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A Primer on Unrealistic Optimism

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Abstract

People display unrealistic optimism in their predictions about countless events, believing that their personal future outcomes will be more desirable than can possibly be true. We summarize the vast literature on unrealistic optimism by focusing on four broad questions: What is unrealistic optimism, when does it occur, why does it occur, and what are its consequences? Unrealistic optimism can be operationalized in multiple ways; is commonplace yet has well-established boundary conditions; occurs for a variety of reasons; and has consequences for affect, decision making, and behavior.

Keywords

unrealistic optimism, comparative optimism, optimistic bias, risk judgments, risk perception

People tend to display a remarkable propensity toward excessive optimism, predicting futures that are often quite unrealistically positive. Researchers have documented this unrealistic optimism in over a thousand studies and for a diverse array of undesirable events, including diseases, natural disasters, and a host of other events ranging from unwanted pregnancies and home radon contamination to the end of romantic relationships (Shepperd, Klein, Waters, & Weinstein, 2013). The same optimistic propensity appears for desirable events, such as graduating from college, getting married, and having favorable medical outcomes (e.g., Weinstein, 1980). In this brief primer, we address four questions: What is unrealistic optimism? When do people display unrealistic optimism? Why do people display unrealistic optimism? And what are the consequences of unrealistic optimism? This primer is designed to provide a snapshot of the field 35 years after the publication of the article that introduced the term *unrealistic optimism* (Weinstein, 1980).

What Is Unrealistic Optimism?

People are considered unrealistically optimistic if they predict that a personal future outcome will be more favorable than that suggested by a relevant, objective standard. Unrealistic optimism also occurs when people unduly predict that their personal outcomes will be more favorable than the outcomes of their peers (Shepperd et al., 2013). The concept is distinct both empirically (Davidson & Prkachin, 1997) and conceptually from *dispositional optimism*, a personality trait representing generally positive expectations about the future.

Researchers distinguish between two types of unrealistic optimism that differ in the standard against which personal predictions are compared (Shepperd et al., 2013). The first type is *unrealistic absolute optimism*, which refers to an unjustified belief that a personal outcome will be more favorable than the outcomes indicated by a quantitative objective standard (e.g., epidemiological or base-rate data). Researchers have operationalized unrealistic absolute optimism in a number of ways. For example, several studies have compared personal predictions with actual outcomes, such as exam grades or starting salaries after college graduation (Shepperd, Ouellette, & Fernandez, 1996). Other studies have demonstrated that financial advisors are overly optimistic in their economic predictions (Calderon, 1993) and that people in general are quite unrealistic in their estimates of the time it will take to complete a task

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(Newby-Clark, Ross, Buehler, Koehler, & Griffin, 2000), a misjudgment known as the *planning fallacy*. Investigations have also operationalized unrealistic absolute optimism by comparing people's estimates with population base rates. For example, field measurements revealed that 73% of homes in Columbus, Ohio, had elevated radon levels. Yet area homeowners estimated only a 27% chance that their own home would have a radon problem (Weinstein & Lyon, 1999). Researchers have shown similar patterns of unrealistic optimism in people's estimates of their likelihood of experiencing a divorce, contracting a sexually transmitted disease, or having an unplanned pregnancy (e.g., Rothman, Klein, & Weinstein, 1996).

The second type of unrealistic optimism is *unrealistic comparative optimism*, which refers to the erroneous estimate that one's personal outcomes will be more favorable than the outcomes of one's peers. Researchers have operationalized unrealistic comparative optimism in two ways. In the first, an individual incorrectly judges that his or her risk is less than that of other people. For example, participants in one study estimated whether they were more likely, less likely, or equally likely to have a fatal heart attack relative to the average person. The researchers then compared these estimates with the predictions of an epidemiologically based personalized heart-attack risk-assessment algorithm to determine whether participants were indeed more, less, or equally likely to have a fatal heart attack compared with the average person. The comparison revealed that 56% of participants were unrealistically optimistic, 25% were unrealistically pessimistic, and 19% were accurate (Radcliffe & Klein, 2002). Other studies have revealed similar findings for breast cancer (Waters et al., 2011) and smoking-related diseases (Ayanian & Cleary, 1999).

