Optimistic Bias

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Definition and History

Optimistic bias is commonly defined as the **mistaken belief** that one's chances of experiencing a negative event are lower (or a positive event higher) than that of one's peers. The bias was first demonstrated by Weinstein (1980), who reported that a majority of college students believed their chances of events such as divorce and having a drinking problem to be lower than that of other students, and their chances of events such as owning their own home and living past 80 years of age to be higher than that of other students. Because a majority of individuals in a group cannot be above (or below) the mean unless the distribution is highly skewed, these findings represented a bias at the level of the group. Other terms representing the same construct include **"unrealistic optimism," "illusion of invulnerability," "illusion of unique invulnerability," "optimism bias," and "personal fable."** It is also possible to be optimistically biased by being overconfident about the objective chances of experiencing a positive event (or avoiding a negative event), irrespective of how one's chances compare with those of one's peers. As noted later, optimistic bias has been more frequently defined using the comparative definition above due to greater methodological ease.

Subsequent work has attempted to evaluate the prevalence of this bias as well as its determinants and moderators. Optimistic bias has been demonstrated across a wide variety of positive and negative events, with most work focusing on health problems such as lung cancer, HIV infection, and alcoholism (for reviews see Helweg-Larsen & Shepperd, 2001; Hoorens, 1993; Klein & Weinstein, 1997). The bias appears in a wide variety of disparate samples including adolescents (Quadrel, Fischhoff, & Davis, 1993), community residents of varying age and socioeconomic status (Weinstein, 1987), prostitutes (van der Velde, van der Pligt, & Hooykaas, 1994), women marines (Gerrard, Gibbons, & Warner, 1991), and smokers (Weinstein, 1998).

Optimistic biases are more likely to emerge for events that are controllable (Klein & Helweg-Larsen, 2002) and for which people have stereotypes of the typical person who experiences the event (Weinstein, 1980). In addition, the bias is more likely to occur when people compare themselves with aggregated comparison targets such as “the average person” than with more individualized comparison targets such as a friend or even a randomly chosen person (Alicke, Klotz, Breitenbecher, Yurak, & Vredenburg, 1995). People also hold similarly self-serving beliefs about their risk-related behaviors such as diet and alcohol consumption (Suls, Wan, & Sanders, 1988).

What causes optimistic bias? Some of the optimistic bias may be attributed to cognitive factors. When comparing their risk to that of others, **people are egocentric** in that they focus more on their own risk factors than on those of the peers to whom they are comparing (Chambers & Windschitl, 2004); indeed, reducing such egocentrism seems to dampen the bias (Weinstein, 1983), and this egocentrism may lead people to be unrealistically *pessimistic* about rare positive events or common negative events (e.g., Chambers, Windschitl, & Suls, 2003; Kruger & Burrus, 2004). People also seem to **focus on base-rate information** rather than individual risk factors when judging the risk of their peers (Klar, Medding, & Sarel, 1996), and they may come to see any individual member of a group as discrepant because they compare individuals to general rather than local standards (Klar, 2002).

However, there are also reasons to believe that optimistic biases derive from **motivational causes** such as a need to protect self-esteem because people engage in numerous strategies to protect these and related beliefs when challenged (e.g., Boney-McCoy, Gibbons, & Gerrard, 1999; Croyle, Sun, & Louie, 1993; Gerrard, Gibbons, Benthin, & Hesling, 1996; Klein & Weinstein, 1997; Kunda, 1987), making optimistically biased judgments highly resistant to change (Weinstein & Klein, 1995). Emotion also plays a role; for example, people are more likely to be optimistically biased when angry and less likely when fearful or sad (Lerner & Keltner, 2001; Salovey & Birnbaum, 1989).

Importance in health behavior models. Perceived vulnerability is a key component of many health behavior models including the **Health Belief Model** (Janz & Becker, 1984), **Protection Motivation Theory** (Rogers, 1983), the **Precaution Adoption Process Model** (Weinstein, 1988), and the **Prototype/Willingness Model** (Gibbons, Gerrard, & Lane, 2003). Based on these models, if people underestimate their risk of experiencing a negative health outcome, they will be less likely to take precautions to prevent that outcome from occurring. Thus, given that optimistic biases represent an underestimation of risk, it may be argued that such biases are maladaptive. However, a different line of research suggests that positive illusions such as the optimistic bias may be adaptive because they promote motivation and discourage placidity (Armor & Taylor, 1998). The notion that underestimations of risk may either hinder or promote precautionary behavior may explain why risk perceptions are often only moderately predictive of behavior (Gerrard, Gibbons, & Bushman, 1996; McCaul, Branstetter, Schroeder, & Glasgow, 1996). It is likely that optimistic biases have differential effects on health behavior depending on many variables that have yet to be identified, providing a fruitful area of future research.

