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Unrealistic Optimism About Susceptibility to Health Problems

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In this study, 100 college students compared their own chances of experiencing 45 different health- and life-threatening problems with the chances of their peers. They showed a significant optimistic bias for 34 of these hazards, consistently considering their own chances to be below average. Attempts to account for the amount of bias evoked by different hazards identified perceived controllability, lack of previous experience, and the belief that the problem appears during childhood as factors that tend to increase unrealistic optimism. The investigation also examined the importance of beliefs and emotions as determinants of self-reported interest in adopting precautions to reduce one's risk. It found that: (a) beliefs about risk likelihood, beliefs about risk severity, and worry about the risk all made independent contributions to interest in risk reduction; (b) unrealistic optimism undermined interest in risk reduction indirectly by decreasing worry; and (c) beliefs about risk likelihood and severity were not sufficient to explain the amount of worry expressed about different hazards.

KEY WORDS: prevention; susceptibility; optimistic biases; fear; preventive health behavior; health beliefs.

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INTRODUCTION

People are constantly being urged to protect themselves from disease, accidents, criminal victimization, and environmental hazards. Even if the precautions recommended are not well known, information about them is usually readily available. Nevertheless, people very often fail to take these precautions; they suffer illness, physical harm, and mental anguish that could have been avoided.

Folk psychology has a simple explanation for this inaction. Supposedly, people tend to think they are invulnerable. They fail to act because they expect misfortunes to strike other people, not themselves.

Although considerable evidence does exist that beliefs about illness susceptibility are important predictors of preventive health behavior (e.g., Becker *et al.*, 1975; Cummings *et al.*, 1979; Kasl, 1975), we know little about the origin and accuracy of these beliefs (Leventhal, 1973; Rosenstock, 1974). The present investigation was an examination of these beliefs about susceptibility. Focusing on a generally healthy sample of college students, it examined the extent of unrealistic optimism about illness susceptibility, identified factors that influence the amount of optimistic bias associated with different health problems, and explored the relationship between unrealistic optimism and motivation to take precautions.

One reason for the scarcity of research on these issues has been the difficulty of deciding whether or not an individual who is optimistic about the future is being unrealistic. A man who says that his chances of suffering from a particular health problem are less than average may be perfectly correct. On a group basis, however, it is relatively easy to test for an optimistic bias. If all people claim that their chances of experiencing this problem are less than average, the group is clearly demonstrating an optimistic bias. In the present project, comparative risk judgments were elicited and group data were used to determine the existence and magnitude of unrealistic optimism.

Past Research on Unrealistic Optimism

Studies of several specific health and safety hazards (Harris and Guten, 1979; Kirscht *et al.*, 1966; Larwood, 1978; Robertson, 1977) suggest that people tend to believe that their own risks are below average. Other recent reports, examining a wider range of positive and negative life events (Weinstein, 1980; Weinstein and Lachendro, 1982), have provided information about the types of events that are most likely to evoke unrealistic optimism and have articulated several mechanisms that may be responsible for this phenomenon.

One possibility is that unrealistic optimism is a form of ego-defensive behavior, a reluctance to admit vulnerability because the threat of harm would be too anxiety producing (Kirscht *et al.,* 1966). This interpretation leads to the prediction that the more threatening the hazard, the greater the optimistic bias one should find. Weinstein (1980) found no relationship, however, between the amount of bias for negative events and ratings of event seriousness.

Several other possible origins of unrealistic optimism involve cognitive errors. For example, humans tend to be egocentric (Jones and Nisbett, 1971; Ross *et al.,* 1977; Ross and Sicoly, 1979); we have trouble adopting the perspective of others. Consequently, we may forget that the same factors that make us feel that an event is unlikely to happen to us may also make other people feel that it is unlikely to happen to them (Weinstein and Lachendro, 1982). We may think that our risk of heart disease is below average because we get exercise and avoid saturated fats, forgetting that other people do as much or more than we do. Because of egocentrism, any factor that influences our beliefs about our *own* risk likelihood could introduce errors into our *comparative* risk judgments. For example, lack of experience with a health problem may make us feel that it is unlikely to happen to us *and* that our risk is below average. As hypothesized, negative events seldom experienced were found to evoke optimistic biases in past research (Weinstein, 1980).