The second way to operationalize unrealistic comparative optimism involves identifying whether a group of people, rather than a specific individual, is unrealistically optimistic. This approach assumes that a group is displaying accuracy if the mean of all their individual comparative-risk judgments for a particular outcome is "average." The rationale is that at the group level, people who report below-average risk should be balanced by people reporting above average-risk, if they are all being accurate. The group is displaying unrealistic optimism if the mean estimate is significantly lower than "average." Most research examining unrealistic optimism has used this approach and has repeatedly demonstrated unrealistic comparative optimism. Unrealistic comparative optimism persists even when controlling for methodological factors such as the nature of the sample and the scale used to examine comparative-risk judgments (Shepperd et al., 2013).

Although unrealistic absolute and unrealistic comparative optimism differ operationally and conceptually, they are likely positively correlated in some instances. Nevertheless, evidence suggests that they may vary in their causes, prevalence, and potential effects (see Shepperd et al., 2013, for more detail).

When Do People Display Unrealistic Optimism?

People are not unrealistically optimistic at all times or for all events (Harris, Griffin, & Murray, 2008). For example, people often show less unrealistic comparative optimism when estimating their chances of experiencing negative events that occur frequently in the population (Chambers, Windschitl, & Suls, 2003). Why? It appears that people often consider their own circumstances and risk-relevant behaviors yet neglect the circumstances and behaviors of others. Put simply, people reason that a common negative outcome is likely to happen to them and, thus, is more likely to happen to them than to other people. They overlook the fact that the outcome is also likely to happen to other people.

In addition, people are less likely to display unrealistic optimism for events that they perceive to be beyond their control (C. T. F. Klein & Helweg-Larsen, 2002). Perceiving control over an outcome allows people to base their predictions on their plans and intentions (e.g., intentions to exercise, diet, stop smoking, etc.). When people perceive that they have no control over an outcome, there is less they can point to that justifies optimism. Indeed, anything that serves to constrain predictions reduces unrealistic optimism. For instance, people display less unrealistic optimism when they believe their estimates might be challenged, particularly in the near future (Carroll, Sweeny, & Shepperd, 2006); when they receive base-rate information about an event (Rothman et al., 1996); and when they have prior experience with an event. Finally, people who have previously experienced an unfavorable outcome are less optimistic about their chances of avoiding a recurrence (see Helweg-Larsen & Shepperd, 2001). Although unrealistic optimism can vary with situational factors, it also seems resistant to interventions designed to reduce it (Weinstein & Klein, 1995).

Why Are People Unrealistically Optimistic?

Unrealistic optimism has many causes, making it a robust and widespread phenomenon. These causes fall into three broad categories (Shepperd, Carroll, Grace, & Terry, 2002). The first is that people are motivated to believe, or to have others believe (Tyler & Rosier, 2009), that they

are unlikely to experience unfavorable outcomes. For example, the desire to feel good may motivate people to be unrealistically optimistic in their personal predictions. Moreover, evidence suggests that people believe that they should be unrealistically optimistic—in other words, people believe that it is better to be unrealistically optimistic than accurate or pessimistic in personal predictions (Armor, Massey, & Sackett, 2008).

The second reason for unrealistic optimism is that people possess different (and often more) information about themselves than about the average person. People know their personal history and their plans and intentions, and they use this information when calculating their chances of experiencing an outcome. However, they lack this information about others. Importantly, when researchers provide study participants with pertinent information about others, the participants seem to realize that they are not so different, and their unrealistic optimism declines (Epley & Dunning, 2000). In a related vein, people show something called the *person-positivity bias*—a tendency to evaluate a target more favorably the more it resembles a specific, visualizable human being (Sears, 1983). In the typical demonstration of unrealistic optimism, the comparison target is "the average person your age," which is less humanlike (i.e., more vague) than a specific target such as the self and is thus rated as more likely to experience unfavorable outcomes (Regan, Snyder, & Kassin, 1995).

