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**Perceiving AIDS-related risks: Accuracy as a function of differences in actual risk**

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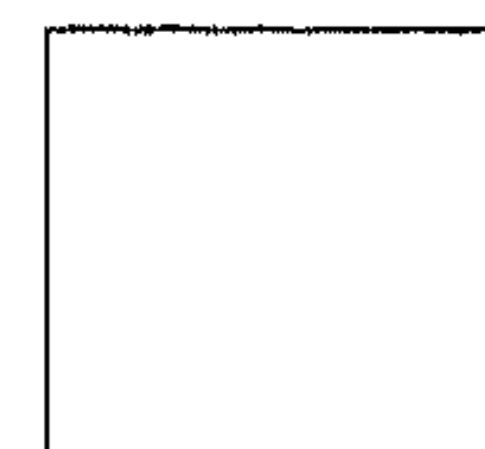
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## Perceiving AIDS-Related Risk: Accuracy as a Function of Differences in Actual Risk

Frank W. van der Velde, Joop van der Pligt, and Christa Hooykaas

This study investigates the perceived risk of an HIV infection. Cognitive antecedents of biases in risk perception and their effects on behavioral intentions were investigated. The purpose of this study was to determine the relative accuracy of risk assessments for samples that vary in actual risk for AIDS. Subjects were citizens of Amsterdam, heterosexuals with *private* partners, gay men, and heterosexuals with *prostitution* partners. Although optimistically biased in all samples, perceptions of risk were related to previous risk behavior in high-risk samples only. Pessimism was more pronounced in samples higher at risk. Optimists had lower levels of previous risk behavior and increased intentions to adopt safe sex practices. Ss in samples higher at risk had, therefore, relatively adequate perceptions of risk.

*Key words:* AIDS, perceived risks, heterosexuals, gay males, prostitution

Generally, people tend to have unrealistically positive views of the self and exaggerated perceptions of personal control (Langer, 1975) and tend to be unrealistically optimistic about the future (Weinstein, 1980). The latter has been found to influence the way people react to health and safety risks: People tend to believe that they are less at risk than others around them. The existence of optimistic biases has been demonstrated in a wide variety of domains—such as wearing seat belts (Weinstein, Grubb, & Vautier, 1986), illness as a result of home radon (Weinstein, Sandman, & Roberts, 1990), and AIDS (Bauman & Siegel, 1987; van der Velde, van der Pligt, & Hooykaas, 1992).

Most models dealing with health-related behavior, for example, Rogers's (1975) protection motivation theory and Becker's (1974) health belief model, predict a relation between perceived risk or vulnerability and preventive health behavior. One of the main reasons for the interest in unrealistic optimism is the assumption that an optimistic bias may lower feelings of vulnerability and, hence, affect risk-reduction motivation and activities (Weinstein, 1984). According to Weinstein, risk judgments (either absolute or comparative) are

seldom related to behavioral risk factors (Weinstein, 1989). Recent findings (van der Velde et al., 1992), however, indicated that subjects who were optimistic had relatively adequate perceptions of risk, given their behavioral practices. Van der Velde et al.'s findings suggest a relationship between previous risk behavior and optimism.

Some of the apparent contradictions between Weinstein's research and our own research might be related to the risk status of the samples included in the various studies. Most research on optimism focuses on young and healthy college students, for whom the health risks under study are relatively remote. We expect optimism to decrease in populations higher at risk. Furthermore, we suppose that people are quite capable of assessing their personal risk, despite their biased beliefs about susceptibility.<sup>1</sup> Previous research on risk perception also showed that people's risk estimates of social and personal risks are relatively accurate; that is, they reflect the risks in an ordinal sense (see, e.g., Slovic, Fischhoff, & Lichtenstein, 1987).

In this study, we investigate judgments of AIDS-related risks. We focused on four different samples with varying degrees of being at risk for AIDS: (a) a general, representative sample, (b) a sample of heterosexual subjects with multiple private partners, (c) a sample of gay male subjects with multiple sexual partners, and (d) a sample of heterosexual subjects with multiple prostitution partners. All samples consisted of subjects living in Amsterdam, The Netherlands. The first goal of the present study was to explore differences in perceived risk and optimism as a function of the samples' risk status (e.g., low risk vs. high risk). The samples were different in many ways; a second goal of the study was therefore to

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<sup>1</sup> The term *accuracy* used in this article can only be interpreted in a relative, ordinal sense. Although there are multiple ways of looking at accuracy, we judged perceptions of risk to be relatively accurate if (a) groups (epidemiologically) higher in risk perceived their risk to be higher and (b) if perceptions of risk were found to be (positively) related to behavioral measures.



explore the effects of other factors that may have caused sample differences in perceived risk. In past research (e.g., Weinstein, 1982), unrealistic optimism was found to increase with perceived controllability and to decrease with experience, supporting a cognitive explanation of optimism. Other research addressed a possible motivational explanation of optimism: Optimism as a way to reduce fear. According to this reasoning, optimism would increase for more severe risks. Some support for this was found by van der Velde et al. (1992). Perceived personal control and personal experience (STD history), as well as perceived severity and previous risk behavior, were therefore assessed. Another goal of the present study was to relate risk judgments to behavioral measures to investigate differences in (relative) accuracy of perceived risks. Finally, the effects of risk judgments were examined on behavioral intentions to adopt safe sex practices.

Summarizing, the purpose of this study was (a) to investigate perceived risk of AIDS for low- and high-risk groups, (b) to investigate the relation between previous behavior, perceived control, personal experience, and perceived severity—on the one hand—and perceived (AIDS-related) risks on the other, (c) to investigate the effect of perceived risk on behavioral intentions to adopt safe sex practices.