Egocentrism will produce an optimistic bias only if the factors people bring to mind are viewed as *decreasing* their risk. Some risk factors may be considered realistically—with people recognizing that their standing on the factor may increase or decrease their risk. Other risk factors may be viewed in a one-sided manner and lead to optimistic biases. Thus, a woman may acknowledge that her family background predisposes her to heart disease, but she may see any amount of exercise as reducing her risk. If a risk factor is consistently considered in a biased fashion, then unrealistic optimism will be greater for health hazards where this factor is perceived to play an important role than for hazards where this factor is less important. Personal actions are one type of risk factor that appears to be viewed in a consistently biased manner, as if people compare themselves to someone who does little or nothing to reduce his or her risk. The more subjects believed that an event could be controlled by personal actions, the more convinced they were that their chances were below average (Weinstein, 1980).

A different cognitive error could also produce optimistic biases. For some problems—having a heart attack, for example—people may have a stereotypic mental image of the victim. If people do not see themselves as fitting this image, they are likely to conclude that the problem will not happen to them, even though they may differ from the image only in features that are irrelevant to risk vulnerability (cf. Kahneman and Tversky,

1972). This reasoning suggests that problems associated with a vivid victim stereotype are more likely to evoke unrealistic optimism than problems without an associated stereotype, a prediction supported by previous results (Weinstein, 1980).

The Present Study

By focusing on causes of illness and death, the present research tested the applicability of past findings to the health domain. It examined the relationships between unrealistic optimism and a wide range of hazard dimensions, including perceived seriousness, perceived probability for people in general, experience, perceived controllability, stereotype salience, and two other factors particularly relevent to health issues: the perceived importance of both heredity and environment in determining risk.

Several additional hazard dimensions were incorporated to clarify conceptual issues. Both stereotype salience and perceived controllability strongly influenced unrealistic optimism in past research, but the correlation between these two dimensions was unexpectedly high. It could be that subjects did not really have a coherent image of the victim, just a mental list of risk behaviors and other risk factors. If so, the suggestion that subjects became optimistic because they saw differences between themselves and their mental image of the victim in features that are irrelevant to risk would be incorrect. In the present study subjects rated each health hazard on the number of risk factors they could bring to mind and on the clarity of their mental image of the high-risk group. If these two variables proved to be highly correlated, it would reinforce the notion that the "mental image" is primarily a composite of perceived risk factors.

In addition, one might question whether it is appropriate to judge the ego-defense interpretation of unrealistic optimism by the size of the correlation between event seriousness and optimistic bias. An event can be extremely serious, but so unlikely or so distant in time that it is not very threatening. Thus information was gathered about the degree of threat and worry associated with the health problems in this study as well as about their perceived seriousness.

Finally, preliminary work suggested that people may be optimistic about some chronic illnesses, even though they are perceived to be uncontrollable, because they believe that these illnesses always make their appearance in childhood. If the problem has not appeared by the time you are a certain age, subjects seemed to reason, you are unlikely to develop this problem. Subjects without this problem would then conclude that their risk was below average, failing to consider that few of their peers may

suffer from this problem either. A dimension called *early appearance* was added to explore the prevalence of this belief pattern.

The present investigation also extends past research in another direction. Although popular belief suggests that unrealistic optimism undermines the motivation to take precautions, there is considerable disagreement in the literature about the influence of beliefs and emotions on coping behavior (Janis, 1967; Lazarus, 1966; Leventhal, 1970). Some theories of self-protection behavior emphasize variables that imply a rational accounting of the risks and benefits of various responses (e.g., Rogers and Mewborn, 1976). Beliefs about risk seriousness, risk probability, precaution effectiveness, and precaution cost are viewed as the principal determinants of action. The Health Belief Model (Rosenstock, 1974) is one such approach. Other writers (Janis, 1967) have emphasized emotions as sources of motivation against threat. The many attempts to change health and safety behaviors through fear arousal (Higbee, 1969; Leventhal, 1970) illustrate this perspective.

In the research on preventive behavior, however, beliefs and emotions are always confounded. Attempts to manipulate beliefs about severity and susceptibility also have emotional effects; investigators trying to manipulate fear use treatments that also provide information about vulnerability and seriousness. Any conclusions drawn from this research about the relative importance of rational and emotional factors are open to question.

By examining a wide range of health hazards, the present investigation includes threats that vary in perceived likelihood, seriousness, and worry. The desire to take new precautions against these threats can then be examined in light of the beliefs and emotions associated with each hazard, and statistical techniques can help to disentangle the contributions of different independent variables. Data reported in this study are limited to self-reported interest in taking precautions, and self-reported interest may well be greater than actual interest. Nevertheless, there is no obvious reason why the *relative* interest in reducing the risks of different health threats should be misleading.