Finally, unrealistic optimism can be a natural consequence of the way people process information. Two processes bear mentioning. The first is the *representativeness heuristic* (Tversky, 1977), whereby people judge their likelihood of experiencing an event on the basis of how well they match their stereotype of the people who experience the event. For example, when people are asked to estimate their risk of getting in an automobile accident relative to the average driver, the question itself seems to prompt them to think about someone who drives too fast, mixes alcohol and driving, and is inattentive to other drivers (Perloff & Fetzer, 1986). In comparison to this prototype, people naturally conclude that their risk is lower.

The second process is the tendency for people to transform a comparative judgment into a personal judgment. When asked to compare their risk to that of the average person, people sometimes merely consider their personal risk, transforming the comparative-risk judgment into a personal-risk judgment with no clear reference group. They infer that if their risk is low, it must be lower than the risk of others. Supporting this explanation is evidence that people rely primarily on information about the self when making comparative judgments (e.g., Eiser, Pahl, & Prins, 2001).

Some researchers have argued that unrealistic optimism is not a bias if it arises from the second and third explanations we have described (Hahn & Harris, 2014). Yet whether one labels unrealistic optimism as a bias or as something else does not negate the larger point that unrealistic optimism occurs reliably in clearly identified situations and for several empirically demonstrated reasons—and, as we discuss below, has real consequences.

What Are the Consequences of Unrealistic Optimism?

Both unrealistic absolute optimism and unrealistic comparative optimism can have significant consequences for affect, decision making, and behavior. For example, research shows that unrealistic absolute optimism can lead to misplaced hope. In one study, over 60% of participants in a Phase 1 clinical cancer trial believed that they were more likely than the other trial participants to experience health benefits from the trial (Jansen et al., 2011). This optimism occurred even though patients knew that the trial was only examining the feasibility of a future randomized trial and that the treatment was unlikely to offer health benefits to any participants. Other research has revealed that unrealistic absolute optimism leads to disappointment, regret, and other problems when outcomes fall short of expectations (Carroll et al., 2006). For example, college students who were unrealistically optimistic about their performance on an exam reported increases in negative affect after receiving their exam score, whereas realistic and pessimistic students reported a decrease in negative affect after receiving their score (Sweeny & Shepperd, 2010). Furthermore, college students who displayed unrealistic absolute optimism about their academic performance suffered declines in self-esteem and well-being over time (Robins & Beer, 2001).

Research also shows that unrealistic absolute optimism can have behavioral consequences. For example, smokers typically overestimate their ability to quit smoking if and when they decide to quit (Weinstein, 2001), which may lead them to persist in smoking well beyond the time it becomes an entrenched behavior. Relatedly, smokers who displayed unrealistic absolute optimism reported lower intentions to quit smoking (Dillard, McCaul, & Klein, 2006). Other research has revealed that people inadequately plan for and allocate time to complete tasks, which in turn can lead to a host of problems (Newby-Clark et al., 2000). Still other studies have shown that people who are unrealistically optimistic about paying off credit card debt make poorer decisions about credit card features, opting for cards with lower annual fees rather than lower interest rates (Yang, Markoczy, & Qi, 2007).

A growing number of studies suggest that unrealistic comparative optimism can also be problematic for behavior. For example, participants in one study who displayed unrealistic comparative optimism wagered more money on the outcome of a trivia test (Moore & Small, 2007). Another study found that among college freshmen, greater unrealistic optimism about avoiding alcohol-related problems corresponded with greater alcohol consumption 1 year later (Dillard, Midboe, & Klein, 2009). And a third study found that people who were unrealistically optimistic about avoiding the H1N1 virus reported lower intentions to wash their hands and use hand sanitizers (Kim & Niederdeppe, 2013).

