mean is significantly different from zero. A mean significantly less than zero indicates an optimistic bias.

[a] $n = 31$. [b] $n = 29$. [c] $n = 28$.
*$p < .05$. **$p < .01$. ***$p < .001$.

interaction between experimental group and risk group was expected. For each subject, the mean of the comparative risk judgments on the five high-optimism risks and the mean for the six low-optimism risks were calculated. The means were analyzed by a linear model that included the following terms: sex, condition, risk group (a within-subject variable), and all appropriate interactions.

As predicted, the Condition X Risk group interaction was significant, $F(2, 82) = 3.84$, $p = .025$, requiring separate analyses for the high and low-optimism risks (Winer, 1971, p. 530). In these separate analyses, the terms in the model were merely sex, condition, and Sex X Condition. For high-optimism risks, the effects of condition and sex were significant, $F(2, 82) = 11.14$, $p < .001$, and $F(1, 82) = 5.52$, $p = .025$, respectively. The interaction was not significant. Post-hoc, pair-wise comparisons of the least squares adjusted means (SAS Institute, 1979) showed that Group I was much less optimistic than either Group C, $p < .01$, or Group OR, $p < .001$. Also, Group OR was significantly more optimistic than Group C, $p < .05$. Finally, females were more optimistic than males.

The analyses for the low-optimism risks showed that only the condition effect was significant, $F(2, 82) = 6.12$, $p < .005$. Post-hoc analyses showed that Group I did not differ significantly from Group C, but that Group OR was much more optimistic than either Group C, $p < .01$, or Group I, $p < .005$.

As shown in Table 1, the differences found between conditions also held for the individual risks. For all five high-optimism risks, Group I was the most pessimistic. Furthermore, Group OR was more optimistic than the other groups in 10 or 11 cases.

Treatment Effects on Worry and Interest in Precautions

The data showed a tendency for Group OR to be the least worried group (for 9 risks) and the least interested in precautions (for all 11 risks). Group I was highest in worry for 10 risks, but no consistent pattern regarding precautions emerged for this group. Although these trends were consistent, the effects were small. An analysis parallel to that carried out for comparative risk judgments revealed that the between-group differences for worry ($p > .1$) and interest in precautions ($p > .2$) were not statistically significant.

Relationships Among Comparative Risk Judgments, Worry, and Interest in Precautions

Examining the mean responses of the control group for the 11 risks in this study, we find strong, between-risk correlations between optimism (the mean comparative risk judgment with sign reversed) and worry, $r = -.82$, $p < .002$, between optimism and interest in precautions, $r = -.66$, $p < .05$, and between worry and interest, $r = .72$, $p < .05$.

The same pattern of correlations also existed between subjects within the three groups, although several of the correlations within Group I were smaller. Within each group, the correlations were averaged over the 11 risks. The mean correlation between optimism and worry was −.52 within Group C, −.47 within Group OR, and −.27 within Group I. The mean optimism-interest correlations were −.36, −.30, and −.09, respectively, within these three groups, and the corresponding worry-interest correlations were .34, .34, and .38.

DISCUSSION

The results of this experiment show that when college students describe their standing on health and safety risk factors and are given information about the risk status of their peers, the optimistic bias in their comparative risk judgments is reduced to a negligible level. As predicted, this procedure had little effect on risk judgments for threats that did not normally evoke unrealistic optimism, indicating that the treatment was eliminating a bias, not just creating greater pessimism.

Group OR, which rated itself on risk factors but did not receive feedback about the risk status of others, was designed to show whether the experimental treatment was effective because it provided information about peers (reducing egocentrism and offering information about others) or because it brought a variety of risk factors to subjects' attention and forced them to consider their own standing on these factors. The data show very clearly that it was the feedback about peers that reduced unrealistic optimism. In fact, merely rating oneself on risk factors substantially *increased* optimistic biases, an unanticipated finding.

We believe at least two mechanisms are responsible for this increased optimism. First, many risk factors have positively skewed distributions with the majority of the population at the lowest risk level. For example, most of our subjects did not smoke at all, had no family members with diabetes, and did not drink alone. If people are reminded of a risk factor that they had overlooked, and find that they fall into the lowest possible risk classification, their optimism is likely to increase. Being egocentric (Weinstein & Lachendro, 1982), it is unlikely that they will stop and remind themselves that most people fall into the same category. A second mechanism can apply regardless of the risk factor's distribution. In several unpublished studies, college students were asked to describe their own standing on a variety of health and safety risk factors and to give their beliefs about the risk status of a typical student at their college. On such diverse factors as lifestyle, family background, and personality, they usually saw themselves as having more desirable characteristics. Thus, even if people are not egocentric when considering some risk factor and do think about others, they are still likely to become more optimistic as new factors are brought to mind.

The unexpected reactions of Group OR subjects suggest that some discussions of health and safety risk factors may actually make people more unrealistic. When a risk factor is discussed, it seems important to provide information about the standing of others or to give evaluative labels (e.g., excellent, good, fair, poor) to different points along the scale. Without such benchmarks, a person cannot interpret his or her standing on that dimension and often appears to assume that he or she is better off than most others.

