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RISK PERCEPTION AND BEHAVIOR: PESSIMISM, REALISM, AND OPTIMISM ABOUT AIDS-RELATED HEALTH BEHAVIOR

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This study investigates the perceived risk of becoming infected with HIV for heterosexuals with multiple sexual partners, examines cognitive and motivational antecedents of biases in risk perception, and relates these biases to behavior. We obtained a moderate degree of optimism in a longitudinal study based on a sample of 535 visitors of a STD clinic. Further analyses—after classifying subjects as “pessimists,” “realists,” or “optimists”—revealed that pessimists were extremely pessimistic and optimists remarkably optimistic. Optimism increased with perceived control and decreased with prior experience, supporting a cognitive explanation of optimism. The data also provided some support for a motivational explanation: optimists who scored higher on a defensive coping style were more optimistic about their risks. Contrary to other findings, we found a positive relation between optimism and intentions to reduce risks. Furthermore, results revealed that optimists showed lower levels of subsequent behavioral risk. It was concluded that optimists were not unrealistically optimistic about their personal vulnerability, but rather that pessimists were unrealistically pessimistic. Previous behavior was found to be the best predictor of subsequent behavior. Although measures of perceived risk were also related to subsequent behavior, their predictive power was rather modest.

KEY WORDS: Preventive health behavior, AIDS, heterosexuals, optimistic biases, coping.

Generally, people seem to have unrealistic positive views of the self, exaggerated perceptions of personal control (Langer, 1975) and they are unrealistically optimistic about the future (Taylor and Brown, 1988). The latter has been found to influence the way people react to many health and safety risks; people tend to believe that they are less at risk than others around them (Weinstein, 1980, 1982). For example, infection with the Human Immunodeficiency Virus (Bauman and Siegel, 1987), illness as a result of smoking (Lee, 1989), not wearing seat belts (Weinstein, Grubb and Vautier, 1986) have all been shown to evoke unrealistic optimism. Weinstein (1983) argued that optimism on an individual level may be perfectly correct. However, optimism on group level can be called unrealistic optimism, because not everyone can be below average in risk. Generally, unrealistic optimism is thus

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defined at group level. If most people in a group claim that their chances of being confronted with negative health consequences are below average, some of them must be wrong.

Perceptions of risk or vulnerability are related to preventive health behavior (e.g. Becker *et al.*, 1977; Cummings *et al.*, 1979; Bauman and Siegel, 1987; McCusker *et al.*, 1989). From this one could argue that if people are unrealistically optimistic, they will tend to feel less vulnerable, and, hence, are expected to be less likely to change their behavior to reduce risks. The effectiveness of health education campaigns depends to a large extent on getting people to acknowledge the link between their behavior and their actual risk status. If this condition is not met, unrealistic optimism may lower risk reduction motivation and/or activities.

Weinstein (1980, 1982) puts forward two categories of explanation for this optimistic bias; motivational and cognitive. The motivational explanation predicts a positive relationship between perceived threat and optimism. Although other research suggests possible relations between perceived risk, threat, and defensive denial (e.g. Janis and Mann, 1977; Rippetoe and Rogers, 1987), Weinstein (1982) found little support for the influence of defensive denial. Yet, another type of ego-defensive process—self-esteem enhancement—was found to influence optimism; a general tendency of people to believe to be better and healthier than average (Weinstein, 1982). The second explanation involves cognitive errors; Weinstein (1982) refers to egocentrism and stereotypic mental images of the victim. Because of egocentrism, people may forget that their efforts to reduce the likelihood of a negative event may be shared by many others. Furthermore, people tend to have a selective recall of factors that reduce one's risk as compared to factors that increase one's risk (Weinstein, 1984). People may also have a stereotypic mental image of the victim. If they do not see themselves as fitting this image, they are likely to conclude they are not at risk, even though they differ from the image only in features irrelevant to risk vulnerability. Both the existence of egocentrism and stereotypic mental image were confirmed by Weinstein (1980, 1982, 1984). Although some research suggests that both motivational and cognitive factors play a role in this optimistic bias (e.g. Weinstein, 1982), most evidence indicates a primary role of cognitive factors as determinants of unrealistic optimism. The role of egocentrism for instance has been studied in two experiments. These showed that optimism can be reduced by making the risk status of other people more salient (Weinstein and Lachendro, 1982), or by providing information about self-protective activities of others (Weinstein, 1983).

Weinstein (1984) acknowledges that the relation between risk judgments and risk related behavior is often weak or nonexistent, and that the consequences of optimism for subsequent behavior are not yet well understood. This may be due, at least in part, to sample characteristics and the selection of health risks: most research on optimism has been carried out on young and healthy college students, for whom the threats under study were relatively remote while their vulnerability to the threats was low.

The present study focuses on a specific risk group; heterosexuals with a higher than average risk for an infection with HIV. Given the tendency to overestimate small probabilities with large consequences (cf. Slovic, Fischhoff, and Lichtenstein, 1987), the perceived risk for a future infection with HIV is likely to be higher than the actual risk. Our own research concerning similar samples revealed this overestimation, as well as an optimistic bias (Hooykaas *et al.*, 1989; Van der Pligt, 1990).

