Available online at www.sciencedirect.com
ScienceDirect
Journal of Experimental Social Psychology 44 (2008) 631–639
Journal of Experimental Social Psychology
www.elsevier.com/locate/jesp

Automatic optimism: Biased use of base rate information for positive and negative events ☆

Heather C. Lench, Peter H. Ditto *

Department of Psychology and Social Behavior, University of California, 3340 Social Ecology Building II, Irvine, CA 92697-7085, USA

Received 28 August 2006; revised 22 February 2007
Available online 1 March 2007

Communicated by Hart Blanton

Abstract

People generally judge that positive events will occur in their lives and negative events will not, even when both events have the same objective likelihood to occur. In four studies, we examined the possibility that this optimistic bias is the result of people's automatic affective reactions to future events. Studies 1 and 2 demonstrate, in two different contexts, that people are consistently optimistic in their predictions, despite identical base rates for positive and negative events. In Study 2, optimistic bias was not influenced by incentives for motivated reasoning or rewards for accuracy, suggesting that bias was the result of automatic processes. Studies 3 and 4 showed that optimistic bias was more pronounced when predictions were speeded and when participants made predictions after exposure to affectively valenced words. Together, these findings suggest that people optimistically interpret base rates and that this optimism is due to an effortless affective process.

Keywords: Optimism; Optimistic bias; Base rates; Bias; Implicit bias; Affect heuristic; Likelihood judgments

I saw a man pursuing the horizon;
Round and round they sped.
I was disturbed at this;
I accosted the man.
"It is futile," I said,
"You can never -"
"You lie," he cried,
And ran on.
-Stephen Crane

We live in a world of probabilities. Every day, we are inundated with the likelihood of positive and negative events in advertisements, educational programs, and the news. Commercials inform us about the chances of medication side effects, financial advisors quote us odds of stock upturns and downturns, newscasters confront us with the latest statistics about the prevalence of various maladies and misfortunes. People are faced with the task of assessing the implications of this information for their likelihood of experiencing desirable and undesirable outcomes.

Despite frequent exposure to probabilities, research has shown that people have considerable difficulty applying sample-based (e.g., consensus or base rate) information to judgments about particular situations or people (McArthur, 1972; Tversky & Kahneman, 1974; Tyler & Cook, 1984). This is not to say that people are completely insensitive to information about the likelihood of events. People distinguish between rare and common events and the impact of likelihood information on judgment can be

☆ Financial support for the preparation of this paper was provided by National Institute of Mental Health, National Research Service Award 5 T32 MH19958-04 to the first author. Portions of this paper were presented at the meeting for the Society of Personality and Social Psychology, 2004, 2005. We thank Daniel Lench for his technical assistance and Marissa Botello, Tiffany Fan, Mahdis Hakhim, Anita Hu, Kate Chu, and Dee Raval for assistance with data collection.
* Corresponding author.
E-mail addresses: hpenteco@uci.edu (H.C. Lench), phditto@uci.edu (P.H. Ditto).

0022-1031/$ - see front matter © 2007 Elsevier Inc. All rights reserved.
doi:10.1016/j.jesp.2007.02.011

enhanced if it is presented such that its relevance to the individual is made salient (e.g., Slovic, Monahan, & MacGregor, 2000). Still, research suggests that the road from base rates to perceived likelihood is a rocky one, and that, like most other forms of information, the interpretation of base rate information is subject to potential bias.

One of the most pervasive biases affecting judgment is optimism about future events (Taylor & Brown, 1988). People demonstrate "unrealistic optimism" for a variety of events, rating themselves as more likely than others to attain positive outcomes and avoid negative ones (e.g., Weinstein, 1980). These studies have almost exclusively focused on judgments about personal risk compared to some average other (Chambers & Windschitl, 2004). Studies have seldom examined how individuals process information about the "objective" likelihood of events. There is limited evidence, however, that use of base rate information is also optimistically biased. People rated their risk of experiencing negative events just below stated base rates (Rothman, Klein, & Weinstein, 1996) and judged that they were more likely to receive positive than negative medical results even when the two were associated with identical prevalence information (Ditto, Munro, Apanovitch, Scepansky, & Lockhart, 2003).

The consistency and robustness of optimistic biases in social judgment has generated considerable discussion of the processes that might underlie them (e.g., Chambers & Windschitl, 2004; Price, Smith, & Lench, 2006). Much of this research has focused on the social comparative processes that can produce judgments that are optimistic relative to some average other (Chambers & Windschitl, 2004). But these processes are less applicable to understanding other forms of optimism that do not focus on self versus other judgments.

We suggest that at the core of optimistic bias is an automatic tendency to rely on affect to judge the likelihood of future events. Negative affect elicited by considering potential negative events leads to cognitive rejection of events and judgments that negative events are unlikely. Similarly, positive affect elicited by potential positive events leads to cognitive acceptance of events and judgments that positive events are likely. Slovic and Peters (2006) have argued that the tendency to rely on affect when making judgments may explain why people view events that elicit negative affect as problems and judge that the events are likely to occur. We propose to extend this theoretical explanation to include less extreme reactions to potential future events.