Measurement and Methodological Issues

Bias at the group level. The simplest method of establishing an optimistic bias (see Appendix A) is to ask a sample of individuals to estimate their risk relative to that of other members of the sample (or the population from which that sample is taken). This is called the "direct" method of elicitation. For example, a respondent might be asked to "compare your risk with that of the average person of your age and sex" on a scale that ranges from "below average" to "above average" with "average" as the midpoint. Investigators have generally used odd-numbered scales (e.g., 5-pt. or 7-pt. scales) to ensure that "average" is in the middle of the scale. If the mean response is higher or lower than this midpoint, one has demonstrated an optimistic bias (assuming that the sample is fully representative of the reference group, and that actual risk is not highly skewed). One might also ask respondents to compare others' risk to their own risk, which turns out to elicit less bias (Otten & van der Pligt, 1996).

Another approach is to ask participants to make two judgments – an estimate of their own risk (on a likelihood scale, for example), and an estimate of the risk of the average peer (see Appendix A). These ratings can then be subtracted, and if the mean difference is not zero, a bias can be said to exist. This is called the "indirect" method of measuring optimistic bias. The attractiveness of such an approach is that it is possible to assess whether a given moderator influences estimates of personal risk or the comparative target's risk. In a review of studies using the indirect method, Helweg-Larsen & Shepperd (2001) showed that negative affect influences personal risk estimates whereas positive affect influences target risk estimates, a finding that would have been obscured had comparative risk not been assessed with separate items. Finally, separate samples can be asked to make the two judgments; for example, Weinstein, Marcus, & Moser (2005) asked separate groups of smokers to estimate their own or other smokers' risks of experiencing tobacco-related illnesses, and again observed an optimistic bias when assessing the difference in estimates between the two groups. Interestingly, some studies show that the magnitude of bias is greater when using the direct method (e.g., Goszsczyska & Roskan, 1989) yet others show the opposite pattern (e.g., Sutton, 2002)

Bias at the individual level. Although the above methods are effective when evaluating optimistic bias at the level of the group, they cannot be used to determine *which* members of a group are biased. A woman who believes her risk of breast cancer is below average, for example, may be quite accurate if she has no risk factors for breast cancer. In fact, this woman may be unrealistically pessimistic if her comparative risk is even more below average than she thinks it is. It is important to be able to identify which members of a sample are biased, however, in order to determine whether biases are correlated with other individual-level variables such as personality and behavior (see Appendix A). Many studies attempting to link optimistic biases and related "positive illusions" with other variables such as health behavior simply define bias as a tendency to make self-serving judgments, without taking the important step of assessing the accuracy of these judgments. Consequently, although we know that optimistic beliefs are related to precautionary behaviors and ultimately to a more adaptive psychophysiological profile (e.g., Taylor, Lerner, Sherman, Sage, & McDowell, 2003), we do not have sufficient data to determine whether such beliefs are adaptive when they are illusory.

A small number of studies have attempted to use **objective criteria** to assess individual bias. Several of these studies use experimenter-initiated models to determine which members of the sample are at higher risk (e.g., Gerrard & Luus, 1995; Wiebe & Black, 1997). Others use "risk engines" to compute a person's risk based on epidemiological models (which are built from large epidemiological data sets such as the Framingham study) and then determine how participants' estimates compare with values computed by these risk engines (e.g., Kreuter & Strecher, 1995; Radcliffe & Klein, 2002). Very few studies measure actual outcomes to determine accuracy, and such studies are needed. In one example, college students estimated their comparative risk of having unplanned sexual intercourse in the next year, and reported six months later whether such an event had occurred (Klein, Geaghan, & MacDonald, 2005).

Absolute vs. comparative optimistic bias. There is no reason, of course, to limit optimistic biases to comparative beliefs. The use of a comparative measure was initially based on the ease of demonstrating optimistic bias at the group level (Weinstein, 1980). However, if a man predicts that he will not get prostate cancer and then he does, he would clearly be optimistically biased. Similarly, most HIV-seropositive individuals who do not believe they will succumb to AIDS are optimistically biased (Taylor, Kemeny, Aspinwall, Schneider, Rodriguez, & Herbert, 1992). Whether an investigator measures optimistic bias based on **comparative or absolute measures** should depend on the hypothesis being tested. For example, given findings that comparative risk perceptions are more predictive than absolute risk perceptions of colorectal cancer screening (Blalock, DeVellis, Sandler, & Afifi, 1990), research on screening behaviors may benefit from the use of comparative measures. Absolute and comparative risk perceptions are not redundant; each explains independent variance in worry, behavior, and other related constructs (Lipkus et al., 2000).

