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Running Head: VERBAL PROBABILITIES INTERPRETED OPTIMISTICALLY

How probable is *probably*? It depends on whom you're talking about

Tim Smits and Vera Hoorens

Katholieke Universiteit Leuven, Leuven, Belgium

Tim Smits and Vera Hoorens, Departement Psychologie, Katholieke Universiteit Leuven, Belgium.

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Correspondence concerning this article may be addressed to both authors at the Laboratorium voor Experimentele Sociale Psychologie, Departement Psychologie, Katholieke Universiteit Leuven, Tiensestraat 102, 3000 Leuven, Belgium.

E-mail: Tim.Smits@oce.kuleuven.ac.be ; Vera.Hoorens@psy.kuleuven.ac.be.

Tim Smits is a graduate student at the Katholieke Universiteit Leuven. His graduation is expected for the fall of 2004. Furthermore, he holds a masters degree in Statistics.

Vera Hoorens is a professor of social psychology at the Katholieke Universiteit Leuven. She teaches courses in introductory psychology, social psychology, and social cognition. Her research interests include risk perception and communication, self-favouring biases in social comparison and person perception.

Abstract

Two studies tested if people interpret verbal chance terms in a self-serving manner. Participants read statements describing the likelihood of events in their own future and in the future of a randomly chosen other. They interpreted the chance terms numerically. Chance terms were interpreted as denoting a higher probability when they were used to describe the likelihood of pleasant events in one's own future than when they were used to describe the likelihood of pleasant events in someone else's future (Study 1). Similarly, chance terms were interpreted as denoting a lower probability when they were used to describe the likelihood of unpleasant events in one's own future than when they were used to describe the likelihood of unpleasant events in someone else's future (Study 1 and 2). These differences occurred primarily when the risk statements were threatening.

Key Words: interpretation of verbal probabilities, risk communication, comparative optimism, unrealistic optimism, self-other differences

How probable is *probably*? It depends on whom you're talking about

People continuously make decisions. In doing so, they frequently evaluate the likelihood of the different outcomes of various behavioral choices. One source of information that is available to them is the probability information they get from others. These may express their uncertainty about an event's future occurrence either by a verbal chance term (e.g., "smokers are *likely* to get cancer") or by a numerical probability (e.g., "the likelihood that this medicine will work is *70 %*").

Most people prefer to express uncertainty verbally rather than numerically (e.g., "likely" versus "70 %"). One reason may be that they feel that a verbal probability term expresses the uncertainty surrounding future events better than a numerical expression. People may think that verbal expressions are conveniently vague so that they will be less likely to be confronted with misjudgements (Budescu & Wallsten, 1985). At the same time, most people like to receive likelihood information numerically. This may be due to numerical probabilities seeming more precise and informative than verbal ones.

If receivers prefer to obtain likelihood information in numerical terms whereas senders prefer to present it in verbal terms (about this so-called *preference paradox*, see Brun & Teigen, 1988; Erev & Cohen, 1990), then we may assume that receivers regularly *interpret* verbal chance terms in numerical terms. It is therefore important to understand how this interpretation comes about and which systematic distortions occur in it. This paper focuses on the latter question and more specifically on differences in interpretations between statements about one's own versus the other's future.

A priori beliefs about event likelihood influence the numerical interpretation of verbal chance terms (e.g., Wallsten, Fillenbaum, & Cox, 1986). One phenomenon that characterizes the perceived likelihood of future events is comparative optimism (Weinstein,

1980): People think that they are more likely than others to experience positive events and less likely to experience negative events. An implication of comparative optimism is that self-other differences may occur in the interpretation of verbal chance terms. Do people interpret expressions such as *likely* or *highly probable* differently depending on whether these expressions occur in statements about their own future or in statements about other people's future? This is the main question we addressed in the present research.

The numerical interpretation of verbal chance terms

Despite the omnipresence of verbal probability expressions in communication (Erev & Cohen, 1990), their interpretation tends to be highly variable (for reviews see Clark, 1990; Budescu & Wallsten, 1995). Different people interpret given chance terms very differently. Adding context to the chance terms further increases this variability (Beyth-Marom, 1982; Brun & Teigen, 1988). Even the same individual may interpret a chance term differently depending on the context in which it occurs (see Fox & Irwin, 1998). Although the within-subjects variability is substantially smaller than the between-subjects variability, it is still considerable (Budescu & Wallsten, 1985). Terms that linguistically denote approximately equal probabilities show a remarkable variation (see, for instance, the difference between positive expressions such as *likely* and negative expressions such as *not certain*; e.g., Teigen & Brun, 2003) whereas the interpretation of terms that linguistically denote different probabilities tends to overlap (Wallsten, Budescu, Rapoport, Zwick & Forsyth, 1986).

Different variables affect the *numerical translation* of verbal chance terms. One is the receiver's a priori belief about the likelihood of the events being described. Higher a priori probabilities generally lead to higher probabilities (Wallsten, et al., 1986). Compare, for instance, "This winter, you will probably develop a common cold" to "This winter, you will probably develop a lung infection". Most people believe that common colds occur more

frequently than lung infections. Therefore, the perceived a priori likelihood of developing a common cold is higher than the a priori likelihood of developing a lung infection. Consequently, when people are asked to estimate the numerical equivalent of the word *likely*, the average estimate tends to be higher when *likely* occurs in the context of a common cold than when it occurs in the context of a lung infection.