In the present study we investigated risk factors that were possible antecedents of

both absolute and comparative risk judgments,[†] and, additionally, related these judgments to behavioral intentions and subsequent behavior. In general (e.g. Weinstein, 1983), comparative risks judgments are measured by assessing responses on a scale ranging from -3 (own risk much below average) to +3 (own risk much above average). Next, these scores are correlated with risk factors and outcome measures. These analyses, however, also include subjects who are not optimistic (scores equal to or above 0). This research thus ignores possible general differences in coping with a health threat between subjects who are optimistic and subjects who are not optimistic. Contrary to Weinstein's line of research (e.g. Weinstein, 1983), we differentiated in our analyses between subjects who were "pessimistic" (own risk higher than others' risk), "optimistic" (own risk lower than others' risk) and subjects who did not discriminate between own and others' risk (referred to as "realists"). In accordance with Weinstein (1982), we investigated the possible role of cognitive factors on optimism such as personal experience (contacts with Aids-risk groups and history of sexually transmitted diseases) and perceived control. We also looked at perceived threat and coping styles to explore the role of motivational factors. To investigate the possible role of coping strategies on optimism, we assessed three coping styles of Janis and Mann's (1977) conflict theory: vigilance, hypervigilance and defensive avoidance. Finally, we incorporated Aids-related knowledge to assess a possible bias due to misinformation or lack of information.

The purpose of this study was (a) to demonstrate the existence of an optimistic bias among heterosexuals at relative high risk for an infection with HIV, (b) to investigate the role of both motivational and cognitive factors as antecedents of absolute and comparative risk judgments (overall, and separately for pessimists, realists and optimists) and (c) to relate these risk judgments to previous behavior, behavioral intentions, and subsequent behavior, in order to answer the question to what extent optimists are *unrealistically* optimistic.

METHOD

Subjects

Subjects in this study were visitors of a STD clinic of the Municipal Health Service of Amsterdam (MHSA). Visitors were asked to participate if they were aged over 17, and had at least five sexual partners during the last six months. Haemophiliacs, men with homosexual contacts and intravenous drug users were excluded from the study. Participation was voluntary, subjects were asked to sign an informed consent. Between October 1987 and August 1989, approximately half the people who met the entrance criteria decided to participate: 235 male and 300 female visitors of the clinic ($N = 535$). Visitors of the clinic more likely to refuse participation were young males of ethnic minorities (Van der Linden *et al.*, 1990). The majority of the visitors who decided to participate engaged in prostitution contacts: 143 males (61%) visited prostitutes, 218 females (73%) worked as prostitute. All subjects were asked to return three weeks after the first visit, and, afterwards, every four months for follow-up. 83% ($n = 446$) returned three weeks later to obtain their HIV and

[†] As Weinstein (1984) points out, neither of these judgments is more reliable than the other, and they are by no means redundant.

STD-results, 61% ($n = 324$) returned for the first follow-up visit. Comparing subjects who did and subjects who did not return for their follow-up visit resulted in significant differences between these two groups. However, after excluding the younger males of ethnic minorities from the analyses, all these differences disappeared. On average, clinic visitors who dropped out of the study had more often prostitution contacts and had more often a history of STDs in the past. Although the questionnaires were also translated in the other languages (e.g. English, French, Turkish) we expect that language problems are part of the cause of the higher drop out rate of ethnic minorities.

Measures

After physical examination, subjects answered questions concerning their sexual behavior and some general characteristics. Finally, they answered a questionnaire dealing with psychological variables.

Physical examination. Subjects were examined for STDs, direct microscopy was performed for gonorrhoea, candidiasis and trichomonas (the latter two for women only). Material was taken for cultures of gonorrhoea and *Chlamydia trachomatis*. Laboratory examinations for other STDs (e.g. herpes simplex) were performed on indication. Serum samples were taken and analyzed for antibodies to HIV, and screened for syphilis. STD-diagnosis included only those STDs which are mainly transmissible via vaginal intercourse. These STDs (prevalence rates added in parentheses) were HIV (0.4%), lues recens (1.0%), gonorrhoea (6.7%), *Chlamydia trachomatis* (11.0%), trichomoniasis (6.0%, women only), primary genital herpes (0.7%) and primary condylomata acuminata (1.8%). Overall, 25.8% of all subjects had one or more of these STD's at entry of the study.