Unrealistic optimism is not always problematic. Positive outcome expectations sometimes foster goal persistence, positive affect, and hope (Armor & Taylor, 1998), although these benefits may be unproductive if the outcome is largely uncontrollable. Because unrealistic optimism represents a positive outcome expectation, it may have similar effects. A recent study, for example, found that cardiac patients who reported greater unrealistic comparative optimism about their future cardiac risk (i.e., they reported that they were at less risk than the typical person who experienced the same cardiac event to have another cardiac event) were less likely to experience a cardiac event over the next 12 months (Hevey, McGee, & Horgan, 2014). In addition, a study of HIV-infected men revealed that greater unrealistic optimism about one's chances of developing AIDS corresponded with more healthful behavior (Taylor et al., 1992). Critically, we have a limited understanding of when unrealistic optimism is beneficial versus problematic, but we suspect that it may be beneficial for people who are already actively coping with a problem and for events that are temporally distal rather than proximal (W. M. P. Klein & Zajac, 2009).

Whether the consequences are positive or negative may also depend on the time considered. The consequences of unrealistic optimism are likely innocuous or even positive in the short run (e.g., reduced anxiety, persistence toward goals) but negative in the long run (e.g., increased likelihood of negative outcomes due to increased risk behavior, failure to take precautions, or insufficient preparation). Perhaps nowhere are the long-term negative consequences more apparent than in research on planning fallacy (Newby-Clark et al., 2000).

It is important to keep in mind that most studies about unrealistic comparative optimism are correlational and cross-sectional, which makes it impossible to determine whether the behaviors linked to unrealistic optimism are a consequence of the optimism. Low perceived risk may not increase risky behavior; rather, people may feel that their risk is low because they take precautions. It is also possible that some third variable (e.g., dispositional optimism, ignorance of an important risk factor, overestimation of personal control) is causing both the unrealistic optimism and the risky behavior.

Conclusion

In the past three and a half decades, we have gained a clearer understanding of when and why unrealistic optimism occurs and how it manifests itself. We now know that unrealistic comparative optimism may arise from an error in personal-outcome estimates, an error in the outcome estimates made on behalf of others, or both. Although unrealistic optimism is pervasive, people are less likely to display unrealistic optimism for uncontrollable and common events, when they have base-rate information, and when they believe that their predictions might be challenged, particularly in the near future. We also know that unrealistic optimism has no single cause. Although it is sometimes motivated by personal goals such as self-enhancement or impression management, it also can arise from errors in the way people process information as well as from differences in the information people have about themselves versus the comparison standard. Finally, we know that unrealistic optimism can be more than just an interesting phenomenon in questionnaire ratings. It can have important, and sometimes harmful, consequences for people's futures.

Recommended Reading

Shepperd, J. A., Klein, W. M. P., Waters, E. A., & Weinstein, N. D. (2013). Taking stock of unrealistic optimism. *Perspectives on Psychological Science*, *8*, 395–411. doi:10.1177/1745691613485247. Provides a detailed review of three decades of research on unrealistic optimism and responds to recent methodological criticisms of the field.

Declaration of Conflicting Interests

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References

Armor, D. A., Massey, C., & Sackett, A. M. (2008). Prescribed optimism: Is it right to be wrong about the future? *Psychological Science*, *19*, 329–331. doi:10.1111/j.1467-9280.2008.02089.x

Armor, D. A., & Taylor, S. E. (1998). Situated optimism: Specific outcome expectancies and self-regulation. In M. P. Zanna

(Ed.), *Advances in experimental social psychology* (Vol. 30, pp. 309–379). New York, NY: Academic Press.

Ayanian, J. Z., & Cleary, P. D. (1999). Perceived risks of heart disease and cancer among cigarette smokers. *Journal of the American Medical Association*, *281*, 1019–1021. doi:10.1001/jama.281.11.1019

Calderon, T. G. (1993). Predictive properties of analysts' forecasts of corporate earnings. *The Mid-Atlantic Journal of Business*, *29*, 41–58.