The above is not meant to say that verbal probability expressions are always more subject to personal and context-bound interpretations than numerical probability expressions are. The latter expressions may also be interpreted differently (see, for instance, Flugstad & Windschitl, 2003; Kleiter, Doherty & Brake, 2002). In fact, numerical expressions may be as inaccurate as verbal expressions and verbal expressions may be as accurate as numerical ones (Rapoport, Wallsten, Erev & Cohen, 1990).

Comparative optimism in likelihood estimates

People believe that they are more likely to experience positive events than others and less likely to experience negative events (for a recent review see Shepperd, Carroll, Grace, and Terry, 2002). This has been named, among other labels, *unrealistic optimism* (Weinstein, 1980) and *comparative optimism* (Harris & Middleton, 1994). It is typically measured using one of two approaches. Researchers may ask participants to estimate their own likelihood to experience various events as compared to someone else's (e.g., the average other's) likelihood. Alternatively, they may ask participants to estimate their own absolute likelihood to experience the events as well as someone else's (e.g., the average other's). The researcher then calculates the difference between the estimates for oneself and the comparison other.

Using both methods, comparative optimism has been shown in a variety of life domains such as health (e.g., Weinstein, 1982; for reviews see Hoorens, 1994, and Klein & Weinstein, 1997), academic and professional success (e.g., Weinstein, 1980), road safety

(e.g., McKenna, 1993), and personal relationships and family life (e.g., Buunk, 2001). However, events differ in the degree to which they elicit comparative optimism. While some studies found stronger comparative optimism for negative than for positive events (e.g., Weinstein, 1980, see also Hoorens, 1996), the most robust determinant of comparative optimism is the perceived controllability of the events. Controllable events elicit stronger comparative optimism than uncontrollable ones (for reviews see Harris, 1996; Hoorens, 1996; Hoorens & Smits, 2001; Klein & Helweg-Larsen, 2002).

Verbal chance terms and comparative optimism

From the above, we may conclude that the interpretation of verbal probability terms partly depends on the subjective a priori likelihood of the event. The subjective likelihood of events, in turn, depends on the target person for whom this likelihood is to be given. Combining these observations, we hypothesized that the numerical interpretation of verbal chance terms depends on the person for whom these likelihoods are given.

In two studies, we presented participants with a set of statements each describing the probability that an event would occur in the life of one out of two targets. Each participant received the set of statements twice: once in the second person, thus simulating the situation in which participants receive likelihood information on their own future (e.g., “you are likely to…”) and once in the third person, thus simulating the situation in which they receive likelihood information on someone else’s future (e.g., “he or she is likely to…”). In both cases participants’ task consisted of interpreting the verbal chance terms numerically.

We expected a self-serving or, stated differently, comparatively optimistic difference between the interpretation of the verbal chance terms used to describe the participants’ own future and the interpretation of the verbal chance terms used to describe another individual’s future. We expected that chance terms would be particularly interpreted in a comparatively

optimistic manner when they are used to describe the likelihood of events that typically elicit comparative optimism. Moreover, we expected that the comparatively optimistic interpretation of verbal chance terms would depend on the threatening nature of the probability statement. Following a motivated reasoning account (Kunda, 1990), we can reasonably expect that participants are more motivated to interpret a threatening statement (e.g., “you are likely to experience a heart attack”) than they are to interpret a less threatening one (e.g., “it is doubtful that you'll have an infected throat”) in a self-serving manner. Therefore, we primarily expected a self-other difference in the interpretation of chance terms that are used in threatening statements.

In Study 1, we tested if a self-other difference occurs in the interpretation of chance terms that are used in statements about positive and negative future life events. In Study 2 we focused on statements about one type of negative future life events, namely, health problems.

Study 1

The aim of Study 1 was threefold. First, it tested the prediction that people interpret chance terms in a comparatively optimistic manner. If they do, verbal expressions describing the likelihood of negative events should be associated with lower numerical probabilities when embedded in statements about the perceiver’s own future than when embedded in statements about another person’s future. In contrast, verbal expressions describing the likelihood of positive events should be associated with higher numerical probabilities when embedded in statements about the perceiver’s own future than when embedded in statements about a third person’s future.

Second, we tested the prediction that this self-other difference depends on the degree to which the events being described elicit comparative optimism. We did so in two different ways. On the one hand, we tested if chance terms are interpreted in a more self-serving

manner when they are used to describe events that elicit stronger comparative optimism. We did so by inspecting the correlation between self-other differences in the interpretation of chance terms with self-other differences in a priori likelihood estimates. On the other hand, we tested if a factor known to influence comparative optimism, namely, event controllability, also affects the degree to which a self-serving interpretation of chance terms occurs. We expected a self-serving interpretation of verbal chance terms when these are used to describe the likelihood of controllable events but not or to a lesser degree when they are used to describe the likelihood of uncontrollable events.

Third, we tested the prediction that people primarily interpret chance terms in a self-serving manner when these chance terms occur in threatening statements. We assumed indeed that the self-serving interpretation of verbal chance terms is an example of motivated reasoning (Kunda, 1990). If this is true, then it should only or particularly occur if a statement is threatening to one's self-view or one's future expectations. Statements saying that positive events are unlikely or that negative events are likely are more threatening than statements saying that positive events are likely or that negative events are unlikely. Therefore, we expected a stronger self-other difference when verbal chance terms were embedded in the former type of statements than in the latter type of statements.

Method

Participants.