## Method

### Subjects

Four different samples participated in the study. All subjects ( $N = 1,318$ ) responded to a close-ended questionnaire; they were approached individually. Subjects in Sample 1, referred to as the *general sample*, were 437 citizens of Amsterdam. They formed a representative sample of the general population living in Amsterdam. These subjects received a shortened questionnaire. Sample 2 ( $n = 241$ ), referred to as a *low-risk sample*, consisted of heterosexual subjects with multiple private partners only. Subjects were recruited through informants, ads, a municipal youth housing agency ( $n = 83$ ), and an STD clinic of the Municipal Health Service of Amsterdam ( $n = 158$ ). A total of 400 subjects met the selection criteria (i.e., they all had multiple sexual partners in the 6 months preceding the study, they had no prostitution partners, and they did not engage in sexual relations with AIDS-risk groups); 241 subjects (60%) decided to participate. Subjects in this sample had, on average, 5 sexual partners in the preceding 6 months. Sample 3 consisted of 147 gay subjects. Because of the high prevalence of HIV among gay men in general and their relatively high average number of sexual partners (11 in the preceding 6 months), this sample is referred to as a *high-risk sample*. Participants were recruited through informants, ads, a municipal youth housing agency, and a longitudinal study among gay men conducted by the Municipal Health Service of Amsterdam. In total, 210 of the approached gay men met the selection criteria (i.e., they all had multiple sexual partners in the 6 months preceding the study, and none of them tested as HIV positive); approximately 70% decided to participate. Subjects in Sample 4 ( $n = 493$ ) were visitors of an STD clinic of the Municipal Health Service of Amsterdam who engaged in prostitution contacts in the 6 months before the study. These subjects had the highest number of sexual partners: Male subjects visited, on average, 14 prostitution partners and had 7 private partners; female subjects had, on average, 524 prostitution partners and 3 private partners in the past 6 months. This sample also is referred to as a *high-risk sample*; prostitutes and their clients have often been implicated to be important in the heterosexual transmission of HIV (e.g., Holmes, Karon, & Kreiss, 1990). Of this

sample, 25% had one or more STDs at entry of the study, and 48% had a history of STDs in the preceding 5 years. Finally, 25% reported sexual contacts with AIDS-risk groups in the preceding 5 years. Approximately 1,000 men and women met the entrance criteria; half of them decided to participate. Subjects most likely to refuse participation were younger men of ethnic minorities (see van der Linden, van der Velde, Hooykaas, van Doornum, & Coutinho, 1990).

### Measures

*Sexual behavior.* With the exception of the general sample, we assessed sexual practices in the 4 months preceding the study.<sup>2</sup> This measure consisted of number and type of partners (private or prostitution), frequencies of various sexual techniques per type of partner, and condom use per technique and per type of partner. Frequencies were assessed on a 5-point scale, and responses for condom use were assessed on a 3-point scale. Endpoints for both scales were *never* and *always*. Previous (risk) behavior was assessed by multiplying the number of (private and prostitution) partners per sexual technique with the frequency of that technique (multiplier 0 when technique was not practiced, through .25, .50, and .75, to 1 if the technique was practiced with all sexual contacts). Finally, this score was multiplied with the frequency of condom use (multiplier 1 if condoms were not used at all, .5 if condoms were used irregularly, and 0 if condoms were always used). For example, a subject in Sample 2 who often had vaginal intercourse with six casual partners while using condoms irregularly obtained a risk score of  $(6 \times .75 \times .5) = 2.25$ . Sample 4 was the only one containing subjects with both casual and prostitution partners. For these subjects, previous risk behavior was calculated by adding the separate risk scores. Because of skewed distributions, these scores were log transformed afterwards. Sexual techniques incorporated in the analyses were vaginal intercourse for heterosexual participants and passive and active anal intercourse for gay male participants.

*Behavioral intentions.* Behavioral intentions were gauged (a 5-point scale for the visitors of the STD clinic in Samples 2 and 4; a 7-point scale for all other subjects) by asking if subjects intended to use condoms in the future, separately for various sexual techniques (intentions were assessed separately for private and prostitution contacts in Sample 4). Summing yielded an overall score for intentions; responses ranged from *definitely not* to *definitely yes*. For gay male participants, "condom use" was replaced in the questionnaire by "safe sex" (intervention campaigns in The Netherlands stressed condom use for heterosexuals, and abstaining from high-risk sexual techniques for gay men). Because the scales differed among the samples, intention scores were standardized. To assess perceived risks, subjects responded to the question, "How do you estimate the chance that you will become infected with the AIDS-virus in the next two years, because of your sexual behavior?" (own risk). The same probability estimation was asked for an average other of one's own age and gender (others' risk). This question was phrased, "How do you estimate the chance that a man/woman of your age, chosen at random, becomes infected with the AIDS-virus in the next two years, because of his/her sexual behavior?" Responses were made by setting a mark on a

<sup>2</sup>The number of partners over the preceding 6 months of the gay male subjects in Sample 3 and the number of partners of part of the heterosexual subjects in Sample 2 ( $n = 83$ ) were divided by 1.5, to make this measure comparable to that for the heterosexual visitors of the STD clinic (Sample 2,  $n = 158$ ; and Sample 4). In these samples, we asked for the number of partners in the preceding 4 months. In addition, because sexual behavior was assessed in much more detail among the visitors of the STD clinic, these subjects completed the questionnaire in a face-to-face interview.