Sexual behavior. The questionnaire assessed the participant's sexual behavior in the four months preceding the study (previous behavior), and in the four months after the first visit (subsequent behavior, measured at first follow-up). Sexual behavior consisted of number and type of partners (private and prostitution), frequencies of various sexual techniques per type of partner, and frequency of condom use per technique and per type of partner. Responses were given on a 5-point Likert-type scale, ranging from "never" to "always." A measure of risk behavior was obtained by multiplying the number of partners with the frequency of vaginal intercourse and the frequency of condom use, separately for private and prostitution contacts. These measures were summed afterwards. Frequency scores for vaginal intercourse ranged from 0 (technique never used) via 0.25, 0.50 and 0.75 to 1 (technique always used). Frequency scores for condom use ranged from 1 if condoms were never used, via 0.75, 0.50, and 0.25 to 0 when condoms were always used. For example, a participant with eight sexual partners (private and/or prostitution) who had often vaginal contact while using condoms half of the time, obtained a risk-score of $8 * 0.75 * 0.50 = 3$ (because of skewed distributions, these scores were log-transformed afterwards).

Additionally, STD-history and frequency of contacts with Aids-risk groups were assessed. These data were assessed covering both the period of four months and the period of five years prior to the study. Finally, their reason for visiting the clinic was assessed (with and without Aids-and/or STD-related complaints).

General characteristics. These included—besides gender and age—year of entrance in study (1987–1989), ethnicity (born inside the Netherlands or not), education (less or more than 10 years of education), previously HIV-tested, and visit-site or work-site of prostitutes (e.g. sex club or “behind windows”).

Psychological variables. The questionnaire assessed behavioral intentions, appraisal of the threat of AIDS, coping styles, and other responses. Unless otherwise specified, subjects responded to questions on 5-point Likert-type scales.

Behavioral intentions were assessed by asking if subjects intended to use condoms in the following four months, separately for private and prostitution contacts (measurement three weeks after the first visit). Summing yielded an overall score for behavioral intentions, responses ranged from “definitely not” to “definitely yes.”

To assess perceived risks, subjects estimated the chance of personally being infected with HIV in the future (own risk). The same probability estimation was asked for an average other of one's own age and sex (others' risk). A comparative risk-score was derived by subtracting the own risk-score from the risk-score for others. Subjects who judged their own risk to be higher than the risk of others are referred to as “pessimists,” subjects who did not differentiate between own and others' risk are referred to as “realists” and, finally, subjects were called “optimists” if they judged their own risk to be lower than the risk of others. Responses for both absolute risk judgments were made by setting a mark on a continuum ranging from 0 to 100% chance, with every 10% point marked. To compare these risk-scores with STDs and other health risks, the same risk estimations were asked for gonorrhoea, syphilis, a heart-attack and lung-cancer.

Additionally, four other psychological variables were included in the questionnaire: coping style, perceived severity, perceived control, and knowledge. We distinguished three *coping styles*. These were: vigilance (seven items, e.g. “you have thought about how to raise the subject of safe sex with your sexual partner”), hypervigilance (six items, e.g. “you still have doubts about how to adapt your sex-life precisely”) and defensive avoidance (seven items, e.g. “you leave the choice whether to practice safe sex or not to your sexual partner”). Coping style was assessed by asking subjects to rate the extent to which they thought the items applied to themselves on a scale ranging from “not at all” (1) to “very much” (5). Scores were summed to yield an index for each coping style. Using the “elbow criterium,” factor analysis (principal component analysis with varimax rotation) confirmed the existence of the three distinct coping styles with an eigenvalue greater than 1. As indicated by Cronbach's alpha, the reliability of these coping styles was 0.77 for vigilance, 0.61 for hypervigilance and 0.70 for defensive avoidance. *Perceived severity* was assessed by rating the severity of an HIV infection on a scale ranging from (1) “not at all severe” to (5) “very severe,” *perceived control* was assessed by asking subjects how much control they had to avoid an infection with HIV. Scores ranged from “no control” (1) to “complete control” (5). Finally, *knowledge* was assessed by 22 questions concerning various dimensions of what people ought to know about AIDS, according to AIDS-information campaigns (e.g. “the AIDS-virus can be transmitted by means of *one* sexual contact”). Possible responses were “true,” “false” and “don't know.” Correctly answered questions were divided by the total number of questions, the resulting knowledge score ranged therefore from 0 (no correct answers) to 1 (all questions correctly answered).

Data Analyses and Statistical Methods

Chi-square tests of independence and analysis of variance (one-way ANOVA) tests were used to test differences in absolute and comparative risk judgments. With the exception of demographic variables (gender, age, ethnicity and education) all variables that could affect absolute or comparative risk judgments (STD-related complaints, HIV-related complaints, STD-history, STD-diagnosis, prostitution contacts, contacts with AIDs-risk groups, work- or visit-site of prostitutes, previously HIV-tested, year of entrance in study and psychological variables) were entered in multiple regression analyses to find independent predictors of these risk judgments. Discriminant analyses (based on maximizing RAO's V) were used to differentiate between pessimists, realists and optimists. Next, multiple regression analyses were used to investigate differences in risk factors within each of these groups. One-way ANOVA's were used to relate risk judgments to behavioral intentions and subsequent behavior. Finally, multiple regression analyses were performed to assess the relative predictive power of these risk judgments as compared to the other variables. For all analyses, a two-sided significance level of 5% was used.