Although this study is correlational in nature, limiting conclusions that can be drawn about cause and effect relationships, the design has some important advantages. A failure to change health behavior in experimental studies may reflect the difficulty of changing beliefs or the transiency of the fear produced by the treatment rather than any weakness in the underlying theory. By examining responses to a range of health problems, this research takes advantage of naturally occurring variations in beliefs and worry, variations much larger than can be produced by a brief intervention.

METHOD

Subjects

The subjects in this investigation were 100 members of an introductory psychology class at Rutgers University who participated to receive extra course credit. The sample contained 46 males and 54 females.

Health Problems

A diverse set of 45 illnesses and causes of death was chosen for study. The problems had to meet three criteria. First, the risk had to apply to all segments of the population. Second, problems that would be completely unfamiliar to subjects were excluded. Third, childhood health problems that rarely recur (for example, measles) and chronic problems that are already apparent by the time a person reaches college age were generally avoided. (Since students would know the probability of their experiencing such problems in the future—zero in the first case, zero or one in the second—it would be inappropriate to ask them to estimate their future risk.) The health problems selected are listed in Table I.

Materials

Comparative Risk Judgments Rating Forms. Health problems were randomly divided into a set of 22 and a set of 23. Separate forms were prepared for each set, with the health problems listed in random order. Next to each problem was a seven-point rating scale with the following choices: much below average, below average, slightly below average, average for other Rutgers students of your sex, slightly above average, and much above average. For purposes of analysis these seven responses were assumed to form an equal interval scale and were asigned the values −3 (much below average) through + 3 (much above average).[2]

Health Problem Attributes Rating Forms. Written and verbal instructions asked subjects to evaluate first the *probability* of each health issue. Students estimated the percentage of Rutgers students who would experience the problem at some time in their lives. Examples were given to help students convert from odds to percentages in case they were more

[2]A variety of other response scales was tested in pilot studies. The one chosen seems to be the most successful. It emphasizes the comparative aspect of the risk judgments, does not demand unnatural numerical estimates (such as percentile rankings), and, unlike a scale used previously (Weinstein, 1980), is not vulnerable to a few extreme responses.

Table I. Comparative Risk Judgments for Health Problems and Causes of Death[a]

Hazard description	Mean comparative risk judgment
Drug addiction (narcotics, barbituates, amphetamines)	−2.13***
Suicide	−1.79***
Venereal disease	−1.74***
Epilepsy	−1.62***
Alcoholism	−1.45***
Lung cancer	−1.30***
Being 40 or more lbs overweight	−1.28***
Infectious hepatitis	−1.13***
Kidney infection	−1.02***
Multiple sclerosis	−1.00***
Warts	−0.94***
Diabetes	−0.85***
Fever blisters (cold sores)	−0.79***
Sunstroke	−0.77**
Glaucoma	−0.76***
Asthma	−0.75**
Bronchitis	−0.74**
Homicide victim	−0.74***
Tetanus	−0.72***
Deafness	−0.72***
Migraine headaches	−0.70**
Tuberculosis	−0.70***
Gallstones	−0.69***
Slipped or ruptured disc	−0.64***
Influenza	−0.62**
Arteriosclerosis (hardening of the arteries)	−0.62**
Gum disease	−0.55**
Tooth decay	−0.51*
Hemorrhoids	−0.51**
Skin cancer	−0.50*
Vitamin deficiency	−0.47*
Heart attack	−0.40*
Strep throat	−0.38*
Conjunctivitis	−0.37*
Being killed in an auto accident	−0.34
Varicose veins	−0.34
Hypoglycemia (low blood sugar)	−0.32
Pneumonia	−0.23
Colitis (irritable colon)	−0.17
Laryngitis	−0.08
Arthritis	0.02
High blood pressure	0.04
Cancer	0.06
Common cold	0.09
Ulcers	0.53*

[a] N = 46-53, depending on rating form and missing data. A comparative risk judgment below zero indicates a belief that one's risk is less than average. Student's t was used to test whether the mean is significantly different from zero.

*$P < 0.05$.
**$P < 0.01$.
***$P < 0.001$.

comfortable thinking in terms of odds. Next, students indicated their *own worry* about each problem (1 = I don't feel at all worried or concerned about this problem happening to me; 2 = I feel some slight worry or concern about this; 3 = I feel moderately worried or concerned about this; 4 = I feel quite worried or concerned about this problem happening to me), their knowledge of *risk factors* (1 = I'm not aware of any factors that identify people who have a higher risk; 2 = I can think of one or two factors that identify people who have a higher risk; 3 = I can think of three or more factors that identify people who have a higher risk), and their *experience* (1 = I don't know anyone this has happened to; 2 = this has happened to acquaintances; 3 = this has happened to relatives or good friends; 4 = this has happened to me once in the past; 5 = this has happened to me two or more times in the past).