Undergraduate psychology students (N = 370) participated for course credits. To avoid participants from having too much experience with some events (e.g., "having to redo a year of your studies"), eight participants were excluded from the analysis because they were older than 23. In addition, 32 questionnaires had missing values and 2 participants failed to

follow the instructions. The final data set (N=328) consisted of 281 women and 47 men, aged 17 to 21 years (*M* = 18.41).

Materials and procedure.

The experiment was run in groups of up to 20 participants. Upon entrance, participants received a booklet that contained all instructions and questionnaires (in Dutch). They filled out the questionnaire in their own pace. Upon completing the questionnaires, participants were thanked and debriefed.

We used a chance term interpretation questionnaire and an event likelihood estimation questionnaire. Each participant filled out each questionnaire twice, once for each of two targets (*self* condition and *other* condition). In the *self* condition, participants interpreted statements about their own future (framed in the second person) and estimated the likelihood of events in their own future. In the *other* condition, participants interpreted statements about the future of a randomly chosen other psychology student of their age and gender (framed in the third person) and estimated event likelihoods for this person's future.

The questionnaires were grouped such that each participant filled out the chance term interpretation task and the likelihood estimation task for one target before proceeding to the second target. Half of the participants completed the questionnaires for *self* first whereas the other half completed the questionnaires for *other* first. Between two targets, participants filled out an unrelated filler task (a questionnaire on mechanisms through which talking about problems may be helpful in coping with them).

The instructions of the chance term interpretation questionnaire explained that people do not attach the same meaning to probability terms under all circumstances. They stated that participants would see a number of statements. Each statement would use a verbal chance term to describe the likelihood of a given event. For each statement, participants had to

indicate what the chance term meant in that context. They had to do so by writing down a percentage from 0 (the term means that the event will certainly not happen) to 100 (the term means that the event will certainly happen). Participants then saw a list of statements in which the likelihood of each of a set of positive and negative events was described using various chance terms. They indicated their responses on a blank space next to each statement.

The second questionnaire examined the degree to which the events that were used elicited *comparative optimism*. Written instructions stated that "in order to better understand your previous answers, we want to know how likely you think the events really are". Participants estimated the events' probabilities by writing a percentage from 0 (the event will certainly not happen) to 100 (the event will certainly happen). They indicated their responses on a blank space next to each statement.

Design.

Each participant's chance term interpretation questionnaire included 32 statements describing the likelihood of eight events. To describe an event's likelihood we used four chance terms, two of which referring to low probabilities and two referring to high probabilities. We used two equivalent sets of chance terms (set A and set B), thus totalling eight chance terms (see Table 1a). The events were selected such that within each questionnaire four categories were equally represented: controllable positive events, controllable negative events, uncontrollable positive events, and uncontrollable negative events. In total, we used 16 events (see Table 1b). From this initial set of 16 we derived two sets of eight to allow two replications of the experiment (replication 1 and replication 2).

INSERT TABLE 1A AND 1B ABOUT HERE

The events were combined with the chance terms such that each chance term of one set (A or B) was combined with each event of a given valence (positive or negative) while

each chance term of the other set was combined with each event of the alternative valence. The chance term set - valence combination and the replications were manipulated over participants.

For the chance term interpretation task, we thus created four within-subjects variables: target (self versus other), event valence (positive versus negative), event controllability (controllable versus uncontrollable), and implied probability (high versus low). In addition, we included three between-subjects variables for reasons of experimental control. These were replication (1 versus 2), chance term-valence combination (A-positive and B-negative versus B-positive and A-negative) and target order (self-other versus other-self). For the likelihood estimation task, the same design applied except, of course, for the within-subjects variables implied probability and term-valence combination.

Results

We first focus on the occurrence of comparative optimism. We then examine if participants interpret the chance terms in a self-serving manner. We conclude with an analysis of the relationship between this self-serving interpretation of chance terms and comparative optimism. Given the large number of effects being tested in this and the following study, we do not discuss between-subjects effects that are not theoretically relevant.

Likelihood estimates.

We predicted that participants would say that positive events were more likely and that negative events were less likely in their own future than in the other's future. To test this prediction, we computed self-other difference scores. Per subject and per event we calculated the difference between the likelihood estimate in the *self* condition and the likelihood estimate in the *other* condition. We did so such that a positive score indicated comparative optimism (for positive events: self minus other; for negative events: other minus self). Per participant,

we calculated the mean self-other difference over events. Showing comparative optimism, overall optimism scores were higher than zero on average (M = 3.41, SD = 7.85; $t(327)$ = 7.86, $p < .0001$, f = .43). We further verified if controllable events elicited stronger comparative optimism than uncontrollable ones. As in previous studies, this was indeed the case (controllable: M = 6.46, SD = 11.62; uncontrollable: M = .35, SD = 9.41; paired t-test, $t(327)$ = 7.82, $p < .0001$).

Chance term interpretations.

One of our main predictions was that participants would interpret chance terms in a more benign manner when these terms described the likelihood of events in their own future than when they described the likelihood of events in another individual's future. To test this prediction, we computed self-other difference scores. Per subject and per statement we calculated the difference between the numerical interpretation in the *self* condition and the numerical interpretation in the *other* condition. We did so such that a positive score indicated a more benign interpretation of the chance term for oneself than for the other (for statements about positive events: self minus other; for statements about negative events: other minus self). Per participant, we calculated the mean self-other difference over all statements. Showing a self-serving or, stated differently, comparatively optimistic interpretation of chance terms, this overall difference score was higher than zero on average (M = 1.40, SD = 4.59; $t(327)$ = 5.54, $p < .0001$, f = .3).