RESULTS

Figure 1 presents the perceived risks of several health risks, for oneself and for comparable others. With the exception of gonorrhoea, all risk judgments showed an

Figure 1 Perceived risk for self and others, for five health risks^{a, b, c}

Note: ^aTotal $n = 464$, ^bAll differences were significant at the 0.05 level, with the exception of gonorrhoea. ^cPerceived risk-scores could range from 0% to 100%.

optimistic bias; perceived risks for others were significantly higher than perceived own risks. This optimistic bias was highest for lung cancer, and lowest for the health risk central to this study: infection with HIV.

Perceived Risk and Risk Factors

Three subjects in this sample were tested HIV-positive (one subject sero-converted in the course of the study). Other indications also suggest that the present group of respondents were at increased risk: 25.8% had one or more STDs at entry of the study, 48.2% had a history of STDs in the last five years, 13.6% in the last four months. Furthermore, 67.5% of the subjects engaged in prostitution contacts, whereas 22.2% and 13.5% of the subjects had contacts with AIDs-risk groups (e.g. intravenous drug users) in the last five years and the last four months respectively. First we investigated possible differences in risk judgments as a function of variables such as year of entrance in the study, previously HIV-tested, STD-history, STD-related complaints, type of partner (prostitution and/or private) and work- or visit-site of prostitutes.[†] With the exception of AIDS-related complaints and the reported history of STDs in the last four months, none of these characteristics was significantly related to either (a) the participants' own risk-score, (b) the score for others, or (c) the comparative risk judgment. Subjects who had AIDS-related complaints had higher other' risk-scores ($F(1,146) = 5.9, p < 0.05$), subjects who had a history of STDs in the last four months were less optimistic about the risk of an HIV-infection ($F(1,464) = 5.6, p < 0.05$).

Before presenting the results of the various regression and discriminant analyses, we will briefly present the results of a one-way ANOVA test for the differences in means between participants with relatively low and participants with relatively high absolute risk-scores (see *Table 1*). Higher scores on hypervigilance, lower levels of perceived control and higher levels of previous risk behavior were significantly related to higher levels of perceived own risk ($F(1,438) = 9.0, p < 0.01$, $F(1,469) = 22.5, p < 0.001$ and $F(1,472) = 3.8, p < 0.05$ respectively). Higher scores on vigilance, higher scores on hypervigilance and lower levels of knowledge were significantly related to higher levels of perceived others' risk ($F(1,436) = 5.4, p < 0.05$, $F(1,428) = 21.7, p < 0.001$ and $F(1,456) = 3.8, p < 0.05$ respectively). Finally, analyses revealed that only vigilance and perceived control were significantly related to the comparative risk judgment; subjects with an optimistic bias (higher risk-scores for others than for themselves) had higher scores on vigilance ($F(1,436) = 6.5, p < 0.01$) and had higher levels of perceived control ($F(1,458) = 4.8, p < 0.05$).

A stepwise multiple regression analysis was performed to find risk factors that were independent predictors of the comparative risk judgment for an infection with HIV. As expected, optimism increased with perceived controllability and decreased with experience: higher perceived control ($F(1,436) = 7.12, p < 0.01$) and the absence of a history of STDs in the preceding four months ($F(1,464) = 5.62, p < 0.05$) were significantly related to increased optimism ($R^2 = .17, p < 0.01$). Perceived severity was not related to the comparative risk judgment. Additionally,

[†] These characteristics were taken into account in all analyses reported in this article. However, unless otherwise mentioned, when considered together with psychological variables in regression and discriminant analyses, these characteristics were not significantly related to the variables under study.

Table 1 Mean differences as a function of perceived risks for self and others

	<i>Own risk</i>		<i>Others' risk</i>	
	<i>Low</i>	<i>High</i>	<i>Low</i>	<i>High</i>
	<i>mean (sd)</i>	<i>mean (sd)</i>	<i>mean (sd)</i>	<i>mean (sd)</i>
Perceived control ¹	3.95 (1.07)	3.43 (1.28) ^{***a}	3.85 (1.15)	3.68 (1.19)
Severity	4.77 (0.79)	4.78 (0.68) ^a	4.78 (0.74)	4.77 (0.73)
Previous behavior	1.34 (1.11)	1.56 (1.27) ^{*b}	1.38 (1.11)	1.46 (1.26)
Knowledge	0.84 (0.14)	0.83 (0.14) ^c	0.85 (0.14)	0.82 (0.14) [*]
Vigilance ¹	3.98 (0.74)	4.02 (0.73) ^a	3.93 (0.74)	4.01 (0.72) [*]
Hypervigilance	2.98 (0.78)	3.21 (0.74) ^{***a}	2.92 (0.76)	3.27 (0.75) ^{***}
Defensive avoidance	2.44 (0.79)	2.50 (0.79) ^a	2.46 (0.76)	2.49 (0.83)

Note: ¹Perceived control and vigilance were also significantly related to the comparative risk judgment $p < 0.01$ and $p < 0.05$ respectively. ^aScores could range from 0 (low) to 5 (high) ^bHigher scores indicate increased risk ^cScores refer to the number of correct answers divided by the total number of items

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

predictors for own and others' risk were assessed: identical to the univariate analysis, lower levels of perceived control, higher levels of previous risk behavior, and higher levels of hypervigilance were related to higher own risk-scores ($R^2 = 0.26$, $F(3,426) = 10.74$, $p < 0.0001$). Higher levels of both hypervigilance and previous risk behavior were related to increased risk-scores for others ($R^2 = 0.23$, $F(2,427) = 12.03$, $p < 0.0001$).