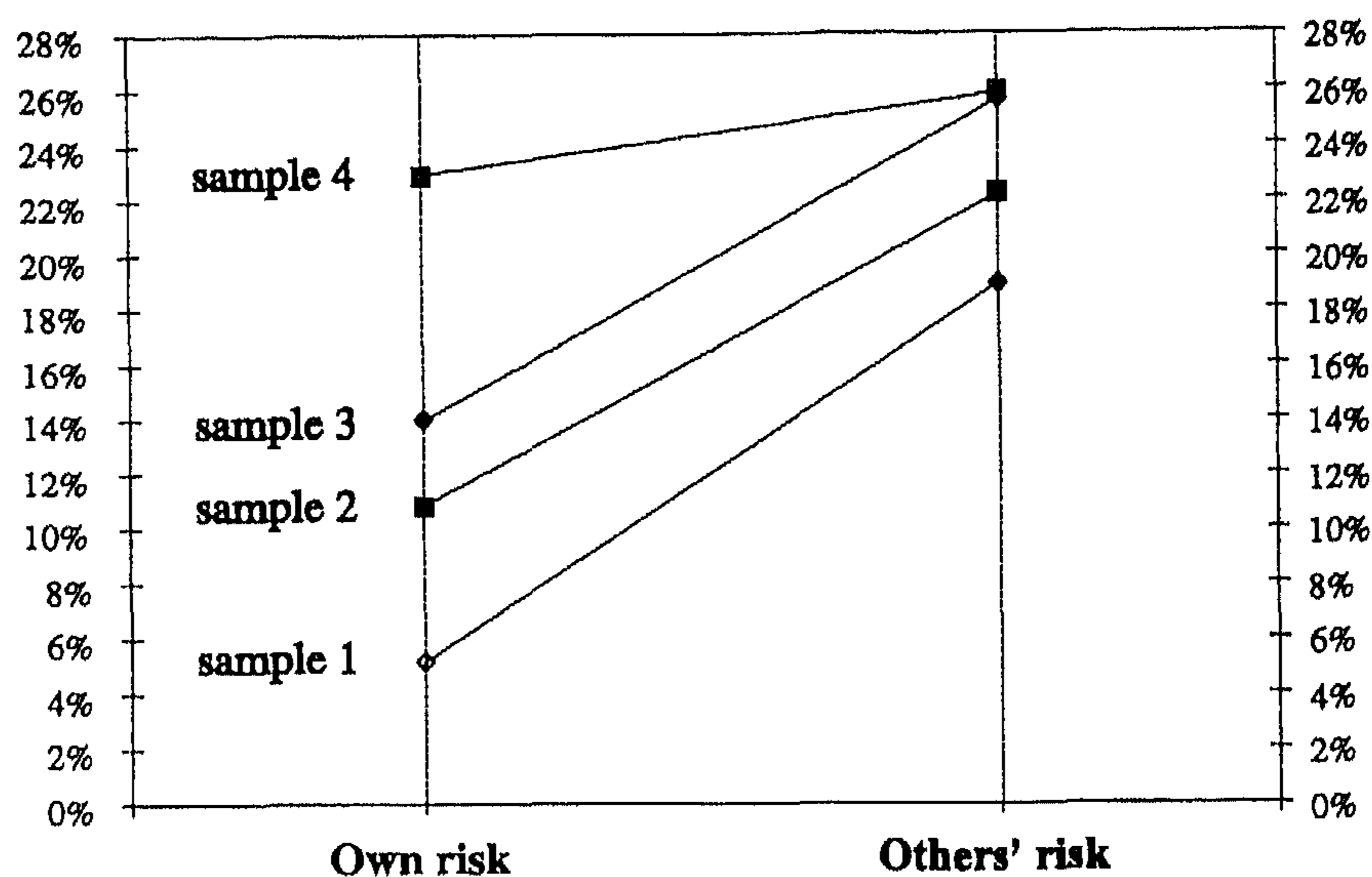


Figure 1. Perceived risks for self and others, for four different samples. Perceived risk scores could range from 0% to 100%. The four samples were Sample 1 (low-risk, general sample); Sample 2 (low-risk, heterosexual sample—private partners only); Sample 3 (high-risk, gay male sample); Sample 4 (high-risk, heterosexual sample—prostitution partners).

continuum ranging from 0% chance to 100% chance, with every 10% point marked. For each person, a comparative risk score was derived by subtracting his or her risk score from the risk score for others. On the basis of this comparative risk score, subjects were classified as pessimists (own risk higher than others' risk), realists (own risk equal to others' risk), and optimists (own risk lower than others' risk). Personal control was assessed by asking subjects, "To what extent do you think you have control over getting infected with HIV?" Scores ranged from *no control* (1) to *complete control* (5). Personal experience was assessed by asking subjects to indicate how often they had (one or more) STDs in the preceding 5 years. Possible scores ranged from *no STDs* (0) to the total number of STDs. Finally, perceived severity was assessed by asking subjects, "How severe do you think it is to be infected with HIV?" Possible scores ranged from *not at all severe* (1) to *very severe* (5).

## Results

### Perceived Risks and Optimism: Sample Differences

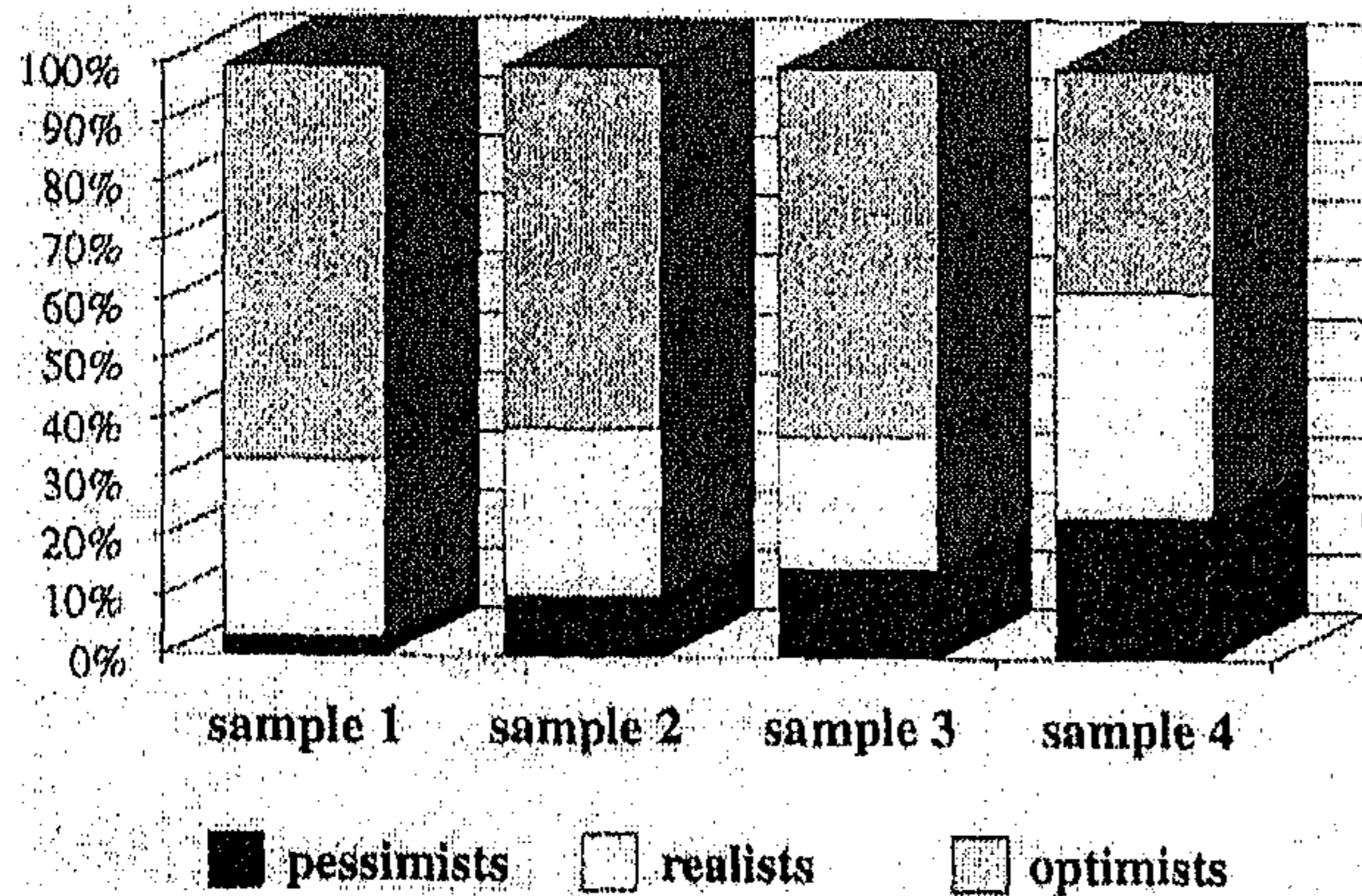
All subjects showed an optimistic bias: Perceived risk for others was significantly higher than perceived own risk,  $t(1107) = 13.5, p < .001$ . Overall, this bias was significantly different among the samples,  $F(3, 1152) = 24.7, p < .001$ . This was mainly due to the low level of optimism among the heterosexual subjects with prostitution partners (Sample 4); Scheffé's range test did not reveal other differences in optimism among the other samples at the .05 level.