To test if the comparatively optimistic interpretation of chance terms depended on the events' controllability and valence and the chance terms' implied probability, we performed an ANOVA on the mean self-other difference scores per implied probability level (high versus low), event valence (positive versus negative), and event controllability

(controllable versus uncontrollable). The between-subjects variables are described in the method section. The relevant means are shown in Figure 1.

INSERT FIGURE 1 ABOUT HERE

Participants interpreted the chance terms in a more self-serving manner when the chance terms described the likelihood of controllable events (M = 2.08, SD = 5.96) than when they described the likelihood of uncontrollable events (M = .73, SD = 5.91; $F(1,320) = 10.64$, $p = .001$, $\eta_p^2 = .03$). They also interpreted the chance terms in a more self-serving manner when the terms implied a high likelihood (M = 2.29, SD = 6.73) than when they implied a low likelihood (M = .52, SD = 6.68; $F(1,320) = 10.97$, $p = .001$, $\eta_p^2 = .03$).

However, participants did not always interpret chance terms that implied a high probability or that described the likelihood of controllable events in a self-serving manner.

They showed a stronger self-serving interpretation when the chance terms described the high likelihood of controllable events than when they described the low likelihood of controllable events or the (high or low) likelihood of uncontrollable events (high likelihood controllable: M = 3.64, SD = 9.19; alternative conditions: M = .67, SD = 5.01; paired t-test, $t(327) = 5.38$, $p < .0001$). The interaction of implied probability and event controllability was significant ($F(1,320) = 7.58$, $p = .006$, $\eta_p^2 = .02$).

Participants also showed a clear-cut self-serving interpretation when the chance terms described the high likelihood of negative events (M = 6.46, SD = 15.1; $t(327) = 7.75$, $p < .0001$). The effect was weaker, but still significant, when they described the low likelihood of positive events (M = 1.16, SD = 9.9; $t(327) = 2.12$, $p = .035$). No self-serving interpretation occurred when the chance terms described the low likelihood of negative events (M = -.12, SD = 11.11; $t(327) = -.19$, $p = .85$). A comparatively pessimistic interpretation even occurred when the chance terms described the high likelihood of positive events (M = -1.89, SD =

10.95; $t(327) = -.3.12$, $p = .002$). The interaction of implied probability and event valence was significant ($F(1,320 = 37.29$, $p < .0001$, $\eta_p^2 = .1$). As a consequence, a main effect of event valence also occurred ($F(1,320) = 26.01$, $p < .0001$, $\eta_p^2 = .08$).

Relationship between chance term interpretations and likelihood estimates.

We tested if comparative optimism predicts the comparatively optimistic interpretations of chance terms. Therefore, we took the event as the unit of analysis. Per event, we calculated the average self-other difference in the numerical interpretations and in the likelihood estimates over participants and (and, for the interpretations, over chance terms). Showing that comparative optimism in likelihood estimates predicts self-serving or comparatively optimistic interpretations of chance terms, the resulting scores were significantly correlated ($r = .51$, $p < .05$).

Discussion

We predicted that participants would interpret verbal chance terms in a self-serving manner. The present study supported this prediction as we observed a significant self-other difference in a comparatively optimistic direction.

We also predicted that this effect would primarily occur when likelihood statements are threatening. The data supported this expectation as well. No self-serving interpretation occurred when chance terms occurred in statements about the low likelihood of negative events and the high likelihood of positive events. It is clear that such statements are reassuring rather than threatening. When chance terms occurred in statements that described the high likelihood of negative events or the low likelihood of positive events, however, a self-serving interpretation occurred. In addition, the former effect was stronger than the latter. Reading that one is unlikely to obtain positive outcomes may indeed be less threatening than reading

that one is likely to obtain negative ones. This may be the case because exposure to negative things may be more dangerous to an individual than not being exposed to positive things.

We also predicted that the self-serving interpretation of chance terms derives from comparative optimism. We reasoned that the latter phenomenon affects the a priori likelihood of events in one's own versus in someone else's life. Hence, it should affect the interpretation of the chance terms describing these events' probability. Our data supported this prediction. First, the events we used generally elicited comparative optimism. Second, a stronger self-serving interpretation occurred when chance terms described the likelihood of events that elicited stronger comparative optimism. Third, the effect of event controllability on comparative optimism came back as a main effect (and an interaction with implied likelihood) on the self-serving interpretation of chance terms. This pattern of results suggests that comparative optimism does contribute to the self-serving interpretation of chance terms.

Surprisingly, when participants were confronted with statements on the high likelihood of positive things, they interpreted the chance terms in a manner that was *unfavourable* to them. This may be an example of defensive pessimism (e.g., Norem & Cantor, 1986, Norem, 2001). By assuming that they are less likely than others to experience common good things, people may brace against disappointment. This strategy also allows them to maintain a sufficient level of energy aimed at obtaining these desirable things. Such a strategy is not necessary in the case of rare good things. Failing to obtain positive outcomes that seldomly occur may indeed be less disappointing and embarrassing than failing to obtain common positive outcomes. At the same time, defensive pessimism may be undesirable when negative events come into play. In this case, the psychological costs of defensive pessimism may indeed be much greater than its benefits (on the psychological benefits of optimism see, for instance, Taylor & Brown, 1988).