Cross-sectional and prospective designs. An important methodological issue one faces when attempting to link optimistic biases with other constructs such as risk-reducing behavior is the type of design in which these constructs are measured. Assessing any type of risk perception and behavior in a cross-sectional design makes it difficult to determine whether bias influences behavior, behavior influences bias (or both), or whether a third variable (such as education or negative affectivity) influences both (Gerrard et al., 1996; Weinstein, Rothman, & Nicolich, 1998). The same problem applies when attempting to link biased risk perceptions with other constructs. Although there is now a growing literature using prospective designs to assess the link between risk perceptions and behavior, very few of these studies evaluate the accuracy of these risk perceptions.

Reliability. Given the difficulty of measuring optimistic biases at the level of the individual, there are few if any studies that determine the **test-retest reliability** of optimistically biased judgments. Moreover, because bias is usually established for single events, no data are available to determine whether bias is consistent across multiple events, so there are no published scales that measure a general form of the optimistic bias. Although some studies have collapsed comparative ratings across multiple events based on high reliability coefficients and identified the collapsed index as a generalized measure of optimistic bias (e.g., Davidson & Prkachin, 1997; Taylor et al., 2003), these measures are better characterized as generalized risk beliefs rather than *biased* risk beliefs per se. However, it is worth noting that comparative risk judgments have been shown to be reliable over time (Shepperd, Helweg-Larsen, & Ortega, 2003), suggesting that biases in these judgment may also be reliable.

Utility of construct

Most research has investigated optimistic biases at the group level, which has been sufficient given the predominant focus on which types of events, comparative targets, and other factors elicit the most bias. However, in order to establish the utility of this construct in the domain of health, it is necessary to measure optimistic bias at the level of the individual. Given the difficulties of doing so, research taking this approach is in its infancy. For the most part, the evidence so far suggests that optimistic biases may be harmful.

Several studies show that optimistically biased individuals know less about health threats (Radcliffe & Klein, 2002), are less attentive and more defensive in response to new health information (Avis, Smith, & McKinlay, 1989; Radcliffe & Klein, 2002; Wiebe & Black, 1997), and endorse myths such as the notion that lung cancer risk is influenced substantially more by genetics than by smoking (Dillard, McCaul, & Klein, 2005). These studies typically control for obvious confounds such as educational level. Other studies have shown that optimistically biased individuals may have higher risk factors for disease such as smoking (Strecher, Kreuter, & Kobrin, 1995) and high cholesterol (Radcliffe & Klein, 2002).

Perhaps most importantly, many studies show that optimistically biased individuals engage in more risk-increasing behaviors such as unprotected sexual intercourse (Burger & Burns, 1988) and alcohol abuse (Klein et al., 2005); one study using a national sample found that optimistically biased smokers were less likely to intend to quit (Dillard et al., 2005). Importantly, one study showed that HIV seropositive individuals who were optimistically biased about their AIDS risk engaged in *more* health-protective behaviors (Taylor et al., 1992), suggesting again that there may be several other factors that determine whether optimistic biases lead to risk-increasing or risk-decreasing behavior. For example, optimistic biases may be more adaptive when health outcomes are reversible, and when the individuals are already coping with a medical problem (Klein & Steers-Wentzell, in press). Importantly, most of these studies are correlational, making it difficult to pinpoint optimistically biased risk perceptions as a direct cause of behavior.

Related constructs

Optimistic biases are thought to represent one example of an array of self-serving beliefs that may influence behavior including the **illusion of control** (Langer, 1975), the **better-than-**

average effect (e.g., Alicke et al., 1995), and the **uniqueness bias** (Goethals, Messick, & Allison, 1991). People who overestimate their ability to control an outcome may engage in more risky decisions and behaviors (Klein & Kunda, 1994). Perceptions of control and self-efficacy represent key components of many models such as Social Cognitive Theory (Bandura, 2001) and the Theory of Planned Behavior (Ajzen, 1991), highlighting the importance that biases in control and efficacy beliefs might play in health behavior.

It is notable that optimistic beliefs and health threats seem to be only weakly associated with **dispositional optimism** (e.g., Goodman, Chesney, & Tipton, 1995; Taylor et al., 1992), including when these optimistic beliefs are biased (Radcliffe & Klein, 2002). There is some evidence that dispositional optimism may interact with optimistic bias to magnify the detrimental effect of bias on information processing (Davidson & Prkachin, 1997), although in this study optimistic bias was measured as a sum of risk estimates across several events without use of an accuracy criterion. Generally, people who are high in dispositional optimism (or a health-specific form of optimism) are more knowledgeable, less defensive in response to health information, and in better health (Aspinwall & Brunhart, 1996; Scheier & Carver, 1992), suggesting that dispositional optimism and optimistic biases may have opposing effects (Radcliffe & Klein, 2002).