Figure 1 shows, for each sample, perceived risks for self and others. Perceived own risk,  $F(3, 1135) = 105.1, p < .001$ , and perceived others' risk,  $F(3, 1115) = 14.6, p < .001$ , were found to be significantly different among the samples. Post hoc contrasts (least significant difference) revealed that the mean own risk score of each sample differed significantly from the

mean own risk score of all other samples ( $p < .01$  for all comparisons). Scheffé's procedure, as a more conservative test for all possible linear combinations of group means, revealed that only the mean own risk estimates of the Samples 1 and 4 were significantly different from all other samples at the .05 level. As can be seen in Figure 1, the mean differences among the samples for others' risk were almost as large as the mean differences for own risk. However, mainly because of the greater variance, others' risk did not differ among the samples. Others' risk was found to be significantly different between the low-risk samples (Samples 1 and 2 combined) and the high-risk samples (Samples 3 and 4 combined):  $t(1167) = 4.9, p < .001$ .

Optimism was found to be significantly lower in only one of the high-risk samples and did not differ among the remaining samples. In accordance with a previous study (van der Velde et al., 1992) we also looked at the number of optimists, realists, and pessimists in the four samples. Subjects were split into three groups: pessimists (own risk higher than others' risk), realists (equal own and others' risk scores), and optimists (own risk lower than others' risk). Significant differences were found among the samples with respect to the number of subjects belonging to each of the three groups,  $\chi^2(6) = 136.7, p < .001$ ; see Figure 2. These differences were also found when each sample was compared with the remaining samples ( $p < .001$ , for each comparison). Results did not show a significant decrease in the percentages of optimistic subjects in samples higher at risk (all samples in analysis; *ns*,  $p = .41$ ); the percentages of optimists in Samples 1, 2, 3, and 4 were 66.7%, 61.1%, 62.3%, and 37.6%, respectively. However, results did show an increase in the proportion of pessimistic subjects: The percentages of pessimists increased from 3.1% in Sample 1, through 7.3% and 15.1% in Samples 2 and 3, respectively, to





**Figure 2.** Optimism, realism, and pessimism for four different samples. The four samples were Sample 1 (low-risk, general sample); Sample 2 (low-risk, heterosexual sample—private partners only); Sample 3 (high-risk, gay male sample); Sample 4 (high-risk, heterosexual sample—prostitution partners). Subjects were classified as either pessimists (own risk > others' risk), realists (own risk = others' risk), or optimists (own risk < others' risk).

24.3% in Sample 4. As can be seen in Figure 2, Sample 4 ( $n = 493$ ) contained a much smaller proportion of optimistic subjects than the other samples combined ( $n = 825$ ),  $\chi^2(1) = 76.0$ ,  $p < .001$ . Furthermore, as mentioned above, Samples 3 and 4 contained a larger proportion of pessimists. Therefore, when the two low-risk samples and the two high-risk samples were combined, results showed that the low-risk samples ( $n = 678$ ) contained more optimistic subjects  $\chi^2(1) = 71.7$ ,  $p < .001$ , less realistic subjects,  $\chi^2(1) = 6.1$ ,  $p < .05$ , and less pessimistic subjects,  $\chi^2(1) = 71.0$ ,  $p < .01$ , than the high-risk samples ( $n = 40$ ).

#### Factors Influencing Perceptions of Risk

Although differences in risk judgments did exist among the samples, it could be premature to conclude that they were

caused by differences in risk status; the samples differed also with regard to other important factors possibly related to differences in risk judgments (see Table 1). For example, subjects of different samples who engage in safe sex practices only, may have similar perceptions of vulnerability, regardless of the risk status of their sexual partners. Likewise, other factors have been found to be related to perceptions of risk. Weinstein (1982) found optimism to be greatest for hazards with which subjects had little personal experience and for hazards judged to be controllable by personal action. Therefore, perceived control and personal experience (STD history), as well as perceived severity and previous risk behavior, were entered together in regression analyses to test if these factors could explain sample differences in risk judgments. To control for differences in some general characteristics, we entered other factors into the regression equation simultaneously (gender, age, year of entrance in study, educational level, living inside or outside of Amsterdam, and ethnicity). Another reason to add previous risk behavior was to explore the relative accuracy of subjects' perceptions of risk; if people tend to interpret risk factors in a self-serving manner, one would not expect to find behavioral risk factors and measures of perceived risk to be strongly related.

As reported above, entering group membership (belonging to Sample 2, 3, or 4—among the subjects in Sample 1, sexual behavior and STD history were not assessed) in a regression equation (stepwise selection of independent variables) revealed a significant relation between this factor and perceived own risk,  $F(1, 734) = 22.0$ ,  $p < .0001$ ,  $\beta = .30$ . However, when other factors were allowed to enter the regression equation, perceived control ( $\beta = -.23$ ,  $p < .01$ ), previous risk behavior ( $\beta = .13$ ,  $p < .01$ ), and perceived severity of AIDS ( $\beta = .11$ ,  $p < .01$ ) also made significant contributions to the prediction of perceived own risk,  $F(4, 734) = 34.8$ ,  $p < .0001$ , multiple  $R = .40$ , thereby reducing the beta weight associated with group membership to .20. As mentioned before, perceived others' risk, was found to be different between the low-risk and the high-risk samples only. However, after educational level ( $\beta = -.13$ ,  $p < .05$ ) and perceived control ( $\beta = -.12$ ,  $p < .05$ )