To our knowledge, our study is the first to show a self-serving tendency in the interpretation of verbal chance terms. A replication was therefore in order before drawing any firm conclusions. One domain in which people are often confronted with statements about the future is in the realm of health and safety education. If the self-serving tendency in the interpretation of verbal chance terms is to have any applied relevance, then it should occur in this domain. Therefore, we replicated Study 1 using health-related events. This replication also allowed us to vary the threatening nature of the statements in an alternative way and hence to further test the view that the self-serving interpretation of chance terms is a case of motivated reasoning. Finally, Study 2 further examined the relationship between in the self-serving interpretation of verbal chance terms and comparative optimism.

Study 2

The aim of Study 2 was to replicate Study 1 using statements about health problems. We expected that people would associate lower numerical probabilities to verbal chance terms when these describe the likelihood of health problems in their own life than when they describe the likelihood of the same problems in someone else's life.

If this effect occurs because the information being transmitted is threatening, as we propose, then it should primarily occur for verbal chance terms that denote a high probability but not or to a lesser degree for verbal chance terms that denote a low probability. Furthermore, among threatening statements denoting a high probability, the effect should primarily occur for very severe health problems. Such statements are indeed even more threatening than comparable statements about less severe events.

Finally, if the effect is based on comparative optimism, then it should be stronger when chance terms are used to describe the likelihood of health problems that elicit

comparative optimism than when they are used to describe the likelihood of health problems that generally elicit weak or no comparative optimism.

Method

Participants.

One hundred and eight university students (75 women and 33 men, aged 18 to 27, mean age = 21.14) participated. They were paid 6,5 EUR for a one-hour session in which various studies were ran and of which the present study was the first part.

Materials and procedure.

The materials and procedure were similar to those of Study 1 except for the following. First, the experiment was computer-administered. Participants were seated in individual cubicles in which stimuli were presented and data were collected using E-Prime (version 1.0) software.

Second, we used a single set of eight health problems (Table 2). We selected them from published comparative optimism studies (Weinstein, 1980, 1982) such that half of the events typically elicit comparative optimism whereas the other half do not. Within each category, we expected the perceived severity of the health problems to vary considerably.

INSERT TABLE 2 ABOUT HERE

To construe the statements we divided the health problems into two sets of four. The first consisted of “get diabetes”, “contract a venereal disease”, “get addicted to alcohol”, and “have a heart attack”. The second consisted of “break a bone”, “have an infected throat”, “have a high blood pressure”, and “get cancer”. For half of the participants, the events from the first set were combined with the chance terms of set A and the events from the second set were combined with the chance terms of set B (combination 1; see Table 1a). For the other half of the participants, the events of the first set were combined with the chance terms of set

B and the events of the second set were combined with the chance terms of set A (combination 2).

Third, after the chance term interpretation questionnaire and the likelihood estimation questionnaire for a given target (*self* or *other*), participants rated how severe they thought each health problem would be if that target experienced it. They did so on a scale from 0 (not at all serious) to 100 (very serious). We chose this unusually fine-grained scale to render the severity scale comparable to the likelihood scale.

For the chance term interpretation task, we thus created four within-subjects variables: target (self versus other), implied probability (high versus low), event severity (high versus low), and event comparative optimism (present versus absent). The severity dichotomization was based on participants' ratings. The comparative optimism dichotomization was verified with the comparative optimism questionnaire. Contrary to the a priori classification, comparative optimism occurred for “break a bone” but not for “have a heart attack”. Therefore, we regrouped the problems accordingly. We also included two between-subjects variables for experimental control: event-chance term combination (combination 1 and 2) and target order (self-other versus other-self). For the likelihood estimation task and the severity rating task, the same design applied except for the within-subjects variable implied probability and the between-subjects variable event-chance term combination.

Results and discussion

We replicated the self-serving or comparatively optimistic interpretation of verbal chance terms. On average, participants attached lower numerical probabilities to verbal chance terms in statements about health problems in their own future than to verbal chance

terms in statements about health problems in someone else's future (M = 3.45, SD = 7.97; $t(107) = 4.5$, $p < .0001$, $f = .43$).

We particularly predicted a self-serving interpretation of verbal chance terms in threatening statements or, more specifically, in statements implying a high likelihood of health problems. We also predicted that this effect would be aggravated by the perceived severity of the health problems and the degree to which the health problems elicit comparative optimism. To test these predictions, we performed an ANOVA on the mean self-other difference scores with implied probability (high versus low), event severity (high versus low), and event comparative optimism (present versus absent) as within-subjects variables and with event-chance term combination (combination 1 and 2) and target order (self-other versus other-self) as between-subjects variables. The within-subjects means are presented in Figure 2. As becomes evident from them, our predictions were supported.

INSERT FIGURE 2 ABOUT HERE

First, chance terms implying a higher probability were more strongly interpreted in a self-serving manner (M = 4.94, SD = 11.41) than chance terms implying a low probability (M = 1.90, SD = 9.92). The self-other difference was significant in both cases (high: $t(107) = 4.5$, $p < .0001$; low: $t(107) = 1.99$, $p < .05$), but the main effect of implied probability was significant ($F(1,104) = 5.18$, $p = .025$, $\eta_p^2 = .05$.

Second, chance terms were particularly interpreted in a self-serving manner when they described the high likelihood of comparative optimism-eliciting events (M = 7.03, SD = 14.53) than in any other combination of chance terms and events (the three remaining likelihood-comparative optimism conditions combined: M = 2.21, SD = 8.13; paired t-test, $t(107) = 3.5$, p = .0007). Not surprisingly, the interaction of event comparative optimism with implied probability was significant ($F(1,104) = 31.37$, $p < .0001$, $\eta_p^2 = .23$).