Implicit, affective reactions are more rapid and intuitively compelling than slower, more deliberate cognitive analysis (Epstein, 1985; Kahneman, 2003). Like other implicit processes, however, reliance on an affective process would not be expected to overwhelm information relevant to judgments (like base rates), and would be most likely to affect judgment under uncertain conditions (when base rates are moderate rather than extreme) and when people lack the ability or motivation to think carefully. It is important to note that the "automatic optimism" effect in no way precludes the operation of other factors that have been found to contribute to optimism. Optimism is almost certainly multiply-determined, and rather than positing automatic optimism as a comprehensive explanation of optimism, our goal is to focus on one simple, but potentially fundamental, contributing factor.

The current studies examined whether the interpretation of base rates is biased by the desirability of future events and the role of automatic affective reactions in this process. In a series of four experiments, we provided participants with identical base rates for positive and negative events and compared their subjective likelihood judgments. Our general prediction was that likelihood judgments would be biased by the outcome's desirability. After demonstrating this effect using two different paradigms, we then develop the proposition that optimistic bias is due, at least in part, to reliance on affective reactions as a basis for likelihood judgments.

Study 1

Optimism is typically examined through judgments about the likelihood of future life events. In Study 1 we used a similar methodology, but adjusted it to examine bias in the interpretation of base rates. We provided base rates for events in the college population (Rothman et al., 1996). Positive and negative versions of similar events were created (e.g., liking a first job versus disliking a first job). The base rates varied, but the two versions of each event always had identical base rates. It was expected that positive events would be rated as more likely than negative events despite identical base rates.

Method

Participants ($n = 120$) judged their likelihood of experiencing 24 life events (see Table 1). Twelve positive and 12 negative events were rated (with versions of each event counterbalanced between participants). Participants rated their likelihood of experiencing each event on a scale ranging from "very unlikely" (1) to "very likely" (9). The instructions stated that information would be provided about the prevalence of each event based on surveys, census data, and statistical projection. The percent of college students who would experience the event was provided and ranged from 3 to 60% (e.g., "56% can expect to like/dislike their first post graduation job").

Results and discussion

Consistent with predictions, 14 out of 24 positive events were rated as significantly more likely than negative events (Table 1). We conducted a multilevel analysis using SAS 9.0 proc mixed to examine whether valence and base rates predicted subjective likelihood judgments for the 24 events. The model included the valence of the event and the base

Table 1
Mean subjective likelihood of events rated in Study 1

Base rate	Positive	Mean	Negative	Mean
High	Like first postgraduation job	6.03*	Dislike first postgraduation job	4.75*
	Do better in classes than expected this quarter	5.23	Do worse in classes than expected this quarter	4.64
	Travel overseas	7.49*	Never travel overseas	2.00*
	Never be unemployed	4.36	Be unemployed at some point	5.21
	Never be burglarized	4.66	Be a victim of burglary	5.10
	Never have a bout of serious depression	4.68	Have a bout of serious depression	4.77
	Never divorce	6.36*	Divorce	3.02*
	Never develop asthma	5.32*	Develop asthma	3.89*
Medium	Own your own home	7.77*	Never own your own home	2.15*
	Starting salary over $60,000	4.66	Starting salary under $30,000	4.75
	Not spend a night in the hospital	4.45*	Have an extended stay in the hospital	3.46*
	Never suffer from severe anxiety	5.80*	Suffer from anxiety	4.25*
	Avoid two or more days ill in bed in the next year next year	4.90	Be ill in bed two or more days in the next year	4.56
	Remain cancer free	4.88	Get cancer	4.56
	Never exposed to low level radiation	5.41*	Be exposed to low level radiation	3.95*
	Never have property damaged by a natural disaster	4.49	Have property damaged by a natural disaster	5.08
Low	Have a gifted child	5.18*	Have a mentally retarded child	2.86*
	Live past 90	4.33*	Die before 40	2.64*
	Not become ill all winter	4.05*	Have a significant illness this winter	2.88*
	Never have a heart attack	4.69*	Have a heart attack by age 40	3.02*
	Graduate from college in five years or less	7.66*	Never graduate from college	1.57*
	Be free from gum disease	5.73*	Have serious gum disease	3.31*
	Never break a bone	4.78	Trip and break a bone	4.18
	Never have wallet stolen	4.02	Have wallet stolen and major charges made	4.19

Note. *$p < .05$, from independent sample *t*-tests conducted between each positive and negative version of events.

rate assigned to the event (Level 1), nested within participants (Level 2). Specifically, the model was $\gamma_{00} + \gamma_{10}$ (valence) + γ_{20} (base rates) + $\zeta_{0i} + e_{ij}$. The average subjective likelihood judgment across all events, adjusted for other predictors, was γ_{00}. The estimate of the effects of valence on the subjective likelihood judgment for that event was γ_{10} and the estimate of the effects of base rates was γ_{20}.