Carroll, P., Sweeny, K., & Shepperd, J. A. (2006). Forsaking optimism. *Review of General Psychology*, *10*, 56–73. doi:10.1037/1089-2680.10.1.56

Chambers, J. R., Windschitl, P. D., & Suls, J. (2003). Egocentrism, event frequency, and comparative optimism: When what happens frequently is "more likely to happen to me." *Personality and Social Psychology Bulletin*, *29*, 1343–1356. doi:10.1177/0146167203256870

Davidson, K., & Prkachin, K. (1997). Optimism and unrealistic optimism have an interacting impact on health-promoting behavior and knowledge changes. *Personality and Social Psychology Bulletin*, *23*, 617–625. doi:10.1177/0146167297236005

Dillard, A. J., McCaul, K. D., & Klein, W. M. P. (2006). Unrealistic optimism in smokers: Implications for smoking myth endorsement and self-protective motivation. *Journal of Health Communication*, *11*(Suppl. 1), 93–102. doi:10.1080/10810730600637343

Dillard, A. J., Midboe, A. M., & Klein, W. M. P. (2009). The dark side of optimism: Unrealistic optimism about problems with alcohol predicts subsequent negative event experiences. *Personality and Social Psychology Bulletin*, *35*, 1540–1550. doi:10.1177/0146167209343124

Eiser, J. R., Pahl, S., & Prins, Y. R. A. (2001). Optimism, pessimism, and the direction of self–other comparisons. *Journal of Experimental Social Psychology*, *37*, 77–84. doi:10.1006/jesp.2000.1438

Epley, N., & Dunning, D. (2000). Feeling "holier than thou": Are self-serving assessments produced by errors in self- or social prediction? *Journal of Personality and Social Psychology*, *79*, 861–875. doi:10.1037/0022-3514.79.6.861

Hahn, U., & Harris, A. J. L. (2014). What does it mean to be biased? Rationality and motivated reasoning. In B. H. Ross (Ed.), *The psychology of learning and motivation* (Vol. 61, pp. 41–102). Boston, MA: Elsevier.

Harris, P. R., Griffin, D. W., & Murray, S. (2008). Testing the limits of optimistic bias: Event and person moderators in a multilevel framework. *Journal of Personality and Social Psychology*, *95*, 1225–1237. doi:10.1037/a0013315

Helweg-Larsen, M., & Shepperd, J. A. (2001). Do moderators of the optimistic bias affect personal or target risk estimates? A review of the literature. *Personality and Social Psychology Review*, *5*, 74–95. doi:10.1207/s15327957pspr0501_5

Hevey, D., McGee, H. M., & Horgan, J. H. (2014). Comparative optimism among patients with coronary heart disease (CHD) is associated with fewer adverse clinical events 12 months later. *Journal of Behavioral Medicine*, *37*, 300–307. doi:10.1007/s10865-012-9487-0

Jansen, L. A., Appelbaum, P. S., Klein, W. M. P., Weinstein, N. D., Cook, W., Fogel, J. S., & Sulmasy, D. P. (2011). Unrealistic optimism in early-phase oncology trials. *IRB: Ethics & Human Research*, *33*(1), 1–8.

Kim, H. K., & Niederdeppe, J. (2013). Exploring optimistic bias and the integrative model of behavioral prediction in the context of a campus influenza outbreak. *Journal of Health Communication*, *18*, 206–222. doi:10.1080/10810730.2012.688247

Klein, C. T. F., & Helweg-Larsen, M. (2002). Perceived control and the optimistic bias: A meta-analytic review. *Psychology & Health*, *17*, 437–446. doi:10.1080/0887044022000004920

Klein, W. M. P., & Zajac, L. E. (2009). Imagining a rosy future: The psychology of optimism. In K. D. Markman, W. M. P. Klein, & J. A. Suhr (Eds.), *Handbook of imagination and mental simulation* (pp. 313–329). New York, NY: Psychology Press.

Moore, D. A., & Small, D. A. (2007). Error and bias in comparative judgment: On being both better and worse than we think we are. *Journal of Personality and Social Psychology*, *92*, 972–989. doi:10.1037/0022-3514.92.6.972

Newby-Clark, I. R., Ross, M., Buehler, R., Koehler, D. J., & Griffin, D. (2000). People focus on optimistic scenarios and disregard pessimistic scenarios while predicting task completion times. *Journal of Experimental Psychology: Applied*, *6*, 171–182. doi:10.1037/1076-898x.6.3.171

Perloff, L. S., & Fetzer, B. K. (1986). Self–other judgments and perceived vulnerability to victimization. *Journal of Personality and Social Psychology*, *50*, 502–510. doi:10.1037/0022-3514.50.3.502