If we regard the close correspondence between optimism, worry, and interest in precautions in this and previous data (Weinstein, in press) as indicating causal relationships—that perceived vulnerability leads to worry and that both perceived vulnerability and worry motivate interest in precautions—it is somewhat surprising that the experimental treatments had so little effect on worry or interest. Two possible explanations come to mind. First, the changes in risk judgments in Group I may have been quite superficial, perhaps more a matter of compliance than a genuine belief change. Second, it is possible that belief changes were genuine but that insufficient time passed for effects on worry and interest to become apparent.

In this regard, it is interesting to note that the correlations of comparative risk judgments with worry and interests were much smaller within Group I than within the other groups. On the other hand, the correlations between worry and interest were practically identical for all three groups. It seems as if, for Group I, the experimental treatment created a disequilibrium among these three variables. Over time, we would expect worry and interest to increase, reestablishing equilibrium, or to find that optimism has increased to its original levels, recreating the normal relationship among these three variables.

The inclusion of self-reported interest in adopting precautions as a variable in this study has certainly been a very limited examination of the link between risk perceptions and risk behavior. Clearly, much additional research is needed—preferably in field settings and with more extensive treatments—to determine whether the motivation to take precautions can be increased by interventions that reduce unrealistic optimism.

REFERENCES

Baric, L. Recognition of the "at-risk" role. *International Journal of Health Education,* 1969, *12,* 24-34.

Becker, M. H., Haefner, D. P., Kasl, S. V., Kirscht, J. P., Maiman, L. A., & Rosenstock, I. M. Selected psychosocial models and correlates of individual health-related behaviors. *Medical Care,* 1977, *15* (5), supplement, 27-46.

Cummings, K. M., Becker, M. H., & Maile, M. C. Bringing the models together: An empirical approach to combining variables used to explain health actions. *Journal of Behavioral Medicine,* 1980, *3* (2), 123-145.

Cummings, K. M., Jette, A. M., Brock, B. M., & Haefner, D. P. Psychosocial determinants of immunization behavior in a Swine Influenza campaign. *Medical Care,* 1979, *17,* 639-649.

Harris, D. M., & Guten, S. Health protective behavior: An exploratory study. *Journal of Health and Social Behavior,* 1979, *20,* 17-29.

Kirscht, J. P. Haefner, D. P., Kegeles, S. S., & Rosenstock, I. M. A national study of health beliefs. *Journal of Health and Human Behavior,* 1966, *7,* 248-254.

Larwood, L. Swine flu: A field study of self-serving biases. *Journal of Applied Social Psychology,* 1978, *8,* 283–289.

Robertson, L. S. Car crashes: Perceived vulnerability and willingness to pay for crash protection. *Journal of Community Health,* 1977, *3,* 136–141.

SAS Institute. *User's guide to SAS (1979 ed.).* Raleigh, N.C.: Author, 1979.

Weinstein, N. D. Unrealistic optimism about future life events. *Journal of Personality and Social Psychology,* 1980, *39,* 806–820.

Weinstein, N. D. Unrealistic optimism about susceptibility to health problems. *Journal of Behavioral Medicine,* in press.

Weinstein, N. D., & Lachendro, E. Egocentrism as a source of unrealistic optimism. *Personality and Social Psychology Bulletin,* 1982, *8,* 195–200.

Winer, B. J. Statistical principles in experimental design. New York: McGraw Hill, 1971.

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REVIEWS

Host Differences in Neoplastic Risk: Behavioral and Social Contributors to Disease

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This paper is intended to provide an overview of behavioral-social variables contributing to the development and course of cancer. For health psychology as an emerging field of inquiry, these are the problem areas that appear to provide the greatest opportunity for health promotion and disease control.

As is true with all other chronic diseases, behavioral, social, and cultural variables—conceived of as sources of disease variance—contribute both directly and indirectly to cancer as a disease process. Table 1 displays schematically these potential "independent" sources of cancer variance.

As can be seen, if *effect* (direct versus indirect) is plotted by *stage of disease* (initiation versus progression) then potential behavioral, social and environmental contributors to cancer can be placed within the cells of the resulting matrix. For example, excessive exposure to solar radiation (Cell A) associated with certain outdoor occupations—particularly in light-skinned caucasians—is a direct contributor to squamous and basal cell carcinomas. Presumptive evidence exists that sunlight may also be a carcinogen, or co-carcinogen, in the initiation of malignant melamona (Ariel, 1980).

On the other hand, non-compliance with proven therapeutic regimens in cancer treatment (Cell D) is an example of a behavioral factor that could potentially contribute indirectly to cancer progression.

One could also view behavioral and social factors as "dependent" variables—that is, as consequences of cancer as a disease or as consequences of aggressive treatment of neoplasia. Table 2 displays examples of such dependent variables.

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