Base rates predicted subjective likelihood ratings, $b = .03$, $SE = .004$, $t(2754) = 6.96$, $p < .001$. Participants judged events as more likely as the associated base rate increased. As predicted, valence also affected likelihood ratings, $b = 1.74$, $SE = .18$, $t(2754) = 9.85$, $p < .001$. Positive events were rated as more likely ($M = 5.26$, $SD = .99$) than negative events ($M = 3.82$, $SD = 1.05$) despite the fact that each set of events had comparable base rate statistics.[1]

[1] There was a base rate × valence interaction, $b = -.02$, $SE = .005$, $t(2754) = -3.10$, $p < .005$. Participants seemed particularly accepting of base rates that matched desires (more likely positive events and less likely negative events), consistent with our predictions (but not a focus of this investigation). The life events varied in whether they depicted lasting states or specific events (e.g., remaining happily married versus getting divorced), with positive outcomes more often represented as lasting states. We divided both positive and negative outcomes according to whether the outcome was lasting or specific. Participants judged positive events as more likely to occur than negative events for lasting states, $t(127) = 8.94$, $p < .001$, and specific events, $t(127) = 11.18$, $p < .001$.

Study 2

One limitation of the traditional method of examining optimism by having participants make judgments about life events is that participants may have preconceptions about their likelihood of experiencing events. College students are likely to have experienced a life more populated by positive than negative events. As such, they may enter our studies with a subjective (but partly rational) sense that they will experience more positive than negative life events. Study 2 sought to create a situation without an evidential basis to expect positive outcomes. To create this "minimal optimism situation," participants played a game of chance with both the desirability of outcomes and their objective probability manipulated (Irwin, 1953; Marks, 1951).

Study 2 also manipulated the importance of goals within this minimal situation. The motivation to make optimistic predictions was enhanced by offering a reward for winning. Incentives encourage attention to factors that justify optimism (Buehler, Griffin, & MacDonald, 1997). We also imposed a consequence for inaccurate predictions to examine whether optimistic bias would be reduced or eliminated. Manipulations of accuracy motivation reduce biases by encouraging effortful information gathering (e.g., Neuberg, 1989; Tetlock, 1985). If optimistic interpretation of base rates relies on effortful cognitive analysis, the prize manipulation should enhance optimism and the accuracy manipulation should reduce it.

Method

Participants ($n = 233$) were told that they would play a version of "blackjack," with the goal of reaching a card count of 21. Each hand began with an ace (assigned a value of 11) and one card was dealt from a deck of 10s and 2s. Thus 10s were winning cards and 2s were losing cards. Each time the computer presented a face down card supposedly randomly dealt from a deck of 10 cards with a specific proportion of winning and losing cards.

Participants were presented with the game rules and played a practice game using Medialab (Jarvis, 2004a, 2004b). Eight games included counterbalanced base rates (1/10–8/10). After each hand, participants predicted whether they believed they received the card.

Participants were randomly assigned to one of six conditions in a 2 (outcome valence: positive, negative) by 3 (motivation: prize, no prize, accuracy) design. In the positive conditions, judgments concerned winning cards (e.g., "In this deck there are 3 out of 10 winning cards. Do you think you have a winning card?"). In the negative conditions, judgments concerned losing cards (e.g., "In this deck there are 3 out of 10 losing cards. Do you think you have a losing card?"). In the positive prize conditions, chances for a prize ($100 gift certificate) were awarded with each 10 or lost with each 2. In the no prize conditions, participants were given similar instructions but played the game without mention of a prize. In the accuracy conditions, participants played for a prize, but they could also receive chances for the prize if they guessed correctly whether they had winning/losing cards. For every hand a prize was possible for reaching 21 and a prize was possible for making an accurate prediction.

Results and discussion

Table 2 presents the percentage of participants who predicted they had the winning or losing card for each base rate. Logistic regression analyses, nested by person, were conducted with base rate as a repeated measure for each person. The between-person factors of valence (positive, negative) and motivation (prize, no prize, accuracy) were entered simultaneously as predictors of subjective likelihood judgments.

As in Study 1, likelihood judgments were influenced by both provided base rates and the valence of the outcome. Fig. 1 illustrates these findings. With every 1/10 increase in the odds of receiving the target card, 354% more participants judged they had it ($OR = 3.54$, *CI*: 3.19–3.97, $p < .001$). At the same time, participants were on average 3.67 times more likely to predict they had winning cards than losing cards ($OR = 3.67$, *CI:* 2.56–5.26, $p < .001$). The effect of valence on predictions is striking given the general sensitivity to the provided base rates.

There was a base rate × outcome valence interaction effect ($OR = 1.31$, *CI:* 1.05–1.64, $p < .05$). As shown in Table 2, optimism was most pronounced during the less extreme base rate trials (particularly 5/10 and 6/10 trials). This pattern is consistent with research suggesting that bias reveals itself most clearly under ambiguous conditions (e.g., Dunning, Meyerowitz, & Holzberg, 2002).