Conclusions

Although much research has investigated the underlying causes and moderators of optimistic biases, less work has addressed how optimistically biased beliefs are related to health information processing, behavior, and physical health outcomes. Moreover, methodological problems make it difficult to determine how biases in risk perceptions influence these outcomes relative to other constructs in health behavior models such as attitudes and self-efficacy

(Weinstein, 2005) as well as less traditional constructs like affect (McCaul & Mullens, 2003). In order to properly assess the impact of optimistic biases, it is important to use accuracy criteria that identify optimistic biases at the level of the individual. The increasing availability of risk engines such as the Harvard Risk Index (Colditz et al., 2000) and the use of prospective designs should facilitate research taking this approach.

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Appendix A
Suggested Scales to Measure Optimistic Biases

Optimistic Bias at the Group Level

To establish an optimistic bias at the level of the group, one might use a version of the following direct comparative question and then determine whether the mean response deviates from the midpoint:

1. How do you think your chances of getting lung cancer compare with those of the average smoker of your age and sex? Your chances are:

1	2	3	4	5	6	7
much lower than average			average			much higher than average

One could also ask a standard risk perception question, yet have respondents answer the question for both themselves and others in two separate items. A difference score deviating from zero would suggest an optimistic bias. Some risk perception scales elicit perceptions of numerical risk such as the following:

2a. Suppose you had to estimate your chances of getting lung cancer on a percentage scale. What would your estimate be? You can give any number between 0% and 100%. Please try to be as exact as possible, and use any number between 0% and 100%.

2b. Using the same scale, what would you estimate the risk of the average smoker to be?

One problem with the preceding questions is that many people might respond with "50%" because they view such a response as equivalent to "unsure." Thus, a more exact approach is to give participants a graduated nonlinear scale such as the following:

.1 .2 .3 .4 .5 .6 .7 .8 .9   1 2 3 4 5 6 7 8 9 10   15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

People have a great deal of difficulty working with numerical information, so it is important not to make too much of their response to any one item. For example, most individuals greatly overestimate the risk of rare hazards. However, if we assume that people use the scale similarly when comparing ratings of their own risk with that of a comparative target, the difference score in these ratings should be a good indication of their perception of risk. One can also get around the difficulties with numerical information by having participants use scales with verbal scale points such as:

3. How likely do you think you are to get lung cancer at some point in the future?

1	2	3	4	5
not at all likely	somewhat likely	fairly likely	very likely	extremely likely

A disadvantage with this approach is that people's use of verbal labels (and the way in which they map verbal labels onto numerical risk) varies considerably. Fortunately, given that establishment of optimistic bias only requires the computation of a difference score between estimates of own risk and others' risk, this is less of a problem when measuring optimistic bias at the group level than when measuring it at the individual level. Scales such as these vary a great deal in the number of scale points and use of scale labels, so the above items are mere examples.

In lieu of having participants answer these items for both own risk and others' risk, one can also have separate samples answer the two items to ensure that responses to one item do not influence responses to the other item (although evidence of such a carryover effect is mixed, with only a handful of studies reporting such effects, e.g., Hoorens & Buunk, 1993).

For all items, identification of the comparative target is important, given that bias occurs for some targets (e.g., the average peer) and not others (e.g., a close friend).

Optimistic Bias at the Individual Level

In order to establish optimistic bias at the individual level, one must use a scale for which there is a credible criterion for accuracy. The numerical items above (#2a and #2b) are problematic because of people's misuse and misunderstanding of numerical information and particularly small probabilities; most people will appear to be unrealistically *pessimistic* because they overestimate small risks. If numerical information is to be used, it is helpful to "anchor" participants by telling them the numerical risks of other, similar hazards, and by using the graduated scale above rather than an open-ended "0-100%" scale.

Several investigators have used the comparative item (#1) instead, because there are several risk engines that can compute a person's comparative risk of having a particular problem. For example, one can ask participants to estimate their comparative risk of heart disease and then use the risk engine at www.yourdiseaserisk.harvard.edu to compute the person's actual comparative risk. Usually people are categorized as believing their risk is below average, average, or above average (irrespective of the number of scale points) and are similarly categorized with respect to actual risk. Of course, this approach makes it impossible to identify some groups of individuals, such as those who believe their risk is only slightly above average when in fact it is well above average. To deal with this problem, one can ask participants to estimate the numerical magnitude of their comparative risk (e.g., 50% lower than average, 10% higher than average), and check the accuracy of this estimate using a risk engine that provides numerical comparative risk (as in many Health Risk Appraisals). In this case, it is conventional to allow some margin of error; for example, Kreuter and Strecher (1995) allowed a 10% margin of error when categorizing participants as optimistically biased or not. Of course, a weakness of this approach is people's difficulty with the use of percentages and other numerical information.

When actual event data are available, it is easiest to simply ask participants whether an event will occur (or whether they are more or less likely than others to experience the event) and then follow up to determine whether the event does or does not occur.