The mean own risk score for an infection with HIV equalled 26.2 ($sd = 21.8$), the mean risk-score for others equalled 28.0 ($sd = 20.0$). Therefore, the overall degree of optimism associated with an HIV-infection was rather modest: 1.8 ($sd = 19.3$). In further analyses, we split up our sample in three groups. Participants were classified as "pessimists" (who reported their own risk to be higher than the risk of others), "realists" (who perceived their risk to be equal to others' risk), and "optimists" (who thought that their risk was lower than that of comparable others). This resulted in three more or less equal groups. As shown in Table 2, pessimists appeared to be very pessimistic, optimists to be very optimistic.

Analyses were performed to predict membership of the differentiated groups; we used discriminant analysis (based on maximizing the increase in RAO'S V) to find factors that were related to the participants' group membership (pessimistic, realistic or optimistic). Four significant predictors were found: vigilance, perceived control, STD-related complaints and knowledge. *Pessimists* had lower scores on perceived

Table 2 Mean risk judgments for self and others, groups classified on the basis of the different between these judgments

N = 535 ^a		<i>Own risk</i>		<i>Others' risk</i>	
		<i>mean</i>	<i>(sd)</i>	<i>mean</i>	<i>(sd)</i>
Pessimists	<i>n</i> = 121	40.30	(23.9)	20.48	(17.4)
Realists	<i>n</i> = 186	26.18	(21.0)	26.18	(21.0)
Optimists	<i>n</i> = 159	15.39	(12.7)	35.72	(17.9)

Note: ^a69 participants had missing values on either of the absolute risk judgments.

control (grouped cases correctly classified: 61%), *realists* had lower scores on vigilance (cases correctly classified: 58%), and *optimists* reported to have more control, scored higher on vigilance and had higher levels of knowledge (grouped cases correctly classified: 60%).

As previously mentioned, regression analysis revealed two significant predictors for the comparative risk judgment: perceived controllability and experience. However, when pessimists and optimists are considered separately, predictors may be different within each group. Therefore, to investigate possible antecedents of optimism versus pessimism, stepwise regression analyses were carried out. These analyses are summarized in Table 3. Because the variance in the comparative risk judgment of pessimists was mainly explained by the variance in own risk-scores ($r = 0.69$) and of optimists by the variance in others' risk-scores ($r = -0.71$), we included both absolute risk-scores in the analyses. To detect evidence of a possible misinterpretation due to multicollinearity, both pessimists and optimists were divided in groups low and high in optimism. Again, own risk of pessimists differed significantly between these groups ($F(1,119) = 52.46, p < 0.001$), others' risk did not. For optimists, only the risk of others was significantly different between subjects high and low in optimism ($F(1,157) = 59.47, p < 0.001$).

For *pessimists*, factors that influenced own risk-scores were knowledge, previous behavior and STD-history; lower levels of knowledge, higher levels of previous risk behavior and a history of STDs in the last four months were related to higher own risk-scores ($F(3,117) = 12.75, p < 0.001$). Higher others' risk-scores were predicted by lower levels of knowledge and higher levels of defensive avoidance ($F(2,118) = 12.24, p < 0.001$). Analysis concerning the comparative risk judgment revealed that participants were less pessimistic if they had higher levels of knowledge and no history of STDs ($F(2,106) = 6.49, p < 0.005$). Higher absolute risk judgments of *realists* were predicted by higher levels of vigilance, lower levels of

Table 3 Multiple regression analyses: Factors associated with own risk, others' risk, and optimistic bias (comparative risk).

	Own risk	Others' risk	Comparative risk ^a
	(R ²) ^b Beta	(R ²) Beta	(R ²) Beta
<i>Pessimists</i> (n = 121)	(0.50)***	(0.41)***	(0.33)**
Knowledge	-0.42***	-0.32***	+0.26**
Previous behavior	+0.19*	—	—
STDs four months	+0.18*	—	-0.24*
Defensive avoidance	—	+0.18*	—
<i>Realists</i> (n = 186)	(0.33)***	c	
Vigilance	+0.23**	—	
Perceived control	-0.22**	—	
AIDS-related complaints	+0.18*	—	
<i>Optimists</i> (n = 159)	(0.27)**	(0.24)**	(0.19)*
Hypervigilance	+0.20*	+0.24**	
Perceived control	-0.16*	—	
Defensive avoidance	—	—	+0.19*