Whether a large prize was offered or accuracy was encouraged had no significant influence on predictions (the motivation condition main effect and all interactions involving the condition were not significant). As can be seen in Table 2, the tendency to predict that winning cards were more likely to occur than losing cards was consistent across the motivation conditions. Follow-up analyses comparing the valence conditions on the number of "have" predictions, summed across trials, confirmed that optimism was equally evident in the prize conditions (positive $M = 4.19$ vs. negative $M = 3.24$), no prize conditions (positive $M = 4.21$ vs. negative $M = 3.00$), and accuracy

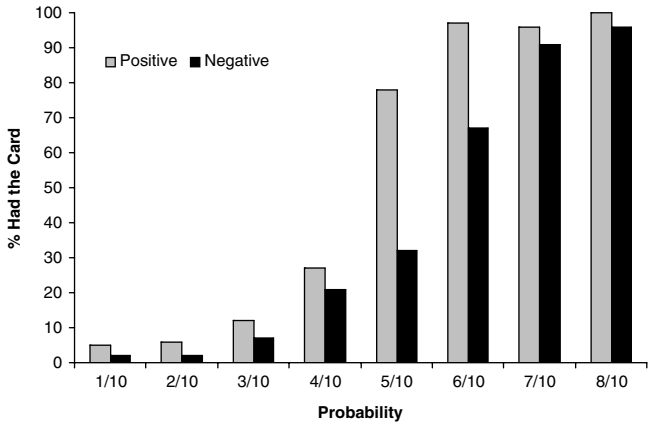

Fig. 1. Study 2—Mean percent of participants predicting that they received the target card by valence framing and base rate information conditions.

Table 2
Percentage of participants in Study 2 stating they had the card by experimental condition and probability

		1/10	2/10	3/10	4/10	5/10	6/10	7/10	8/10
Prize	Negative (%)	5	3	5	24	35	68	92	92
	Positive (%)	5	7	10	29	79	98	93	100
No prize	Negative (%)	0	0	5	11	22	68	95	100
	Positive (%)	5	8	11	21	82	100	95	100
Accuracy	Negative (%)	0	3	10	28	38	67	87	97
	Positive (%)	5	3	15	30	78	93	100	100

conditions (positive $M = 4.18$ vs. negative $M = 3.31$), all Fs > 15, all ps $< .001$.

The imperviousness of the optimistic interpretation of base rates to manipulations that have been found to affect bias in other studies is instructive. The fact that optimistic bias was unaffected by an accuracy motivation manipulation is reminiscent of research showing that monetary incentives do little to mitigate biases that result from reliance on judgmental heuristics (e.g., Tversky & Kahneman, 1973). Similarly, to the extent that accuracy motivation improves the quality of judgment processes, it seems to do so by increasing the cognitive effort individuals allocate to the judgment task (Kunda, 1990). As such, increased desire to be accurate should have little effect if judgmental biases stem from relatively effortless processes that are difficult to recognize or control.

Study 3

Past research has demonstrated that people tend to prefer self-enhancing information, even at the expense of accuracy, when they make judgments under time restrictions (e.g., Swann, Hixon, Stein-Seroussi, & Gilbert, 1990). We assume that people making assessments about future events go through a struggle between what they would like to believe (that they will experience positive, and not negative, outcomes) and what an evenhanded assessment might suggest (that personal characteristics and history make some negative outcomes likely). If the optimistic interpretation of base rates stems from effortless processes that people attempt to temper with additional thought, forcing people to make speeded judgments should: (a) not disrupt the tendency to show the bias as it does not require processing time, and (b) make people more likely to rely on effortless processes and thus increase bias. In Study 3, therefore, participants made judgments about whether they would or would not experience positive and negative future events either quickly or with time to consider their responses. We predicted that individuals given less time would judge that they would experience positive events and would not experience negative events more often than individuals given time to respond.

Method

Participants ($n = 121$) pressed one of two keys to signify that they thought an event would happen to them (F12 labeled as the "me" key) or would not happen to them (F1 labeled as the "not me" key; Paulhus & Levitt, 1987). After six practice trials, six negative and six positive life events appeared sequentially on the screen (order was counterbalanced across participants). The events were chosen from Study 1 on the basis that they were clear and short enough to be read in less than 1 s. In contrast to Study 1, in which events were matched by their semantic similarity, a pilot group ($n = 26$) rated the likelihood of these events happening to college students and events were chosen so that the perceived base rates of positive events and negative events were equivalent.

A screen with each event appeared for a specified period of time. The base rate, obtained from the results of the pilot study, was presented on the left side of the screen. Participants were told to expect the event and base rate at these locations and practiced the format. The event screen appeared for either 10 or 1 s. After the specified time had elapsed, a response screen would appear, indicating the need to respond immediately. After each judgment there was a pause before the next event.