Problems were then rated for *controllability* (1 = people can't do anything that affects the chances of this happening; 2 = people's actions have a small effect on the chances that this will happen; 3 = people's actions have a moderate effect on the chances that this will happen; 4 = people's actions have a large effect on the chances that this will happen; 5 = completely controllable), *mental image* (1 = no image comes to mind of the person who is likely to have this problem; 2 = I get a mental image of the type of person who is likely to have this problem, but the image isn't as clear as in number 3; 3 = I get a clear mental image of the type of person who is likely to have this problem), and *seriousness* (if this happened to someone it would be: 1 = not at all serious; 2 = slightly serious; 3 = serious; 4 = very serious; 5 = extremely serious or fatal).

Finally, health problems were rated for *early appearance* (if signs of this problem haven't appeared by the time a person is 20 years old, it's not likely to happen: 1 = disagree; 2 = agree), *environmental influence* (the environment—"where you live or work, your job, events that happen"—can affect some health risks: 1 = not affected by the environment; 2 = slightly affected by the environment; 3 = strongly affected by the environment), and *heritability* (1 = not influenced by heredity; 2 = slightly influenced by heredity; 3 = strongly influenced by heredity).[3]

[3]Ratings of most (41) of these health problems on two other dimensions were available from pilot studies: *others' worry* (1 = people don't feel threatened by this; 2 = people feel somewhat threatened by this; 3 = people feel very threatened by this) and *interest in risk reduction information* (how much interest would you have in reading an up-to-date article written by an expert in the field about the causes and prevention of this problem: 1 = not at all interested; 2 = slightly interested; 3 = moderately interested; 4 = very interested). These additional ratings will be cited when they throw light on the issues addressed by this study. They were obtained the previous semester from students in the same course as those who participated in the present investigation. The applicability of these earlier ratings to the present data, and the stability of these ratings, is demonstrated by the fact that correlations between ratings of the pilot group and ratings of the present

Because rating a set of 22 or 23 problems on 11 dimensions would be very arduous, the problems were divided into three groups of 15. About half of each group of 15 came from one problem set, and half from the other.

Interest in Risk Reduction Actions. Students were asked how much interest they would have in doing more to reduce their own risk of each of the health problems. Response options were as follows: 1 = little interest; 2 = moderate interest; and 3 = strong interest.[4]

To counteract any possible order effects, all forms were prepared in two versions, with the health problems listed in both forward and reverse orders.

Procedure

Subjects met in small groups and completed the forms individually. Verbal instructions stated, "I want you to think about various health problems that could happen to you at some time in the future. I want you to think about your chances and tell me how they compare with the chances of other Rutgers students of your sex. . . . Remember, we don't want to know if you think it's likely or unlikely, but whether your own risk is greater than, less than, or about the same as other students' risks."

Students then completed one of the comparative risk judgment forms. After further instructions, subjects filled out one of the health problem attributes rating forms and one of the interest in risk reduction actions forms.

RESULTS

Unrealistic Optimism

If the comparative risk judgments gathered in this study were unbiased, the mean judgment would be zero for each health issue. A mean of less than zero indicates an optimistic bias. The more negative the mean, the greater the optimistic bias.

subjects on seven dimensions that were included in both studies (probability, risk factors, personal experience, heritability, controllability, mental image, and seriousness) were extremely high, ranging from 0.88 to 0.98.

[4]One problem was inadvertently left off these questionnaires.

Table I presents the mean comparative risk judgments for the 45 health problems in this study in order of decreasing optimism. It is obvious from the data that the students in this investigation tended to have a significant optimistic bias about their vulnerability to most health issues. (All tests reported in this paper are two-tailed.) Nevertheless, the amount of unrealistic optimism associated with different health problems varied greatly. For 10 problems there was no significant bias, and one problem, ulcers, was associated with a significant pessimistic bias.

In the following pages, simple correlations and multiple regression analyses are used to provide insights into the types of health problems that evoke optimistic biases. Next, the same techniques are employed to examine the motivation to take risk reducing actions. The final portion of the results section investigates health problem attributes that are associated with worry and concern.