**Table 1**  
Mean Scores on the Selected Variables for the Four Samples

Variable	Sample 1		Sample 2		Sample 3		Sample 4	
	M	SD	M	SD	M	SD	M	SD
Own risk	5.18	11.17	10.83	11.30	13.97	14.42	22.97	20.99
Others' risk	18.92	18.96	22.19	19.27	25.65	20.69	25.89	19.94
Comparative risk	13.38	18.32	13.01	20.61	11.08	19.96	2.61	18.91
Perceived control	4.25	1.11	4.07	0.84	4.07	0.90	3.83	1.20
Perceived severity	4.78	0.82	4.96	0.78	4.92	0.30	4.77	0.78
Previous risk behavior	—	—	0.87	0.44	0.49	0.65	1.49	1.31
	<i>n</i>		<i>n</i>		<i>n</i>		<i>n</i>	
Personal experience <sup>a</sup>	—		45		44		215	

*Note.* Sample 1 = low risk, general sample ( $n = 437$ ); Sample 2 = low-risk, heterosexual sample, private partners only ( $n = 241$ ); Sample 3 = high risk gay male sample, ( $n = 147$ ); Sample 4 = high risk, heterosexual sample, prostitution partners ( $n = 493$ ). Risk scores could range from 0% to 100%. The comparative risk score could range from -100% to 100%; perceived control could range from 1 to 5. Scores for previous risk behavior ranged from 0 to the (log-transformed) total number of partners. All means differed significantly ( $p < .05$ ) between the samples at the .05 level. Dashes signify that previous risk behavior was not measured.

<sup>a</sup>Number of subjects with STD history.



Table 2  
Correlations Between Perceptions of Risk and Several Other Factors

	1	2	3	4	5	6	7
Sample 2 <sup>a</sup>							
1. Own risk	—						
2. Other's risk	.40***	—					
3. Comparative risk	-.20***	.81***	—				
4. Previous risk behavior	.05	-.01	-.04	—			
5. Experience (STDs)	-.08	-.09	-.05	.13*	—		
6. Perceived control	-.14*	-.10	-.03	-.05	.04	—	
7. Perceived severity	.00	-.03	.02	-.07	-.10	.14*	—
Sample 3 <sup>b</sup>							
1. Own risk	—						
2. Other's risk	.31***	—					
3. Comparative risk	-.37***	.74***	—				
4. Previous risk behavior	.26***	.02	-.19**	—			
5. Experience (STDs)	.25***	-.02	-.16	.06	—		
6. Perceived control	-.28***	-.29***	-.10	-.05	.09	—	
7. Perceived severity	.06	-.13	-.19**	.06	-.06	-.06	—
Sample 4 <sup>c</sup>							
1. Own risk	—						
2. Other's risk	.61***	—					
3. Comparative risk	-.49***	.39***	—				
4. Previous risk behavior	.13**	.08	-.07	—			
5. Experience (STDs)	.07	-.01	-.09*	.09*	—		
6. Perceived control	-.24***	-.10*	.17*	-.06	.02	—	
7. Perceived severity	.05	.03	-.02	-.04	-.01	.11*	—

<sup>a</sup>Low-risk, heterosexual sample ( $n = 241$ ). <sup>b</sup>High-risk, gay male sample ( $n = 147$ ). <sup>c</sup>High-risk, heterosexual sample (prostitution partners) ( $n = 493$ ).

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

entered the regression equation,  $F(2, 580) = 10.29, p < .0001$ , multiple  $R = .19$ , group membership (low versus high risk) and perceived risk for others were no longer significantly related. Next, analyses were performed to test if differences in the comparative risk judgment (perceived others' risk minus perceived own risk) could be explained by factors other than group membership. Because optimism was found to be different between Sample 4 (least optimistic sample) and the other samples, we focused on the differences between Sample 4 and the remaining samples. The initial relationship,  $F(1, 800) = 34.58, p < .001, \beta = -.20$ , between group membership and optimism did not change significantly ( $\beta = -.17, p < .01$ ) after personal experience ( $\beta = -.09, p < .05$ ) and previous risk behavior ( $\beta = -.08, p < .05$ ) entered the regression equation,  $F(3, 721) = 14.8, p < .001$ , multiple  $R = .24$ . Contrary to previous findings (e.g., Weinstein, 1982), additional analysis showed that personal control was only marginally related to optimism ( $\beta = .06, p = .07$ ). However, when group membership was not entered in the equation, we found the expected significant relationship between personal control and optimism ( $\beta = .08, p < .05$ ).

The results mentioned above showed that the introduction of factors such as perceived control, personal experience (with STDs), and previous risk behavior increased the variance explained in risk judgments. Next, stepwise multiple regression analyses were carried out to investigate the role of these factors in more detail, in each of the samples separately.

Factors such as previous risk behavior, STD experience, and perceived control are likely to be correlated, which may result in unstable beta weights. As can be seen in Table 2, previous risk behavior, STD experience, perceived control, and per-

ceived severity were not significantly related among the subjects in the gay male sample. For subjects in both heterosexual samples, however, (a) STD experience was significantly related to higher levels of previous risk behavior, and (b) higher levels of perceived control were related to higher levels of perceived severity. For these variables for which correlations do not coincide with their corresponding beta weights, the results of regression analyses should be interpreted with caution.

In the low-risk heterosexual sample, regression analyses (stepwise selection of independent variables) did not reveal significant predictors for perceived own risk or comparative risk. Within the high-risk samples, however, predictors were found for both measures of perceived risk. As shown in Table 3, higher levels of perceived own risk—for Sample 3,  $F(3, 128) = 10.00, p < .0001$ , multiple  $R = .43$ ; for Sample 4,  $F(3, 387) = 16.26, p < .0001$ , multiple  $R = .28$ ) were predicted by higher levels of previous risk behavior and lower levels of perceived control in both samples. Additionally, having had one or more STDs in the preceding 5 years was related to higher levels of perceived own risk for the subjects in Sample 3.

In the heterosexual high-risk sample, regression analysis showed the theoretical expected predictors of comparative risk judgment: Optimism increased with perceived control and decreased with experience,  $F(2, 385) = 7.81, p < .001$ , multiple  $R = .20$ . Within the gay male sample, the expected predictors of comparative risk were not found. Instead, previous risk behavior and the perceived severity of AIDS were found to be independent predictors of optimism: Higher levels of previous risk behavior and higher levels of perceived severity of AIDS were related to lower levels of optimism,  $F(2, 137) = 5.06, p < .01$ , multiple  $R = .26$ .