Results and discussion

A repeated-measure ANOVA was conducted with the number of "me" judgments for positive and negative events as the within-person factor and speed condition (10, 1 s) as the between-person factor. The main effect for speed was not significant, but there was a main effect of valence, $F(1, 119) = 95.13$, $p < .001$. Participants responded "me" for positive events ($M = 4.40$, $SD = 1.31$) almost twice as often as they did for negative events ($M = 2.56$, $SD = 1.40$), despite comparable base rates. This main effect, however, was qualified by a significant valence × speed interaction, $F(1, 119) = 7.51$, $p < .01$. As shown in Fig. 2, when considering positive events, participants with less time judged they would experience the event more often ($M = 4.75$, $SD = 1.10$) than participants with more time ($M = 4.00$, $SD = 1.43$), $t(119) = 3.26$, $p < .01$. In contrast, when considering negative events, participants with less time judged they would experience the event less often ($M = 2.44$, $SD = 1.38$) than participants with more time ($M = 2.70$, $SD = 1.41$), although this difference was not significant, $t(119) = 1.04$, *n.s.*

These effects are consistent with the hypothesized relationship between speed of judgments and optimism. The results of Study 3 provide affirmative support for the automatic underpinnings of optimistic bias by showing greater bias when responses were relatively fast. The weak effect of

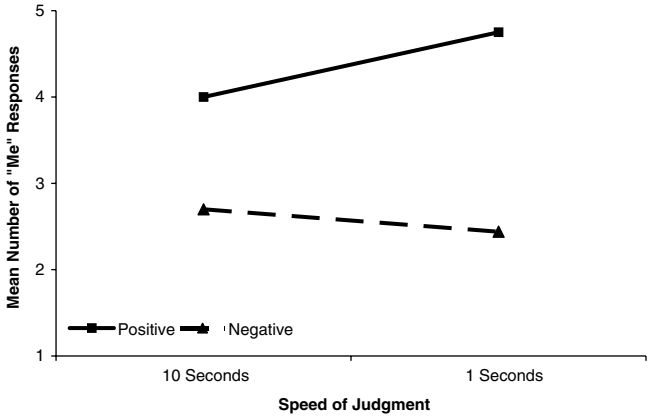

Fig. 2. Study 3—Number of times participants responded "me" to positive and negative future life events by speed condition.

response speed on judgments for negative events may be due to the substantial main effect of event valence.

Study 4

The results of Study 3 suggest that the optimistic interpretation of base rates is governed by a process that requires few cognitive resources. This is consistent with the proposition that people use automatic affective reactions to guide judgment, but so far we have not provided evidence for the affective nature of the effect. Judgments about personality characteristics are made faster and more egotistically following an affective prime that matches the characteristic (Paulhus & Levitt, 1987). If optimism for future events results from reliance on an effortless affective process, primes with a similar affective valence should similarly facilitate judgments about the likelihood of future events.

Method

Participants ($n = 109$) sat at a computer, were provided with base rates, and pushed one of two keys to indicate whether they thought negative and positive events would happen to them in the future. Participants were again told to expect the event and base rate at the same location and practiced several times. The major change from Study 3 was that judgments were made as quickly as possible and "distracter" words were presented at random locations on the screen during judgments. The words were positive (e.g., love, smile) or negative (e.g., hate, loss), matched for length, and counterbalanced across participants (Paulhus & Levitt, 1987). All participants received positive and negative words paired with positive and negative events. The words were allegedly due to program error and should be ignored.

Results and discussion

A repeated-measure ANOVA was conducted to examine the number of "me" responses when likelihood judgments of events (positive, negative) occurred in the presence of words (positive, negative). Consistent with each of the studies reported here, there was a main effect of event valence, such that participants judged positive events would happen to them more often ($M = 3.42$, $SD = .60$) than negative events ($M = 1.14$, $SD = .67$), $F(1, 108) = 655.74$, $p < .001$. There was also a main effect of word valence, $F(1, 108) = 103.82$, $p < .001$. Participants responded that events would happen to them more often when the events were evaluated in the presence of positive words ($M = 2.62$, $SD = .61$) than negative words ($M = 1.94$, $SD = .49$). Participants responded that they would experience positive events more often in the presence of positive words ($M = 3.53$, $SD = .73$) than negative words ($M = 3.31$, $SD = .75$), $t(108) = 2.63$, $p < .05$, and that they would experience negative events less often in the presence of negative words ($M = .57$, $SD = .66$) than positive words ($M = 1.71$, $SD = 1.02$), $t(108) = 11.13$, $p < .001$. An event × word interaction was found, $F(1, 108) = 48.99$, $p < .001$, reflecting the fact the word effect was more pronounced for negative events than positive events.[2]

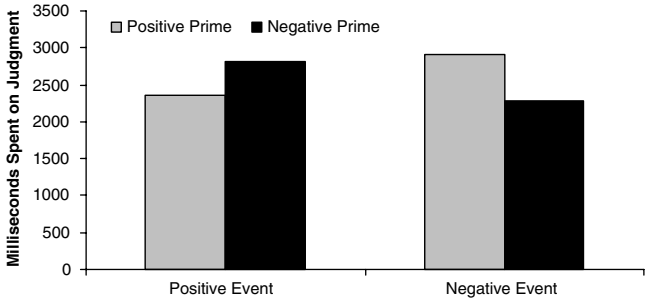

Fig. 3. Study 4—Milliseconds spent making judgments in response to positive and negative future life events with positive and negative primes.