Health Problem Attributes Influencing Unrealistic Optimism

The health problems were rated on dimensions that might affect the amount of optimistic bias and that might provide insight into the processes that lead to this bias. In examining the relationships among all these variables, the health problem is taken as the unit of analysis. The measure of optimistic bias is the mean comparative risk judgment from Table I (with the sign reversed). The measures of the other health problem attributes are the group mean ratings. Significance tests of the correlations between the optimistic bias and the mean ratings refer to the null hypothesis that the correlations are zero in the larger, hypothetical population of health problems from which the present sample of 45 was drawn. For probability, the log of the geometric mean rather than the mean itself was used in the calculations (cf. Lichtenstein *et al.*, 1978).

Table II presents the correlations among these measures. As predicted from previous research (Weinstein, 1980), unrealistic optimism increased with perceived controllability and decreased with experience. The correlation with mental image, however, was not replicated. Greater optimistic biases were also found to be significantly associated with health problems that were low in perceived probability and high in perceived seriousness. Optimistic biases were not significantly correlated with perceived heritability or perceived environmental influence.

The correlation with perceived seriousness is consistent with the notion that defensive denial is an underlying cause of unrealistic optimism, but other findings do not support this view. Because some health problems that are quite serious may have little fear value, variables other than

Table II. Correlations Among Mean Health Problem Ratings[a]

	Control-lability	Mental image	Risk factors	Heritability	Environ-ment	Probability[b]	Early appearance	Experience	Seriousness	Own worry
					Principal outcome variables					
Optimistic bias	0.30*	0.15	0.03	−0.04	−0.05	−0.33*	0.27	−0.38*	0.35*	−0.48***
Interest in risk-reducing actions	0.18	0.46**	0.68***	0.36*	0.42**	0.09	−0.23	−0.03	0.61***	0.78***
Own worry	0.14	0.41**	0.65***	0.24	0.42**	0.40**	−0.41**	0.31*	0.22	—
					Other health problem attributes					
Mental image	0.71***									
Risk factors	0.70***	0.78***								
Heritability	−0.35*	0.05	0.07							
Environment	0.53***	0.56***	0.68***	−0.26						
Probability	0.28	0.40**	0.44**	−0.11	0.16					
Early appearance	−0.38**	−0.20	−0.35*	0.43**	0.40**	0.26				
Experience	−0.02	0.17	0.22	0.00	0.06	0.81***	0.05			
Seriousness	0.17	0.22	0.39**	0.29	0.34*	−0.54***	0.01	−0.56***		

[a] $N = 45$ except for correlations involving interest in risk-reducing actions, in which case $N = 44$.

[b] Log geometric mean rather than simple mean.

*$P < 0.05$.

**$P < 0.01$.

***$P < 0.001$.

seriousness were added to the study to give more direct measures of the threat associated with each problem. The rating of how threatened by the problem people in general feel (see footnote 3) is one such variable. Yet it correlated only 0.06 with optimistic bias. Furthermore, the more subjects said *they* worry about a problem, the *less* optimistic they were. (The scales *own worry* and *others' worry* were expected to tap the same dimension, but correlated only 0.55 with one another.) These additional results do not support the hypothesis that people are most likely to claim that their risk is below average when they are most afraid. In fact, the correlation with own worry suggests a quite different relationship, that people are afraid because they see themselves as being relatively high in risk.

The correlations between optimistic biases and health problem attributes in Table II are potentially misleading since the bottom section of the table shows that these attributes are not independent. For example, experience, perceived probability, and seriousness form a highly intercorrelated cluster; so do perceived controllability, mental image, and risk factors. The strong correlation between the last two variables reinforces the suspicion that the mental image of the victim that subjects bring to mind is mainly a composite of risk factors, not a coherent picture endowed with many features unrelated to risk.

Multiple regression techniques were used to determine whether the various health problem attributes make independent contributions to the prediction of optimistic biases. Two basic approaches can be used in such calculations. One approach is to attempt to validate a specific equation, an equation derived from past research or from theoretical considerations. A goal of the present study was to attempt to replicate the results of past research (Weinstein, 1980). A stepwise regression analysis was conducted in which those variables that had previously predicted optimistic biases were entered together in step 1 (plus the variable *early appearance* for reasons outlined in the Introduction), and then other variables were considered in subsequent steps to see if any of them made a significant additional contribution.