Note: ^aPositive Beta weights indicate for pessimists lower levels of pessimism, for optimists higher levels of optimism. ^bMultiple R for variables in the equation. ^cIdentical risk judgments for self and others

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

perceived control and reported AIDS-related complaints in the four months preceding the study ($F(3,182) = 6.74, p < 0.001$). Finally, higher own risk-scores for *optimists* were predicted by higher levels of hypervigilance and lower levels of perceived control ($F(2,146) = 5.60, p < 0.005$), while others' risk-scores were positively related to hypervigilance ($F(1,147) = 9.10, p < 0.005$). Analysis concerning the comparative risk judgment showed that optimists were more optimistic about the risk of a future HIV-infection if they had higher scores on defensive avoidance coping ($F(1,147) = 5.7, p < 0.05$).

Perceived Risk and Behavioral Intentions

Table 4 summarizes the relations between the selected variables and behavioral intentions.† Differences in perceived own risk did indeed influence intention: $F(1,362) = 7.62, p < 0.005$. Furthermore, the comparative risk judgment was related to intention too; higher levels of optimism were associated with increased intentions to reduce risks ($F(1,353) = 4.21, p < 0.05$). Let us now take a closer look at the groups previously defined; pessimists, realists and optimists. Do they differ in intentions? On a 5-point scale, pessimists had the lowest behavioral intentions (2.8), optimists the highest (3.3). Intentions of realists were somewhat higher than those of pessimists: 2.9. Intentions of pessimists and optimists differed significantly from the combined other groups: $t(354) = 2.33, p < 0.05$ and $t(346) = 2.54, p < 0.05$.

Table 4 Mean differences of selected variables as a function of behavioral intentions

	Behavioral intentions ¹			
	Low (<i>n</i> = 203)		High (<i>n</i> = 197)	
	mean	(<i>sd</i>)	mean	(<i>sd</i>)
Own risk (%)	29.9	(22.8)	23.6	(20.2)**
Others' risk (%)	28.6	(20.1)	27.1	(19.9)
Comparative risk (%)	0.8	(20.1)	-3.3	(17.5)*
Vigilance	3.9	(0.8) ^a	4.2	(0.8)
Hypervigilance	3.1	(0.9) ^a	3.1	(0.8)
Defensive avoidance	2.5	(0.8) ^a	2.3	(0.8)*
Perceived control	3.7	(1.2) ^a	4.0	(0.9)*
Previous behavior	1.7	(1.4) ^b	1.2	(0.9)**
Severity aids	4.7	(0.8) ^a	4.9	(0.5)*
Knowledge	0.8	(0.2) ^c	0.9	(0.2)**

Note. ¹Groups were formed by a median split. ^aScores could range from 0 (low) to 5 (high). ^bHigher scores indicate increased risk. ^cScores refer to the number of correct answers divided by the total number of items.

* $p < 0.05$; ** $p < 0.01$.

† Behavioral measures were assessed separately for contacts with private and prostitution partners. Although intentions to reduce risks and risk behavior were significantly higher for subjects with prostitution partners, analyses revealed that the patterns of findings concerning both types of partners were almost identical. For clarity reasons, we choose therefore to present the combined measures in our results.

respectively. The inference drawn from these results may be that optimists' perceptions of risk were in accordance with their behavioral intentions. Likewise, pessimists and realists had, compared to optimists, intentions that more or less matched their perception of risk. Next we will test if these groups succeeded to translate their views even further: their subsequent behavior.

Perceived Risk and Subsequent Behavior

The relation between behavioral risk factors and perceived risk was rather weak. When perceived risks were related to subsequent behavior, analysis revealed that none of the absolute risk judgments correlated significantly with the level of risk that was generated by unprotected vaginal contacts. In spite of these results, contrasting pessimists, realists and optimists showed significant differences between these groups. Although overall analysis did not reach significance ($p = 0.06$), orthogonal contrasts showed that optimists, compared to the other groups, had the lowest level of subsequent behavioral risk ($F(1,291) = 4.52, p < 0.05$), realists the highest ($F(1,291) = 4.42, p < 0.05$). Pessimists, realists and optimists had respectively mean scores on risk behavior of 1.38, 1.50 and 1.25.

To assess the relative predictive value of perceived risk on subsequent behavior, the selected variables were allowed to enter in two stepwise multiple regression analyses. In the first analysis, absolute and comparative risk judgments were considered (self, other and the difference score). In the second analysis, these risk judgments were substituted by group membership (pessimists, realists and optimists). Within each analysis, only four variables survived the entrance criteria; previous (risk) behavior, behavioral intentions, defensive avoidance and either perceived risks ($F(4,281) = 19.10, p < 0.0001$) or group membership ($F(4,281) = 18.98, p < 0.0001$) entered the equations successively (see Table 5). Higher levels of previous risk behavior, lower levels of intentions, higher scores on defensive avoidance and lower perceived risk-scores for others (or being pessimistic or realistic rather than optimistic) were the only significant predictors of subsequent risk behavior ($R^2 = 0.46$).