A repeated-measure ANOVA was conducted to examine the effect of the words on the time in milliseconds required to make judgments about positive and negative events. The only significant effect was the event × word interaction, $F(1, 96) = 20.71$, $p < .001$. As shown in Fig. 3, positive events were judged more quickly when positive words were present ($M = 2373.43$, $SD = 874.05$) than when negative words were present ($M = 2846.95$, $SD = 1348.03$), $t(108) = 2.63$, $p < .05$. Conversely, negative events were judged more quickly when negative words were present ($M = 2347.06$, $SD = 1093.01$) than when positive words were present ($M = 2882.53$, $SD = 1474.66$), $t(108) = 11.13$, $p < .001$.[3] Consistent with predictions, judgments were facilitated when the valence of the word matched the valence of the event.

These findings support the hypothesis that optimistic interpretation of base rates results from reliance on an affective process. Optimistic bias was again prominent and, most importantly, positive events were embraced and negative events rejected after exposure to stimuli that evoked matching incidental affect. Positive affect facilitated acceptance of potential positive events, whereas negative affect facilitated rejection of potential negative events.

[2] One might wonder why the effect of primes in Study 4 was stronger for negative events than positive events, but the effect of speed in Study 3 was stronger for positive events than negative events. It is not inconsistent that effects can be more affective and less automatic. The tendency for negative information to provoke cognitive analysis is thought to occur precisely because of the negative affect it generates (Ditto et al., 2003). Also, the pattern of the effects is the same for both studies, only reliability of the effect differs.

[3] Additional analyses were conducted based on whether the response was optimistic (positive events would occur or negative events would not) or nonoptimistic (positive events would not occur or negative events would). The word effect reported in the text was found when responses were optimistic, but when the nonoptimistic response was given the two priming conditions did not differ.

General discussion

The studies presented here make three points. First, base rate information influenced judgments about the likelihood of future outcomes. Second, the desirability of potential future events clearly biased subjective likelihood judgments, above and beyond the influence of base rate information. Third, this optimistic interpretation of base rates was not dependent on prior experience, motivation, or cognitive processing, and instead appears to result from reliance on an effortless, affective process.

Optimism and base rates

Optimistic bias is often defined and studied comparatively through ratings of self risk compared to the average other (Chambers & Windschitl, 2004). Rather than comparing individual's judgments to an average, we compared people's judgments about their likelihood of experiencing positive versus negative events associated with the same "objective" statistical standard. This manifestation of optimistic bias has received relatively little attention in the literature on unrealistic optimism (but see Dembo, 1931; Festinger, 1942). The current research adds to the literature on base rate use (McArthur, 1972; Tversky & Kahneman, 1974) by highlighting the fact that, in addition to either being utilized appropriately or ignored, base rate information can be utilized, but in a biased fashion.

The finding that subjective likelihood judgments are affected by the desirability of the outcome may seem unsurprising given the voluminous research on "positive illusions" of one kind or another (e.g., Krueger & Funder, 2004; Taylor & Brown, 1988). However, the fact that what people expect can be contaminated by what they want is underappreciated, and has both important theoretical and practical implications.

Theoretically, the implicit assumption that the perceived likelihood of events is independent of their desirability underlies several theories, most notably expectancy-value theories. What these models do not generally consider is that value might also have an indirect effect on behavior via its effect on expectancy (e.g., more threat = lower perceived susceptibility = lower likelihood of behavior). Incorporation of these indirect effects might lead to improved predictions of behavior (Tversky & Koehler, 1994). Similarly, research on motivated reasoning (Ditto & Lopez, 1992; Kunda, 1990) has tended to pit expectancy-based cognitive explanations and value-based motivational explanations against one another (Miller & Ross, 1975; Tetlock & Levi, 1982). Although there is evidence for an independent effect for motivation (e.g., Ditto & Lopez, 1992; Ditto et al., 2003), the current studies suggest why cleanly parsing the two explanations is difficult and essentially misguided. The tendency to derogate the validity of negative compared to positive feedback is likely caused both by the unwanted nature of the negative feedback *and* the fact that it seems subjectively unlikely to have occurred. The rub suggested by the current studies, however, is that the unwanted nature of the feedback may be a substantial part of what causes the negative feedback to seem unlikely.

Practically, it is important to recognize that the same likelihood statistic or verbal probability descriptor may be interpreted differently when it is used in reference to an undesirable outcome (e.g., a medication side effect) than to a desirable one (e.g., the successful outcome of a surgery). Medical researchers have long been concerned with how the statistics and statistical phrases that are a staple of physicians' speech are understood by patients (Budescu & Wallsten, 1985; Hamm, 1991). The current research suggests that the desirability of the outcome is an important variable to consider in this translation process.