The second approach employed is very conservative, entering all the health problem dimensions simultaneously into the regression equation. The conservative nature of this procedure can be seen from the fact that the overall regression equation can be highly significant even though none of the individual regression coefficients is significant. Such an outcome can arise when the independent variables have substantial overlap, as in the present data. Any variable that survives this second approach is making a unique contribution to the prediction equation. Variables that are not significant in such an analysis are not necessarily unimportant; it

may be just that their contributions can also be explained by other variables in the equation.[5]

Using the first approach, we found that experience [$F(1,41) = 7.82$, $P < 0.01$], perceived controllability [$F(1,41) = 11.62$, $P < 0.005$], and early appearance [$F(1,41) = 9.94$, $P < 0.005$] all made significant contributions to the prediction of optimistic biases about health problems ($R^2 = 0.38$, $P < 0.001$), but that having a mental image did not ($F < 1$). No other variables entered the regression equation after these were included. As suggested in the Introduction, early appearance was found to moderate the relationship between perceived controllability and optimistic bias. In stepwise regression analyses, the statistical significance of perceived controllability increased greatly when early appearance was entered into the regression equation. [The partial correlation between optimism and perceived controllability, controlling for early appearance, was 0.45 ($P < 0.005$).]

Applying the second approach to the data analysis, all nine variables were entered simultaneously into the prediction equation ($R^2 = 0.48$, $P < 0.005$). The contributions of perceived controllability and early appearance remained significant [$F(1,35) = 5.23$, $P < 0.05$, and $F(1,35) = 5.74$, $P < 0.05$, respectively], but experience did not ($F < 1$). Seriousness was marginally significant [$F(1,35) = 3.51$, $P < 0.07$]. The variable own worry was not entered into these calculations since it seemed most plausible to regard it as a consequence of the comparative risk judgment. However, repeating the preceding calculations after adding the variable others' worry (see footnote 3) did not change any of the conclusions.

Although perceived probability, experience, and seriousness failed to make a significant contribution in the nine-variable equation, these three variables are all highly intercorrelated, and it would be difficult for any one to make a significant contribution when the others are also present in the regression equation. To examine the importance of these three dimensions further, separate correlations were calculated for each health problem between a student's comparative risk judgment and his or her rating of its seriousness, probability (log probability) for students in general, and experience. (Thus, these are between-subject correlations.) Because only a few students (12 to 20) provided both risk judgments and attribute ratings

[5]The number of independent variables in the multiple regression analysis for unrealistic optimism is nine. Since there would be 45 second-order terms, it is impossible to test for interactions and nonlinearity with our sample of 42 health problems.

on the same health issue, these correlations are based on small samples. Consequently, the pattern across the 45 health problems, rather than the significance of individual correlation coefficients, is most informative.[6] The calculations did not reveal any consistent associations between comparative risk judgments and either seriousness or perceived probability (median r's $= -0.09$ and -0.04, respectively). For experience, however, the median correlation was 0.20, 36 of 45 correlations were positive, and the mean of the correlation coefficients was significantly greater than zero [$t(44) = 3.81, P < 0.001$].

Motivation to Reduce Risk

It is evident in Table II that subjects' self-reported interest in taking further actions to reduce the risk of various health problems was significantly related to the variables own worry, risk factors, seriousness, mental image, heritability, and environment. The 0.78 correlation between interest in risk reduction and own worry was particularly large, and correlations between other measures of worry and interest in risk reduction were also large. For example, interest in reading risk reduction information (see footnote 3) correlated 0.83 ($P < 0.001$) with others' worry and 0.49 ($P < 0.002$) with own worry. Interest in taking risk-reducing actions correlated 0.80 ($P < 0.001$) with others' worry.

A model that included both beliefs about expected harm and fear as potential sources of self-protection motivation had the variables own worry, seriousness, perceived probability (for one's peers), and optimistic bias (comparative risk for oneself relative to one's peers). When entered simultaneously into a regression equation, the result was highly significant ($R^2 = 0.83$, $P < 0.001$) and all variables except optimistic bias made significant contributions: own worry—$F(1,39) = 45.36$, $P < 0.001$; seriousness—$F(1,39) = 41.73$, $P < 0.001$; and perceived probability—$F(1,39) = 4.55$, $P < 0.05$. No other variables (including the interaction of probability and seriousness) entered the regression equation in later steps.

[6]Since the data used in these calculations are the responses of individual students, not averages over several raters, their reliability is probably low, decreasing the magnitude of the correlations.

If the amount of optimism tends to determine the amount of worry, the presence of both these variables in the regression analysis could obscure the effect of optimistic biases on risk reduction motivation. Therefore, the preceding calculation was repeated without own worry. Optimistic bias joined seriousness and perceived probability as a significant predictor [$F(1,40) = 15.0$, $P < 0.001$], and no other variables entered the regression equation. This suggests that optimistic biases have a negative effect on the motivation to take precautions, but only through their tendency to reduce an individual's fear of the hazard.