Third, chance terms were more strongly interpreted in a self-serving manner when they described the high likelihood of severe events (M = 5.90, SD = 14.38) than in any other combination of chance terms and events (the three remaining likelihood-event severity conditions combined: M = 2.59, SD = 8.12; paired t-test, $t(107) = 2.44$, $p = .02$). Again, the interaction of event severity with implied probability was significant ($F(1,104) = 17.96$, $p < .0001$, $\eta_p^2 = .15$).

Unexpectedly, event comparative optimism interacted with event severity ($F(1,104) = 15.47$, $p < .0005$, $\eta_p^2 = .13$). We did expect a self-serving interpretation of chance terms when these described the likelihood of problems that elicited comparative optimism, particularly when the events were severe. This is exactly what we found (severe: M = 4.11, SD = 12.02, $t(107) = 3.55$, $p < .001$; less severe: M = 2.79, SD = 9.69, $t(107) = 2.99$, $p <.005$). Equally unsurprising, no self-serving interpretation occurred when chance terms described severe problems that did not elicit comparative optimism (M = 1.37, SD = 10.82, $t(107) = 1.32$, $p = .19$). However, the strongest self-serving interpretation occurred when chance terms described less severe events that did not elicit comparative optimism (M = 5.42, SD = 10.36, $t(107) = 5.44$, $p < .0001$).

One explanation may be that the perception of the likelihood of events and the perception of their seriousness are not independent. The more unlikely an event seems, the more extreme its subjective utility (Kanouse and Hanson, 1972; Jemmott, Ditto & Croyle, 1986; Jemmott, Croyle & Ditto, 1988; Ditto & Jemmott, 1989; Weinstein, 2000). For instance, Jemmott and his colleagues (1986) made their participants believe that a fictitious enzyme deficiency was rare or common. Those who believed that it was rare rated it as more serious than those who believed that it was common. Consistent with such a trade-off of prevalence and severity, Weber and Hilton (1990) showed that chance terms may be

interpreted as denoting a higher probability if they describe the likelihood of less severe problems than if they describe the likelihood of more severe problems. Using a similar logic, chance terms may be interpreted as denoting a higher probability if they describe the likelihood of events for which people are not motivated to believe that they are less at risk than others (i.e., comparative optimism absent) than if they describe the likelihood of events for which they are motivated to do so (i.e., comparative optimism present). If this is true, then statements about the (high or low) probability of less severe problems that do not elicit comparative optimism may be psychologically equivalent to statements about the high probability of negative events.

We tested this explanation by combining participants' mean likelihood estimates for the two targets and subjecting the resulting means to an ANOVA with event severity and comparative optimism as within-subjects variables. Less severe problems were perceived as more likely (M = 43.04, SD = 14.86) than severe problems (M = 24.7, SD = 13.11; $F(1,107)$ = 268.34, $p < .0001$). Similarly, events that elicited no comparative optimism were perceived as more likely (M = 42.92, SD = 16.73) than events that elicited comparative optimism (M = 24.82, SD = 11.28; $F(1,107)$ = 215.12, $p < .0001$). Perceived severity and comparative optimism also interacted: $F(1,107)$ = 24.66, $p < .0001$. Less severe events that did not elicit comparative optimism were perceived as more likely (M = 54.45, SD = 18.14) than more severe events that did not elicit comparative optimism or (more and less severe) events that elicited comparative optimism (the three conditions combined: M = 27.01, SD = 12.31; paired t-test, t(107) = 21.38, $p < .0001$.

General Discussion

When participants read about negative events that might happen to them, they thought that the verbal chance terms being used meant lower numerical probabilities than

when they read about negative events that might happen to someone else (Study 1 & 2). When they read about positive events that might happen to them, they thought that the chance terms meant higher numerical probability when they read about positive events that might happen to someone else (Study 1).

This self-serving interpretation depended on the probability level implied by the chance terms. When they described a high probability of negative events (Study 1 and 2) or a low probability of positive events (Study 1), they were interpreted in a self-serving manner. When they described a low probability of negative events or a high probability of positive events, no (Study 1) or a weak (Study 2, negative events) self-serving interpretation occurred.

We interpret this pattern in terms of the threatening nature of the statements and suggest that the self-serving interpretation of verbal chance terms is a case of motivated reasoning. Individuals use cognitive strategies to interpret probabilistic expressions favourably when they are motivated to do so. This motivation is stronger when they are confronted with threatening communications about their future than when they are confronted with non-threatening communications on their or someone else's future. Supporting this view, both the severity of the health problems being described (Study 2) and the probability implied by the chance terms (Study 1 and 2) affect the degree to which the interpretation of chance terms yield a comparatively optimistic self-other difference.

Teigen and Brun (1995) offer further support for the idea that some probability statements are more threatening than others. They found that chance terms may communicate a sense of directionality. Affirmative chance terms elicit thoughts about why a given outcome may occur. Negative terms elicit reasons why the outcomes will not occur. Interestingly, high probability terms are mostly affirmative, whereas low probability terms are mostly negative. Statements saying that negative events will occur may therefore elicit frightening thoughts

about risk-enhancing factors while statements saying that positive events will not occur may elicit scary thoughts about blocks and pitfalls on the way to success. Because both are threatening, they motivate self-serving interpretations of the chance terms being used.