Table 3  
Multiple Regression Analyses: Factors Associated With Own Risk and Optimistic Bias (Comparative Risk)

Factor	Own risk	Comparative risk
	( $R^2$ ) <sup>a</sup> $\beta$	( $R^2$ ) <sup>a</sup> $\beta$
Sample 3 <sup>b</sup>	(.43)****	(.26)**
Perceived control	-.27***	—
Previous behavior	.25***	-.18*
STD experience	.22***	—
Perceived severity	—	-.18*
Sample 4 <sup>c</sup>	(.28)****	(.20)
Perceived control	-.24***	.16***
Previous behavior	.13**	—
STD experience	—	-.11*
Perceived severity	—	—

<sup>a</sup>Multiple  $R$  for variables in the equation. <sup>b</sup>High-risk, gay male sample ( $n = 147$ ). <sup>c</sup>High-risk, heterosexual sample (prostitution partners;  $n = 493$ ).

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

Comparing the reported beta weights in Table 3 and their corresponding bivariate correlations in Table 2 supports the validity of the results of the multiple regression analyses. In summary, significant predictors for own risk and comparative risk were found in the high-risk samples only. In both high-risk samples, increasing levels of perceived control and lower levels of previous risk behavior resulted in lower levels of perceived own risk. Additionally, within the gay male sample, STD history also predicted perceived own risk. With regard to predictors of comparative risk, results showed a completely different set of predictors for each of the samples: Within the high-risk heterosexual sample, optimism increased with perceived control and decreased with personal experience (with STDs); within the gay male sample, optimism decreased with previous risk behavior and increased with perceived severity of AIDS.

### Perceptions of Risk and Behavioral Intentions

The analyses above showed that higher levels of previous risk behavior were related to higher levels of perceived own risk in both high-risk samples. Furthermore, among subjects in the gay male sample, higher levels of previous risk behavior were found to be related to lower levels of optimism. Apparently, subjects in the high-risk samples were able to make risk judgments contingent on their own behavior. In this section, we test if a similar relation exists between risk judgments and the motivation to adopt safe sex practices.

As can be seen in Figure 3, subjects appeared more willing to adopt safe sex practices when engaging in sexual contacts with partners higher in risk: Gay male subjects in Sample 3 and heterosexual subjects with prostitution partners in Sample 4 had higher levels of behavioral intentions than did heterosexual subjects with private partners in Sample 2 ( $t(224) = 5.7$ ,  $p < .001$ , and Sample 4,  $t(482) = 6.0$ ,  $p < .001$ ). Subjects with prostitution partners in Sample 4 also engaged in sexual contacts with private partners; the mean score for behavioral intentions with private partners in this sample equaled 3.9, a

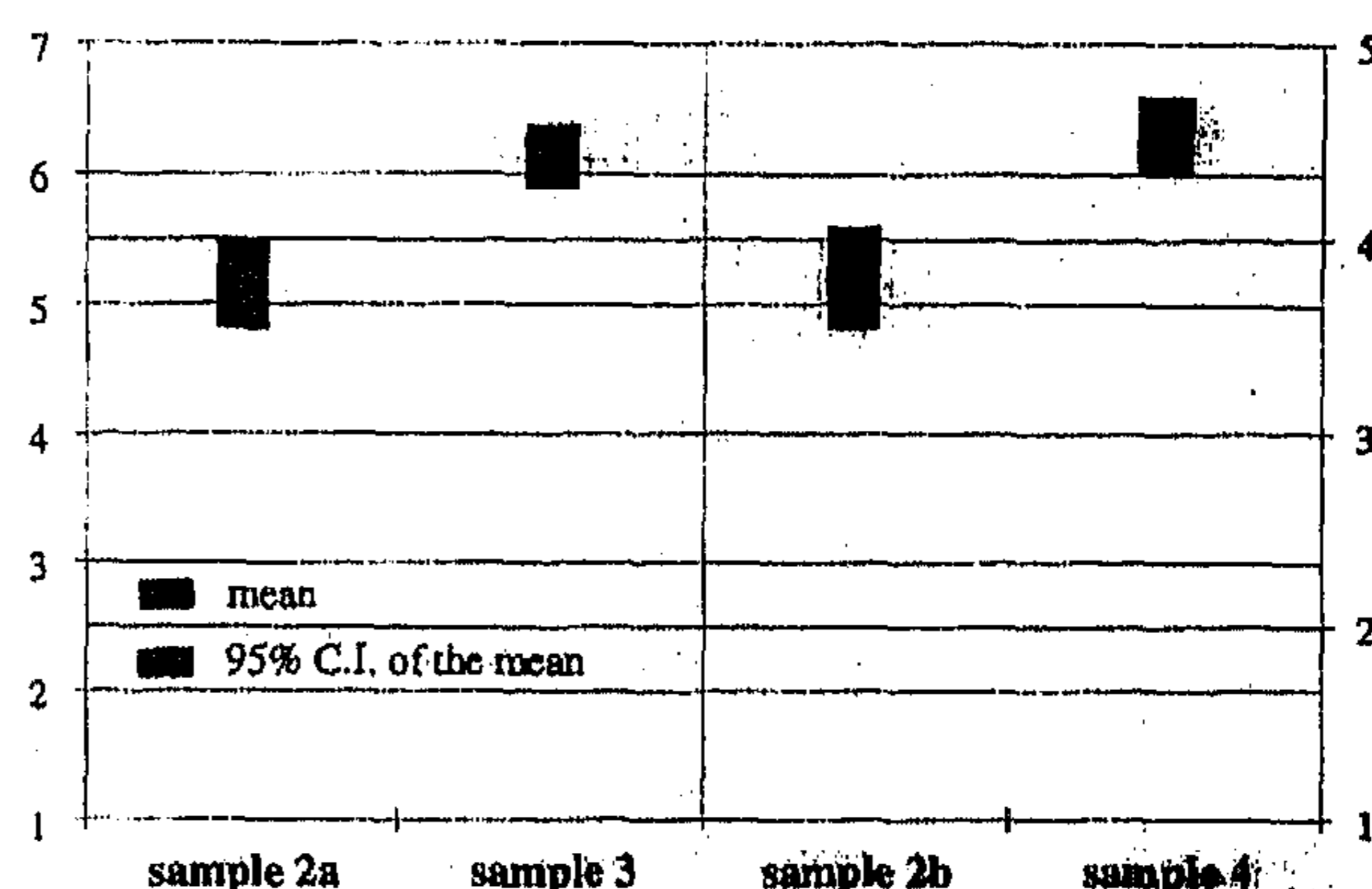


Figure 3. Mean scores on behavioral intentions, for three different samples. The three samples were the following. Sample 2 was low-risk, heterosexual sample—private partners only. Sample 2a was formed with subjects primarily obtained through a Municipal Youth Housing Agency ( $n = 84$ ); subjects in Sample 2b were visitors of the STD clinic ( $n = 157$ ). Sample 3 was high-risk, gay men. Sample 4 was high-risk, heterosexual men with prostitution partners. Behavioral intentions were measured using a 7-point scale for Samples 2a and 3 (left Y axis) and a 5-point scale for Samples 2b and 4 (right Y axis).

score not significantly different from that of intentions of the subjects with exclusively private partners (Sample 2).