Next all 11 variables were included in a regression equation (the nine independent variables in the optimistic bias regression plus optimistic bias and own worry). The variance explained by this equation was quite large ($R^2 = 0.86$, $P < 0.001$). Both worry [$F(1,32) = 10.0$, $P < 0.005$], and seriousness [$F(1,32) = 10.0$, $P < 0.005$] remained important, but perceived probability was no longer significant [$F(1,32) = 2.59$, $P = 0.12$].

Determinants of Worry About Health Hazards

The strong correlations between one's worry about a health problem and one's self-reported motivation to reduce risk suggest the importance of understanding the hazard dimensions that lead to worry. Simple correlations are given in Table II. Significantly greater worry was expressed about health issues that have many known risk factors, can be caused by environmental conditions, are associated with an image of the high-risk individual, are more likely, and have been experienced in the past. Students were significantly less worried about issues that they believe make their appearance early in life (and from which they are presumably not suffering). Surprisingly, the correlation with the perceived seriousness of the problem was not significant.

If worry were purely a result of the expected harm predicted by a rational analysis of risk, worry would be a function of perceived seriousness and perceived likelihood of personal harm (represented here by the perceived probability for one's peers and by the optimism expressed in comparative risk judgments). A multiple regression equation containing these three variables was highly significant ($R^2 = 0.66$, $P < 0.001$), and the contribution of each variable was significant: seriousness—$F(1,41) = 44.7$, $P < 0.001$; perceived probability—$F(1,41) = 32.0$, $P < 0.001$; and mean comparative risk judgment—$F(1,41) = 29.4$, $P < 0.001$. (The interactions of seriousness with the two likelihood variables were

not significant.) Nevertheless, the risk factors variable made a significant additional contribution to the prediction of own worry in the next step of the regression analysis [$F(1,40) = 6.17$, $P < 0.02$], and once it entered the equation, the contributions of seriousness and perceived probability were no longer significant.

In the complete 10-variable equation ($R^2 = 0.79$, $P < 0.001$), significant contributions to the prediction of own worry came from optimistic bias [$F(1,34) = 11.0$, $P < 0.01$], risk factors [$F(1,34) = 10.9$, $P < 0.01$], perceived controllability [$F(1,34) = 6.9$, $P < 0.02$], and early appearance [$F(1,34) = 5.3$, $P < 0.05$]. In fact, an equation containing just these four variables was an excellent predictor of students' expressed worry ($R^2 = 0.77$, $P < 0.001$).

DISCUSSION

Unrealistic Optimism

The preceding data show that college students tend to be unrealistically optimistic about avoiding health problems. Students generally believed that their own chances of experiencing harm were less than the chances of their peers. Nevertheless, students were not always optimistically biased, and when bias did appear, the amount evoked by different health problems varied greatly. Students were most biased for problems that they perceived to be controllable and when they thought (correctly or incorrectly) that they were free from risk if the health problems had not already appeared.

Several other health problem attributes had significant correlations with optimistic bias. One of these (own worry) seems more likely to be a result of feelings of vulnerability than to be a cause of these feelings. Three other dimensions (perceived probability, experience, and seriousness) failed to survive the more conservative test of multiple regression analysis. Additional calculations, however, showed that experience with harm increases feelings of vulnerability. Consequently, it does appear that events experienced frequently are less likely to be associated with optimistic biases.

In general, the evidence of this and previous research (Weinstein, 1980; Weinstein and Lachendro, 1982) indicates that optimism arises because people give themselves credit for factors in their favor (perhaps exaggerating these factors or showing bias in the factors they consider) but fail to give similar credit to others. Yet only certain types of risk factors

produce optimistic biases. Genetic factors determine risk status for some health problems, but people are apparently able to recognize that their own heredity is not necessarily an advantage. Because there is no general tendency to see hereditary factors as grounds for optimism, we find no correlation between the perceived role of heredity and the degree of optimistic bias. Similarly, people appear to be capable of seeing their environment as an asset or a liability.

On the other hand, people appear to believe that their self-protective actions are more extensive or more effective than the actions taken by others. Consequently, the more the occurrence of a health problem is seen as being controlled by such actions, the more unrealistic people are. This biased perception of one's own efforts is consistent with a substantial body of research (Miller and Ross, 1975; Weary, 1978; Zuckerman, 1979), showing that people are reluctant to take responsibility for poor performance. They attribute failure to factors that are not under their control, such as chance or task difficulty, rather than to their own actions.