To be sure, the self-other difference we observed in the interpretation of chance terms was not very large. Therefore, we do not mean to say that people reinterpret chance terms *completely* differently when these terms describe one's own versus someone else's future. We believe that the self-serving distortion is limited by the boundaries of perceived rationality. As suggested in the literature on self-favouring biases, people adjust their likelihood estimates and personality ratings to the degree that they can rationalise their views and maintain a self-image as a reasonable person (e.g., Kunda, 1990). Consequently, the self-other difference in the interpretation of chance terms is consistent but small. As an illustration, Figure 3 depicts the mean absolute interpretations for self and other per chance term in the context of statements about negative events (averaged over Study 1 and 2).

INSERT FIGURE 3 ABOUT HERE

The motivated reasoning account implies that identifying the motivational basis of the self-serving interpretation of chance terms is not sufficient. To fully understand why people say that chance terms denote a different probability when they describe their versus someone else's future, we also need to analyse the cognitive mechanism that allows them to reach this outcome without being confronted with their motivated subjectivity. Both studies suggest that the effect is related to comparative optimism (for a recent overview see Shepperd et al., 2002).

To conclude, we found that people interpret risk messages differently depending on whose future these messages describe. As such, our studies add insight in context effects in the interpretation of risk messages (for an overview, see Fox and Irwin, 1998). Although risk

communication does not exist exclusively of messages on the high probability of unhappy events in the future, such messages constitute a large and important part of it. Health and safety education messages that aim at eliciting behavioral change may particularly underline the high probability of hazards if the audience does not comply. Ironically, this is the kind of risk communication that is most likely to elicit a comparatively optimistic interpretation of the chance terms that are used in describing these hazards.

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Table 1a

Verbal chance terms used in Study 1 and 2 (translation within brackets)

	Set A	Set B
High	Waarschijnlijk (Probably)	Grote kans (Big chance)
	Aannemelijk (Likely)	Te verwachten (To be expected)
Low	Twijfelachtig (Doubtful)	Onzeker (Uncertain)
	Kleine kans (Small chance)	Onwaarschijnlijk (Improbable)

Table 1b

Events used in Study 1 (translated from Dutch)

	Replication 1	Replication 2
Controllable positive	Meet interesting people during one's college years	Get or keep a good fitness level
	Graduate with honors	Get a romantic relationship or maintain one's current relationship
Uncontrollable positive	Never in hospital for next 20 years	Never have a car stolen
	Win a lottery	Have a highly talented child
Controllable negative	Divorce	Unplanned pregnancy as a mother or as a father
	Get addicted to alcohol/drugs	Have to redo a year of one's studies
Uncontrollable negative	Get jaundice	Become blind due to accident or illness
	Be forced to retire early	Be robbed

Table 2

Health problems used in Study 2 as a function of their perceived severity and the degree to which they elicit comparative optimism (post hoc classification, events translated from Dutch)

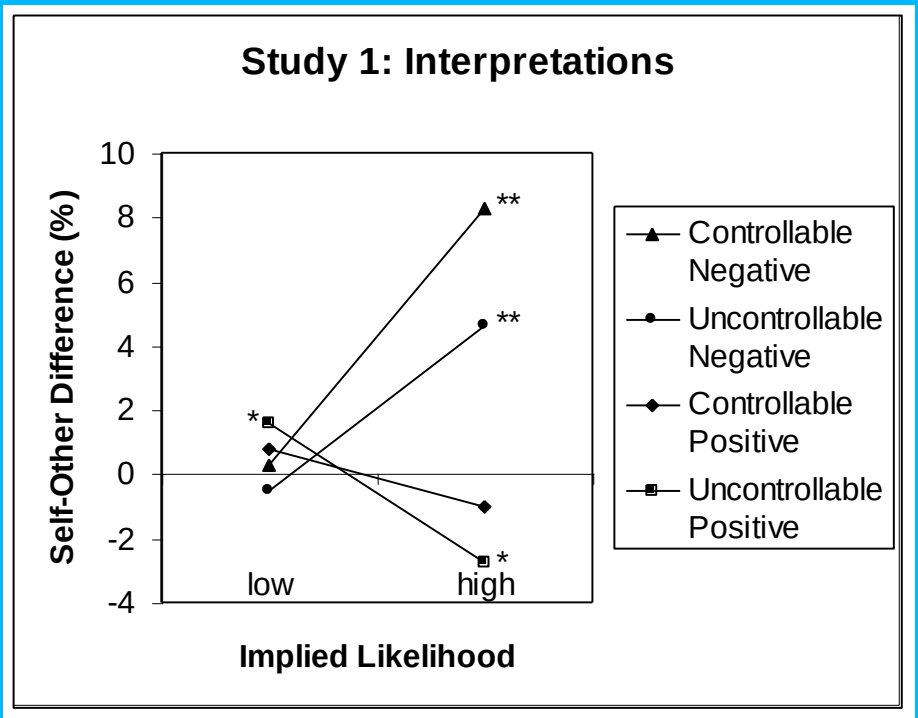
	Less severe	More severe
Comparative optimism	Diabetes	Venereal disease
	Broken bone	Alcohol addiction
Comparative realism	Infected throat	Heart attack
	High blood pressure	Cancer