Because some of the selected variables can be expected to assert their influence on subsequent behavior solely through intentions, analyses were repeated omitting behavioral intentions. However, no other variables entered the equations, other than the ones mentioned when intentions were allowed to enter.

Table 5 Multiple regression analyses: Factors associated with subsequent risk behavior.^a

	<i>Subsequent risk behavior</i>	
	<i>Absolute and comparative risks in analysis</i>	<i>Group membership in analysis</i>
	(R^2) ^{b,c} Beta	(R^2) Beta
Previous risk behavior	(0.46)**** +0.40***	(0.46)**** +0.38***
Behavioral intentions	-0.12*	-0.12*
Defensive avoidance	+0.12*	+0.11*
Others' risk	-0.11*	—
Optimists v. others'	—	-0.11*

Note. ^aTotal $n = 291$. ^bMultiple R for the variables in the equation. ^cPositive Beta weights indicate higher levels of subsequent risk behavior.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; **** $p < 0.0001$.

Given these results, we can conclude that optimists, who had both higher behavioral intentions (mainly related to own perceived risk) and lower scores on subsequent risk behavior (related to perceived risk of others) had reasons to be optimistic. Pessimists had few reasons to be pessimistic; although they had the lowest intentions, their subsequent risk behavior did not differ significantly from that of optimists. Finally, realists—who had behavioral intentions comparable to those of pessimists—had the highest level of behavioral risk. Figure 2 summarizes behavioral intentions, perceived control and both behavioral measures, for pessimists, realists and optimists.

Figure 2 Pessimists, realists and optimists: behavior, behavioral intentions and perceived control.^a

Note: ^aMean scores, total $n = 342$.

DISCUSSION

The degree of optimism about the risk of an infection with HIV, as well as the percentage of people with an optimistic bias, was found to be moderate compared to findings in similar studies among homosexual men (Bauman and Siegel, 1987; Joseph *et al.*, 1987). In these studies, more than 50% of the subjects were optimistic about their vulnerability to an infection with HIV. Although sero-prevalence of HIV in Western countries is much higher among homosexuals than among heterosexuals (e.g. McNeil *et al.*, 1989), less than 30% of the subjects in the present study showed an optimistic bias. Furthermore, the degree of optimism within the present sample was low compared to other samples: the mean difference score (self minus other, both

scores ranging from 0 to 100% chance) equalled -1.8 within this sample, compared to -9.6 and -13.0 within respectively a homosexual ($N = 147$) and a heterosexual ($N = 83$) sample with multiple sexual partners (Van der Velde and Van den Broeke, 1988). Comparisons between this sample and the samples mentioned above with respect to AIDS-related vulnerability indicate that our subjects perceived themselves considerably at risk. Although they *are* at increased risk compared to other heterosexuals, their high own risk-scores are contradicted by HIV prevalence rates (actual HIV prevalence rate and own risk chance estimation within this sample 0.4% and 26.2% resp.). This supports the notion that people, generally, tend to overestimate small probabilities with large consequences (cf. Slovic, Fischhoff and Lichtenstein, 1987).

Perceived Risk and Risk Factors

In accordance with previous research findings (e.g. Weinstein, 1980, 1982), the degree of optimism varied with perceived controllability and prior experience. These results support a cognitive explanation of the optimistic bias. Seriousness was not significantly related to optimism. Given the data, this was not surprising: more than 80% of the subjects rated an infection with HIV to be very serious, a score of 5 on a 5-point scale. Scores for perceived severity of syphilis had more variability. When these scores were related to optimism about an infection with syphilis, severity correlated significantly with optimism ($r = 0.22$, $p < 0.001$).

We found no evidence that motivational factors were significantly related to optimism. However, when optimists were viewed separately, optimism was associated with one motivational factor only: optimism increased with higher levels of defensive avoidance. This finding does not parallel the work of Weinstein (1982). He concluded that defensive denial *may* indeed occur when people believe they are already vulnerable, but that this would result in diminished feelings of vulnerability, and not necessarily in increased optimism. Another motivational factor, hypervigilance, was related to both absolute risk judgments. However, since hypervigilance influenced both judgments simultaneously, it did not influence the degree of optimism.

Another purpose of the present study was to determine subjects' accuracy of their perception of vulnerability. Contrary to Weinstein's (1984) findings, both absolute risk judgments varied systematically with previous risk behavior, indicating that subjects had fairly adequate—although optimistically biased—perceptions of risk. Differentiating between optimists, pessimists and realists revealed, however, that only pessimists judged their risk to be contingent upon previous behavior. We don't know whether realists and optimists were aware or unaware of previous risks. If they were *aware* of previous risks, they may have dismissed feelings of vulnerability because they perceived their control to be sufficient to break the chain between past (maladaptive) behavior and future behavior. On the other hand, the "selective emphasis" hypothesis (Weinstein, 1984) suggests that realists and optimists, because of their perceived control, may have been *unaware* of previous risks: people generally tend to focus on risk decreasing factors instead of risk increasing factors.