Automatic optimism

The results suggest that the influence of desires on judgment is not solely due to motivated reasoning, because in Study 2 incentives designed to encourage biased or accurate reasoning had no effect and in Study 3 optimism was greater when participants had less time to make judgments. Further, Study 4 demonstrated that optimistic bias was facilitated when incidental affect matched the judged event. These results suggest that people have a tendency to reflexively accept positive future events and reject negative future events. This suggestion is consistent with recent research demonstrating that affect is often has a strong influence on judgment (Slovic & Peters, 2006). This is not to say that all optimism is the result of effortless processes. Instead, we suggest that at the core of optimistic biases is a reflexive tendency to judge events that elicit positive affective reactions as likely and to judge events that elicit negative affective reactions as unlikely. A similar mechanism may underlie various self-enhancing biases that have been shown to occur automatically, such as the better-than-average effect (Alicke, 2000; Codol, 1975), automatic egotism (Paulhus & Levitt, 1987), and implicit egotism (Pelham, Mirenberg, & Jones, 2002).

People's reliance on effortless affective reactions likely helps them efficiently navigate the world by quickly marking the good from the bad (Slovic, Finucane, Peters, & MacGregor, 2002; Zajonc, 1980). People can then rely on their positive affect to motivate attainment of desirable stimuli and their negative affect to motivate avoidance of dangerous or unpleasant stimuli (Epstein, 1994). Reliance on quick and dirty processes also exacts some inferential costs. Although affective reactions may be useful in evaluating stimuli in the here-and-now, and even to determine how much effort to invest in trying to attain future goals or avoid future pitfalls, how people feel about future outcomes plays no rational role in judgments about how likely those outcomes are to actually occur. The current studies do not show that affective reactions lead people to ignore substantive information about the likelihood of future outcomes. What they do show, however, is that affective

reactions can contaminate subjective likelihood judgments in a subtle but pervasive way. People begin their assessment regarding the likelihood of future outcomes with a bias toward assuming that good things are more likely than bad things, even when available information about the likelihood of the events is equivalent.

Because optimism is multiply-determined, this reflexive tendency to embrace positive and reject negative futures can be accentuated or mitigated by a host of other psychological factors. There is good evidence, for example, that optimism is related to beliefs about personal control (Klein & Helweg-Larsen, 2002) and the ability of individuals to construe facts in a favorable light (Klein, 1996; Klein & Kunda, 1993). In addition, there is evidence that incidental emotion can increase or decrease optimism. Fear, in particular, is associated with decreased optimism for future events (Lerner & Keltner, 2001; Lench & Levine, 2005). The effortless processes proposed here likely operate at a more implicit level of processing than that required for a specific emotion like fear.

Although more research is needed to clarify the psychological processes that might account for the pervasive influence of optimism on judgment, the current studies provide intriguing evidence of the fundamental nature of optimism, and the subtle effects it can have on the processing of other types of information we use to generate expectations about what our future might hold.

References

Alicke, M. D. (2000). Evaluating social comparison targets. In J. Suls & L. Wheeler (Eds.), *Handbook of social comparison: Theory and research. The Plenu series in social/clinical psychology* (pp. 271–293). Dordrecht, Netherlands: Kluwer Academic Publishers.

Budescu, D. V., & Wallsten, T. S. (1985). Consistency in interpretation of probabilistic phrases. *Organizational Behavior and Human Decision Processes, 36*, 391–405.

Buehler, R., Griffin, D., & MacDonald, H. (1997). The role of motivated reasoning in optimistic time predictions. *Personality and Social Psychology Bulletin, 23*, 238–247.

Chambers, J. R., & Windschitl, P. D. (2004). Biases in social comparative judgments: the role of nonmotivated factors in above-average and comparative-optimism effects. *Psychological Bulletin, 130*, 813–838.

Codol, J. P. (1975). On the so-called ''superior conformity of the self'' behavior: twenty experimental investigations. *European Journal of Social Psychology, 5*, 457–501.

Dembo, T. (1931). Der aerger als dynamisches problem. *Psychologische Forschung*, 1–144.

Ditto, P. H., & Lopez, D. F. (1992). Motivated skepticism: use of differential decision criteria for preferred and nonpreferred conclusions. *Journal of Personality and Social Psychology, 63*, 568–584.

Ditto, P. H., Munro, G. D., Apanovitch, A. M., Scepansky, J. A., & Lockhart, L. K. (2003). Spontaneous skepticism: the interplay of motivation and expectation in responses to favorable and unfavorable medical diagnoses. *Personality and Social Psychology Bulletin, 29*, 1120–1132.

Dunning, D., Meyerowitz, J. A., & Holzberg, A. D. (2002). Ambiguity and self-evaluation: The role of idiosyncratic trait definition in self-serving assessments of ability. In T. Gilovich & D. Griffin (Eds.), *Heuristics and biases: The psychology of intuitive judgment* (pp. 324–333). New York: Cambridge University Press.

Epstein, S. (1985). The implications of cognitive-experiential self-theory for research in social psychology and personality. *Journal of the Theory of Social Behavior. Special Issue: The Rediscover of the Self in Social Psychology: Theoretical and Methodological Implications, 15*, 283–310.

Epstein, S. (1994). Integration of the cognitive and the psychodynamic unconscious. *American Psychologist, 49*, 709–724.

Festinger, L. (1942). A theoretical interpretation of shifts in level of aspiration. *Psychological Review, 49*, 235–250.