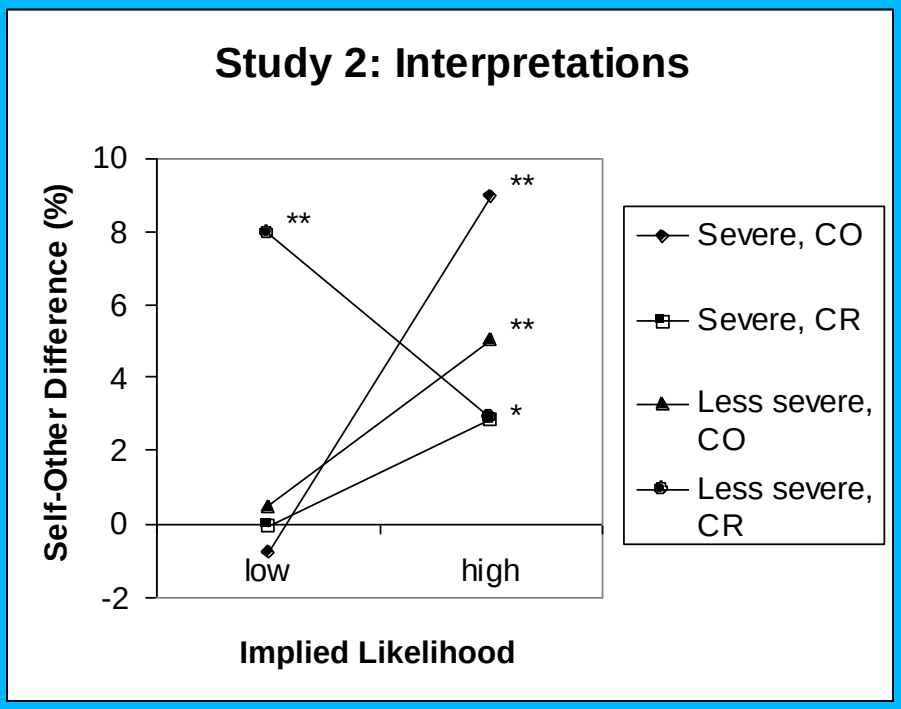
Figure captions

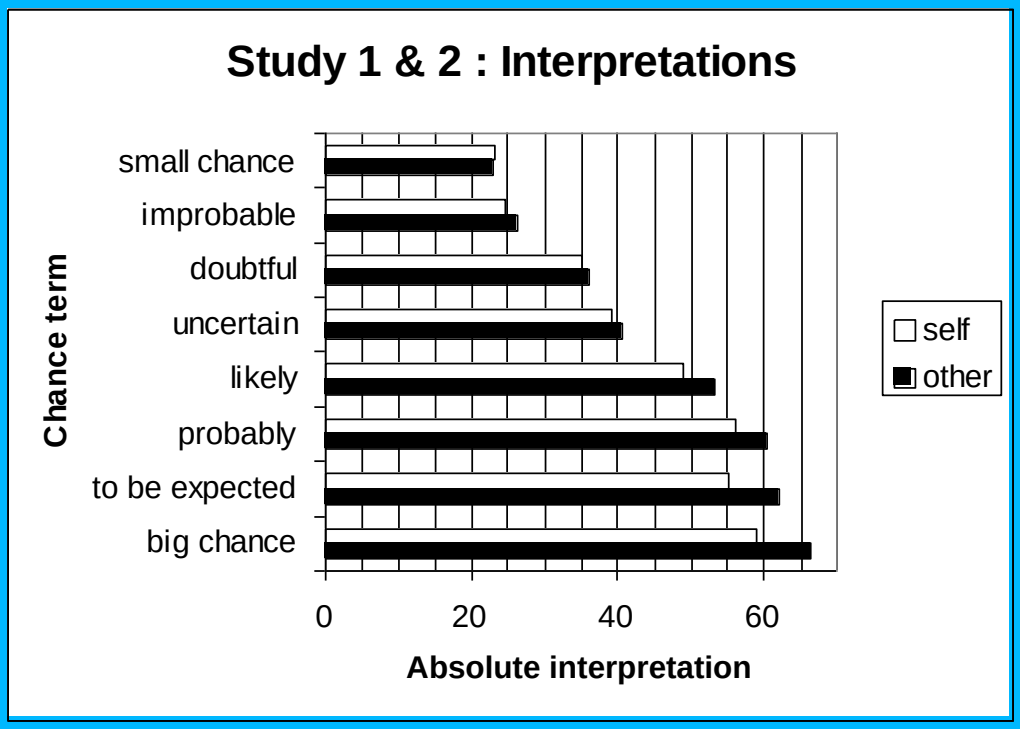
Figure 1. Self- other differences (in % points) in the interpretation of chance terms as a function of the probabilities implied by the terms and the events' controllability and valence. Positive values denote self-serving interpretations (** = $p < .0001$; * = $p < .05$; data of Study 1).

Figure 2. Self-other differences (in % points) in the interpretation of chance terms as a function of the probabilities implied by the terms and the events' severity and comparative optimism. Positive values denote self-serving interpretations (** = $p < .0001$; * = $p < .05$; data of Study 2).

Figure 3. Mean absolute interpretation (in %) for self and other of verbal chance terms describing negative events (averaged over Study 1 and 2)


Study 1: Interpretations
Self-Other Difference (%)
10
8
6
4
2
0
-2
-4
low
high
Implied Likelihood
**
**
*
*
Controllable Negative
Uncontrollable Negative
Controllable Positive
Uncontrollable Positive


Study 2: Interpretations
Self-Other Difference (%)
10
8
6
4
2
0
-2
low
high
Implied Likelihood
**
**
**
*
Severe, CO
Severe, CR
Less severe, CO
Less severe, CR


Study 1 & 2 : Interpretations
Chance term
small chance
improbable
doubtful
uncertain
likely
probably
to be expected
big chance
0
20
40
60
Absolute interpretation
self
other