Table 4 summarizes the relations between risk judgments and intentions to adopt safe sex practices. Overall, differences in perceived own risk were negatively related to behavioral intentions; subjects with lower own risk scores had higher

Table 4  
Mean Differences of Risk Judgments as a Function of Behavioral Intentions

Risk judgment	$r^b$	Behavioral intentions <sup>a</sup>			
		Low		High	
		$M$	$SD$	$M$	$SD$
Sample 2					
Own risk	.02	10.60	10.34	10.43	11.51
Others' risk	.20***	16.80	13.96	23.96	20.82**
Comparative risk	.19***	6.95	12.46	15.27	21.81**
Sample 3					
Own risk	-.43***	19.92	18.27	8.89	7.43**
Others' risk	-.06	23.82	16.38	23.70	19.50
Comparative risk	.26***	5.03	18.80	15.70	20.09*
Sample 4 <sup>c</sup>					
Own risk	-.19***	29.11	20.80	22.99	20.80**
Others' risk	-.08	28.45	20.94	26.10	20.55
Comparative risk	.16***	-3.55	18.97	3.97	19.43***

Note. Sample 2 = low-risk, heterosexual subjects ( $n = 241$ ); Sample 3 = high-risk, gay male subjects ( $n = 147$ ); Sample 4 = high-risk, heterosexual subjects ( $n = 493$ ). Perceived risk scores could range from 0% to 100%. Higher scores for the comparative risk indicated higher levels of optimism.

<sup>a</sup>Groups were formed by a median split. <sup>b</sup>Bivariate correlation coefficients. <sup>c</sup>Reported results refer to intentions with prostitution partners. Correlations between perceptions of risk and behavioral intentions with private partners equaled .02 (own risk,  $ns$ ), .15 (others' risk,  $p < .01$ ), and .17 (comparative risk,  $p < .01$ ).

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .



intentions to engage in safe sex practices,  $F(1, 662) = 17.1, p < .0001$ . This overall finding was mainly caused by the subjects in the high-risk samples, 3 and 4:  $F(1, 139) = 23.0, p < .001$ , and  $F(1, 308) = 9.7, p < .01$ , respectively. Overall, and in each sample as well, comparative risk was related to behavioral intentions; higher levels of optimism were related to increased intentions to adopt safe sex practices: Overall  $F(1, 649) = 20.2, p < .001$ ; Sample 2  $F(1, 190) = 6.2, p < .01$ ; Sample 3  $F(1, 138) = 10.5, p < .01$ ; and Sample 4  $F(1, 427) = 11.8, p < .001$ . In these analyses, we also looked at the effects of perceived risk for others. Overall, this measure was not significantly related to intentions. For the heterosexual subjects in Sample 2, however, perceived risk for others was found to be positively related to intentions,  $F(1, 190) = 6.2, p < .01$ ; higher risk scores for others were related to increased intentions. Additionally, when intentions with private partners of the high-risk heterosexual subjects in Sample 4 were analyzed, perceived others' risk was likewise related to behavioral intentions,  $F(1, 401) = 4.3, p < .05$ . Table 4 reports the bivariate correlations between measures of perceived risk and behavioral intentions. The obtained correlations support the results of the above mentioned analyses of variance.

Theoretically, it is assumed that higher levels of perceived risk increase subjects' intention to adopt the recommended behavior. As reported above, within the high-risk samples, we found increased perceptions of risk to be related to decreased intentions. These contradictory findings were investigated further by examining the relationship between perceived own risk and behavioral intentions, after controlling for the effects of previous risk behavior.

First, we expected that subjects with higher perceptions of risk and higher levels of previous risk behavior, as well as subjects with lower perceptions of risk and lower levels of previous risk behavior, would have the highest intention to adopt the recommended behavior. The first were expected to do this to reduce their risk, the latter to keep their risk low. However, subjects with higher perceptions of risk and higher levels of risk behavior had the lowest intentions (Sample 3  $M = 5.4$ ; Sample 4  $M = 4.2$ )—lower than the remaining subjects in their sample (Sample 3,  $F(1, 138) = 17.0, p < .001$ ; Sample 4,  $F(1, 295) = 15.5, p < .001$ ). In accordance with the above mentioned assumption, subjects with low perceived risk and low levels of risk behavior appeared to have the highest intentions: For Sample 3,  $M = 6.6, F(1, 138) = 10.5, p < .01$ ; for Sample 4,  $M = 5.0, F(1, 295) = 15.5, p < .001$ .

Second, analyses were performed to test if any of the significant relations between measures of perceived risk and behavioral intentions could be explained by previous behavior. Multiple regression analyses were performed to test this relationship, controlling in an incremental fashion for the influence of previous behavior. Previous behavior was, in all samples, negatively related to intentions (correlations ranged from  $-.22$  in Sample 3 to  $-.34$  in Sample 2;  $p < .01$  for all comparisons). Although most beta weights dropped slightly after introducing previous behavior in the analyses, none of the relations between measures of perceived risk and behavioral intentions dropped to a nonsignificant level. The largest decrease in beta values equaled  $.04$ .

## Discussion

Slovic et al. (1987) noted that in general, people tend to overestimate small probabilities with large consequences. Given the low actual HIV prevalence rate among the heterosexual visitors of the STD clinic (0.4%), this study underlines their notion; even within the general sample, subjects estimated their personal vulnerability to be, on average, more than 10 times higher. Relative risk (i.e., one's own risk as compared with others) was expected to be optimistically biased (e.g., Weinstein, 1982). According to Weinstein (1989), optimism is lower for people with personal experience with a hazard, and for people who judge the hazard to be uncontrollable by personal action. We expected optimism to decrease among samples higher at risk for AIDS. However, after controlling for perceived controllability and personal experience (with STDs), optimism was not found to be significantly different between the first three samples. Nevertheless, optimism was found to be lowest in the sample with the highest levels of behavioral risk (Sample 4). We did, however, find a significant increase in the proportion of subjects that were pessimistic among samples higher at risk for AIDS.