Hamm, R. M. (1991). Selection of verbal probabilities: a solution for some problems of verbal probability expression. *Organizational Behavior and Human Decision Processes, 48*, 193–223.

Irwin, F. W. (1953). Stated expectations as functions of probability and desirability of outcomes. *Journal of Personality, 21*, 329–335.

Jarvis, B. G. (2004a). MediaLab Research Software, Version 2004 [Computer Program]. New York, NY (www.empirisoft.com): Empirisoft.

Jarvis, B. G. (2004b). DirectRT Research Software, Version 2004 [Computer Program]. New York, NY (www.empirisoft.com): Empirisoft.

Kahneman, D. (2003). A perspective on judgment and choice: Mapping bounded rationality. *American Psychologist, 58*, 697–720.

Klein, W. M. (1996). Maintaining self-serving social comparisons: attenuating the perceived significance of risk-increasing behaviors. *Journal of Social and Clinical Psychology. Special: Unrealistic Optimism about Personal Risks, 15*, 120–142.

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

Klein, W. M., & Kunda, Z. (1993). Maintaining self-serving social comparisons: biased reconstruction of one's past behaviors. *Personality and Social Psychology Bulletin, 19*, 732–739.

Krueger, J. I., & Funder, D. C. (2004). Towards a balanced social psychology: causes, consequences, and cures for the problem-seeking approach to social behavior and cognition. *Behavioral and Brain Sciences, 27*, 313–327.

Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin, 108*, 480–498.

Lench, H. C., & Levine, L. J. (2005). Effects of fear on risk and control judgments and memory: implications for health promotion messages. *Cognition and Emotion, 19*, 1049–1069.

Lerner, J. S., & Keltner, D. (2001). Fear, anger, and risk. *Journal of Personality and Social Psychology, 81*, 146–159.

Marks, R. W. (1951). The effect of probability, desirability, and ''privilege'' on the stated expectations of children. *Journal of Personality, 19*, 332–351.

McArthur, L. A. (1972). The how and what of why: some determinants and consequences of causal attribution. *Journal of Personality and Social Psychology, 22*, 171–193.

Miller, D. T., & Ross, M. (1975). Self-serving biases in the attribution of causality: fact or fiction? *Psychological Bulletin, 82*, 213–225.

Neuberg, S. L. (1989). The goal of forming accurate impressions during social interactions: attenuating the impact of negative expectancies. *Journal of Personality and Social Psychology, 56*, 374–386.

Paulhus, D. L., & Levitt, K. (1987). Desirable responding triggered by affect: automatic egotism? *Journal of Personality and Social Psychology, 52*, 245–259.

Pelham, B. W., Mirenberg, M. C., & Jones, J. T. (2002). Why Susie sells seashells by the seashore: implicit egotism and major life decisions. *Journal of Personality and Social Psychology, 82*, 469–487.

Price, P. C., Smith, A. R., & Lench, H. C. (2006). The effect of target group size on risk judgments and comparative optimism: the more, the riskier. *Journal of Personality and Social Psychology, 90*, 382–398.

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.

Slovic, P., Finucane, M., Peters, E., & MacGregor, D. G. (2002). Rational actors or rational fools: implications of the affect

heuristic for behavioral economics. *Journal of Socio-Economics, 31*, 329–342.

Slovic, P., Monahan, J., & MacGregor, D. G. (2000). Violence risk assessment and risk communication: the effects of using actual cases providing instruction, and employing probability versus frequency formats. *Law and Human Behavior, 24*, 271–296.

Slovic, P., & Peters, E. (2006). Risk perception and affect. *Current Directions in Psychological Science, 15*, 322–325.

Swann, W. B., Hixon, J. G., Stein-Seroussi, A., & Gilbert, D. T. (1990). The fleeting gleam of praise: cognitive processes underlying behavioral reactions to self-relevant feedback. *Journal of Personality and Social Psychology, 59*, 17–26.

Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: a social psychological perspective on mental health. *Psychological Bulletin, 103*, 193–210.

Tetlock, P. E. (1985). Accountability: a social check on the fundamental attribution error. *Social Psychology Quarterly, 48*, 227–236.

Tetlock, P. E., & Levi, A. (1982). Attribution bias: on the inconclusiveness of the cognition–motivation debate. *Journal of Experimental Social Psychology, 18*, 68–88.

Tversky, A., & Kahneman, D. (1973). Availability: a heuristic for judging frequency and probability. *Cognitive Psychology, 5*, 207–232.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: heuristics and biases. *Science, 185*, 1124–1131.

Tversky, A., & Koehler, D. J. (1994). Support theory: a nonextensional representation of subjective probability. *Psychological Review, 4*, 547–567.

Tyler, T. R., & Cook, F. L. (1984). The mass media and judgments of risk: distinguishing impact on personal and societal level judgments. *Journal of Personality and Social Psychology, 47*, 693–708.

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

Zajonc, R. B. (1980). Feeling and thinking: preferences need no inferences. *American Psychologist, 35*, 151–175.