Radcliffe, N. M., & Klein, W. M. P. (2002). Dispositional, unrealistic and comparative optimism: Differential relations with the knowledge and processing of risk information and beliefs about personal risk. *Personality and Social Psychology Bulletin*, *28*, 836–846. doi:10.1177/0146167202289012

Regan, P. C., Snyder, M., & Kassin, S. M. (1995). Unrealistic optimism: Self-enhancement or person positivity? *Personality and Social Psychology Bulletin*, *21*, 1073–1082. doi:10.1177/01461672952110008

Robins, R. W., & Beer, J. S. (2001). Positive illusions about the self: Short-term benefits and long-term costs. *Journal of Personality and Social Psychology*, *80*, 340–352. doi:10.1037/0022-3514.80.2.340

Rothman, A. J., Klein, W. M., & Weinstein, N. D. (1996). Absolute and relative biases in estimations of personal risk. *Journal of Applied Social Psychology*, *26*, 1213–1236.

Sears, D. O. (1983). The person-positivity bias. *Journal of Personality and Social Psychology*, *44*, 233–250. doi:10.1037/0022-3514.44.2.233

Shepperd, J. A., Carroll, P., Grace, J., & Terry, M. (2002). Exploring the causes of comparative optimism. *Psychologica Belgica*, *42*(1-2), 65–98.

Shepperd, J. A., Klein, W. M. P., Waters, E. A., & Weinstein, N. D. (2013). Taking stock of unrealistic optimism. *Perspectives on Psychological Science*, *8*, 395–411. doi:10.1177/1745691613485247

Shepperd, J. A., Ouellette, J. A., & Fernandez, J. K. (1996). Abandoning unrealistic optimism: Performance estimates and the temporal proximity of self-relevant feedback. *Journal of Personality and Social Psychology*, *70*, 844–855. doi:10.1037/0022-3514.70.4.844

Sweeny, K., & Shepperd, J. A. (2010). The costs of optimism and the benefits of pessimism. *Emotion*, *10*, 750–753. doi:10.1037/a0019016

Taylor, S. E., Kemeny, M. E., Aspinwall, L. G., Schneider, S. G., Rodriguez, R., & Herbert, M. (1992). Optimism, coping, psychological distress, and high-risk sexual behavior among men at risk for acquired immunodeficiency syndrome (AIDS). *Journal of Personality and Social Psychology*, *63*, 460–473. doi:10.1037/0022-3514.63.3.460

Tversky, A. (1977). Features of similarity. *Psychological Review*, *84*, 327–352. doi:10.1037/0033-295X.84.4.327

Tyler, J. M., & Rosier, J. G. (2009). Examining self-presentation as a motivational explanation for comparative optimism. *Journal of Personality and Social Psychology*, *97*, 716–727. doi:10.1037/a0016231

Waters, E. A., Klein, W. M. P., Moser, R. P., Yu, M., Waldron, W. R., McNeel, T. S., & Freedman, A. N. (2011). Correlates of unrealistic risk beliefs in a nationally representative sample. *Journal of Behavioral Medicine*, *34*, 225–235. doi:10.1007/s10865-010-9303-7

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

Weinstein, N. D. (2001). Smokers' recognition of their vulnerability to harm. In P. Slovic (Ed.), *Smoking: Risk, perception, & policy* (pp. 81–96). Thousand Oaks, CA: Sage.

Weinstein, N. D., & Klein, W. M. (1995). Resistance of personal risk perceptions to debiasing interventions. *Health Psychology*, *14*, 132–140. doi:10.1037/0278-6133.14.2.132

Weinstein, N. D., & Lyon, J. E. (1999). Mindset, optimistic bias about personal risk and health-protective behaviour. *British Journal of Health Psychology*, *4*, 289–300. doi:10.1348/135910799168641

Yang, S., Markoczy, L., & Qi, M. (2007). Unrealistic optimism in consumer credit card adoption. *Journal of Economic Psychology*, *28*, 170–185. doi:10.1016/j.joep.2006.05.006