The results of the present study underline the crucial role of perceived control in explaining optimism. Perceived control was found to be the most important factor in classifying subjects as being pessimistic, realistic or optimistic. Within the differentiated groups, however, differences in control were not related to the extent of

optimism displayed. This could suggest the existence of a threshold effect of perceived control: if control is believed to be insufficient to surmount future obstacles for preventive behavior, people may become pessimistic rather than realistic or optimistic.

Vigilance was found to be another important factor within the context of optimism. When vigilance and perceived control were considered together to distinguish between the three groups, subjects experiencing a lack of control were found to be pessimistic, subjects with lower levels of vigilance were found to be realistic, while subjects with higher scores on both variables were found to be optimistic. On the basis of our results, we cannot provide a conclusive explanation why subjects who perceived their control to be low were rather pessimistic and subjects who scored low on vigilance were mainly realistic. The latter relation seems intuitively plausible: vigilance refers to accurate and complete information search, followed by analyzing the problem and the planning of behavior to reduce or minimize the threat. Based on their information search, low vigilant subjects may have concluded that they are as vulnerable as others, and that the same factors blocking their intentions to behave adaptively may block adaptive behavior of others.

Many studies highlighted the relation between perceived control and optimism (e.g. Alloy and Abramson, 1979; Depue and Monroe, 1986; Joseph *et al.*, 1987; Monroe and Steiner, 1986; Taylor and Brown, 1988). These studies suggest a reverse causation effect: pessimists may have lower levels of control rather than lower levels of control leading to pessimism. In general, psychologically disordered people and people experiencing psychological or social distress are more likely to perceive a lack of control, to acknowledge behavioral risks, and consequently to have more accurate perceptions of vulnerability.

Perceived Risk, Behavioral Intentions and Subsequent Behavior

Past research on the consequences of perceptions of risk resulted in two patterns of findings. (1) There exists an univariate relationship between perceived vulnerability and behavior (e.g. Bauman and Siegel, 1987; Rippetoe and Rogers, 1987), and (2) increased optimism is related to decreased risk reduction motivation (e.g. Weinstein, 1982, 1984). Our results provide mixed support for both patterns of findings. First, although increased personal vulnerability significantly raised behavioral intentions to reduce risk, vulnerability was not found to be related to behavioral measures in the four months after enrolment in the study. Second, in contrast to Weinstein's (1982, 1984) findings, we found that optimism was related to *increased* intentions to reduce risk. Furthermore, optimists had significantly *lower* levels of subsequent behavioral risk.

Own risk and comparative risk were related to behavioral intentions, others' risk was related to subsequent behavior. Higher risk-scores for others predicted lower levels of behavioral risk; subjects seemed to attune their risk reduction activities to their beliefs about the degree of threat AIDS generates for the community as a whole. It is not surprising therefore that optimists, who had relatively higher risk-scores for others, had lower levels of risk behavior. Given these results, we cannot conclude that optimists were *unrealistically* optimistic. We found that pessimists were rather *unrealistically pessimistic* about their possibilities to control an infection with HIV: they were the only participants who reduced their behavioral risk in the four months after their first visit.

Previous research of Weinstein (1984) was designed to eliminate optimistic biases. In particular, providing subjects with information about risk reduction activities of peers was found to reduce the degree of optimism displayed. Considered in the light of the present results, efforts to reduce optimism by lessening the perceived risk of others may well be counterproductive; these efforts can be expected to result in increased levels of maladaptive behavior. In our view, reducing optimism may be helpful *only* if optimism results from a denial of own vulnerability, indicating that people are actually unrealistically optimistic.

The present study embedded perceptions of risk in the context of cognitive, motivational and behavioral measures. As predicted by behavioral models like Rogers' (1975) Protection Motivation theory, all but one of the incorporated cognitive factors—including own vulnerability and optimism—were positively related to behavioral intentions (cf. Chaiken and Stangor, 1987; Rippetoe and Rogers, 1987). Additionally, motivational factors (cf. Janis and Mann, 1977) as well as previous behavior (cf. Bentler and Speckart, 1979) were related to behavioral intentions. Among the variables that asserted a direct influence on subsequent behavior—apart from their influence on intentions—were previous behavior, others' risk (or being optimistic rather than realistic or pessimistic), and defensive avoidance. However, compared to previous behavior, the influence asserted on subsequent behavior by the other variables was found to be only marginal. After controlling for previous behavior in regression analyses, each of the three remaining variables, including behavioral intention itself, raised the explained variance in subsequent behavior only with approximately 2% (from 40% to 46%). These results indicate that perceptions of risk concerning an infection with HIV *are* indeed related to behavioral intentions and subsequent behavior, but that their influence is limited. The pronounced effect of previous behavior on future risk behavior underlines the importance of early health-education interventions, i.e.; in periods such as early adolescence when sexual habits are being formed.

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