Weinstein (1989) posited two possible processes that could lead to optimism: People could underestimate their own risk, or they could exaggerate the risk of "average" others. There is evidence, however, that people engage in "downward comparisons": They tend to compare themselves to people particularly high in risk (e.g., Perloff & Fetzer, 1986). It seems likely that optimism results from exaggerating the risk of others rather than from underestimating one's own risk. The results obtained among the high-risk samples illustrate this. Heterosexual subjects with prostitution partners had—at least partly because of lower levels of perceived control and higher levels of previous risk behavior—much higher perceived own risk estimates than did the gay male sample. However, these two samples did not differ in their estimate of the risk for others. It could be that our high-risk heterosexual subjects found it difficult to imagine a reference group higher in risk and compared themselves primarily with subjects in the same sample (i.e., other visitors of the STD clinic). Consequently, subjects in the high-risk heterosexual sample were less optimistic.

Most research on optimism assesses subjects' own perceived risk as compared with the risk of their peers (e.g., Weinstein, 1984). Even though we asked subjects to compare themselves with average others of the same sex and age, we found relatively small differences in the amount of optimism obtained in the four samples. This finding suggests that subjects did not merely compare themselves with others higher at risk but to others more at risk in their specific social network (e.g., gay men with gay men higher at risk and heterosexuals with heterosexuals higher at risk).

Contrary to findings reported by Weinstein (1989), subjects had, to some degree, relatively adequate (although optimistically biased) perceptions of risk; because own risk was found to be related to personal control and previous risk behavior, subjects seemed to judge their vulnerability (at least in part) on the basis of their own sexual practices. There are two limitations to this conclusion. First of all, we found behavioral risk factors to be related to perceptions of risk in the high-risk



samples only. Second, the obtained correlations of .25 (high-risk homosexual sample) and .13 (high-risk heterosexual sample) between previous risk behavior and own risk estimates are modest; only a limited percentage of the variations in personal risk estimates can be explained by variations in previous risk behavior. However, the obtained significant relation between these measures is discrepant with earlier research (see, for example, Weinstein, 1989).

In the high-risk heterosexual sample, factors related to optimism were in accordance with Weinstein's research (e.g., Weinstein, 1984): Optimism varied with personal control and personal experience (with STDs). Surprisingly, in the gay male sample, perceived severity of AIDS and previous risk behavior were significantly related to optimism. Weinstein (1980) noted that if optimism was found to increase with event seriousness, this would point to an ego-defensive origin of optimism. We found, however, levels of optimism to decrease with increasing levels of perceived severity among subjects in the gay male sample. The relation between previous risk behavior and optimism might be the result of the relatively high prevalence of HIV among gay men in general; 42% of the subjects in this sample had sexual contacts with partners who, after the event, were known to be seropositive or who were presumably seropositive (van der Velde & van den Broeke, 1988). Note, however, that the comparative risk is calculated by subtracting the own risk score from the risk score for others. Given the pronounced effect of previous behavior on perceived own risk and the lack of a relationship between previous risks and others' risk, the present significant relationship might well be due to differences in perceived own risk.

#### *Perceived Risks and Behavioral Intentions*

Perceptions of risk or vulnerability have been found to be related to both risk reduction motivation (e.g. Mewborn & Rogers, 1979; Rippetoe & Rogers, 1987) and preventive health behavior (e.g., Bauman & Siegel, 1987; Cummings, Jette, Brock, & Haefner, 1979). Furthermore, as reported by Weinstein (1982), optimism has been found to lower risk reduction motivation. However, we found optimism to be positively related to intentions to adopt safe sex practices in all samples. Apparently, in general, people are well able to translate optimism (or pessimism) to behavioral intentions (because no causal inferences can be drawn, it is equally likely that higher levels of intentions generate higher levels of optimism). Furthermore, in contrast to theoretical predictions (e.g., Rogers, 1975), we found a negative relation between perceived own risk and intentions: Higher levels of perceived own risk were related to lower levels of intentions, even after adjusting for the influence of previous behavior. Joseph et al. (1987) reported similar findings in a study on AIDS among gay men. Apparently, reducing behavioral risks implies—especially among gay men and high-risk heterosexuals with prostitution contacts—a sacrifice some subjects do not want to make, willingly accepting higher levels of risk (van der Velde & van der Pligt, 1991). Rogers and Mewborn (1976) also reported a similar negative relation between perceptions of risk and behavioral intentions. However, they found that increments in probability of occurrence resulted in higher levels of behav-

ioral intentions only when recommendations were presented as relatively effective. If recommendations were presented as relatively ineffective, an increase in the threat's probability of occurrence was found to decrease intentions. Although the present data do not provide a direct test of their conclusion, we did find that (low-risk) heterosexual subjects judged recommendations to be significantly more effective than did gay subjects (van der Velde & van der Pligt, 1991). Surprisingly, behavioral intentions with private partners were positively related to perceived others' risk in both the low- and high-risk heterosexual samples. These subjects thus seemed to adjust their behavioral intentions to their perception of the proportion of HIV-infected heterosexuals in the community. The inference drawn from these results may be that heterosexuals with private partners adjusted their motivation to adopt safe sex practices to the perceived threat of AIDS to the community as a whole (others' risk), whereas subjects who attributed high risk to themselves adjusted their perception of (own) risk to their intentions; given the higher risk with their partners, a low motivation to adopt safe sex practices would simply imply a higher likelihood of an infection with HIV. Differences in risk between the various sexual partners resulted also in differences in intention with these partners: We found that behavioral intentions for respondents with partners higher at risk for AIDS were higher; intentions with regard to gay male or prostitution partners were higher than intentions with heterosexual, private partners.

#### *Implications for Intervention Programs*

Contrary to subjects with same-sex partners or subjects with prostitution partners, (low-risk) heterosexual subjects with private partners did not perceive their own risk to be related to their sexual practices. Instead, these subjects seemed motivated to change their sexual practices only if they perceived HIV prevalence rates to be high. If among low-risk groups, perceptions of risk would mirror more accurately actual prevalence rates among these groups, prevention campaigns might be less successful in persuading low-risk groups to adopt safe sex practices. Risk estimates for (other) STDs are generally higher than for HIV (van der Velde et al., 1992). Furthermore, prior experience with STDs is related to perceptions of risk (in the present study primarily among subjects in high-risk groups). Therefore, integrating STD- and AIDS-prevention campaigns may have beneficial effects, both for low-risk and high-risk populations. Finally, the present study showed substantial differences between samples with differing degrees of being at risk for AIDS, suggesting that conveying population-specific messages may be more helpful in changing (and maintaining) adaptive behavior than general, large-scale prevention campaigns.

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