There are several mechanisms that might produce exaggerated confidence in our own actions: (1) we might be unaware or only partially aware of the self-protective activities of others; (2) we might fail to think very carefully about others' activities because of our egocentrism; (3) we might overestimate the effectiveness of our own actions or belittle the actions of others; and (4) we might selectively recall our risk-reducing rather than our risk-increasing actions. Previous research (Weinstein and Lachendro, 1982) has shown that egocentrism is one contributor to unrealistic optimism (providing a mechanism by which lack of experience with a health problem and beliefs in early appearance could increase optimistic biases), but the present study was not designed to decide which of these many processes are involved. Clearly, different mechanisms suggest different ways of reducing optimistic biases.

The data provided little support for the idea that optimistic biases result from defensive denial. The degree of threat posed by different health risks was not particularly important in stimulating unrealistic optimism. Optimism did increase with event seriousness; both the simple correlation and the multiple regression coefficient were significant or marginally significant, but they were small. Furthermore, the correlation with *others' worry,* a variable designed to assess more directly the degree of threat presented by each health problem, was near zero.

Denial stimulated by the threat of illness or physical harm should vary with the degree of threat. But this source of denial may be uncommon in young, relatively healthy adults. In fact, such defensive denial may occur mainly when people already have reasons for believing that they *are* vulnerable. In such circumstances, defensiveness might diminish feelings of vulnerability but would not necessarily lead to outright optimism.

A different type of ego-defensive process—self-esteem enhancement—seems to provide a better fit to many of the present results. It may be important to our self-esteem to believe that we are healthier than others, and we may find it difficult to admit that our risk is above average for any problem, blister or heart attack (cf. Goethals and Darley, 1977). The unrealistic optimism observed here may, at least in part, be an example of the general desire to believe that we are better than average (Myers and Ridl, 1979; Svenson, 1981).

The data are consistent with this perspective. Subjects were apparently realistic (or at least not consistently biased) about personal risk factors such as heredity and environment that are not likely to diminish feelings of self-esteem. In contrast, it seems that self-esteem would be threatened by admitting that one's self-protective actions are inadequate, and the important role of perceived control in our results suggests that students were consistently biased about such actions.

Unrealistic Optimism and Self-Protection Motivation

Although previous research (Weinstein, 1980) had demonstrated the existence of unrealistic optimism about future risks, the present investigation goes further in linking this optimism to self-protection. Risk features expected to be important from a rational model of human behavior—severity, perceived probability for peers, relative probability compared to peers—all made significant contributions to explaining variations in the self-reported motivation to take precautions against different threats. Yet worry about the threat was also very important. A three-variable equation containing seriousness, perceived probability, and own worry explained 83% of the variation in reported risk reduction motivation for our wide-ranging set of health issues.

Since past investigators have argued about the relative importance of rational and emotional factors in motivating action, but have not utilized research designs that could separate these factors, the present data are unique. They suggest that rational factors *are* important: risk reduction motivation varies with beliefs about risk likelihood and severity even when worry is held constant. Yet they indicate that emotional factors *also* play a significant role—interest in risk reduction varies with worry even when perceived risk severity and likelihood are held constant. In addition, the present findings support the folk belief that unrealistic optimism reduces the motivation to take precautions, suggesting that it acts indirectly by influencing the amount people worry about a potential problem.

It is important to recognize that worry is not simply a reflection of rational factors related to the expected magnitude of harm. Although subjects were less worried when they thought their own chances were much less than their peers, it was not clear that risk severity or perceived frequency of the health problem had much influence on worry. Instead, worry was closely related to the number of risk factors subjects were aware of, perhaps because the more risk factors there are, the more difficult it is to protect oneself. One can easily think of other factors—vividness of a threat, frequency of reminders, time till onset—that would influence emotional reactions, and hence interest in risk reduction, without necessarily affecting beliefs about expected harm.

CONCLUSION

Because this research used a specific sample of young, generally healthy college students, we must be very cautious in generalizing to any other groups. The amount of unrealistic optimism and the types of threats that evoke optimism may vary greatly as a function of age, socioeconomic background, and health status. Nevertheless, the optimistic biases observed in several studies employing much broader samples (Harris and Guten, 1979; Kirscht *et al.*, 1966; Robertson, 1977) give us some confidence that unrealistic optimism about vulnerability to harm is not restricted to young adults.

If, as we believe, the realization that one's own risk is above average is a powerful motivator for change (cf. Baric, 1969), health promotion and safety campaigns need procedures that will lead people to recognize their actual risk status. Research that clarifies the processes that produce unrealistic optimism should help by suggesting strategies to eliminate these biases.

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