

## Unpacking Perceived Control in Risk Perception: The Mediating Role of Anticipated Regret

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### ABSTRACT

Perception of control has been a fundamental construct in research on risk-taking behavior. It has been shown, for example, that people tend to underestimate risks that are under their control. Despite its importance, surprisingly, little attention has been paid to what is actually meant by control. In three studies, we argue that the common conceptualization of perceived control is too broad as it fails to distinguish between two distinct aspects of control ‘command over exposure to the risk itself (volition)’ and ‘command over the outcome (control)’. Thus, whether the risk is imposed or freely chosen likely differs from, and has different consequences for, the ability to exert influence over a risky behavior, once it has been initiated. Using a wide variety of risk behaviors (e.g., ecstasy use, unsafe sex), we demonstrate that volition and control exert opposing influence on risk perception: control decreases perceived risk while volition increases perceived risk. This latter prediction is counterintuitive and is explained in terms of the mediating role of anticipated regret: voluntary appraisals elicit anticipated regret, which, in turn, increases perceived risk. This work highlights the dynamic relationship between risk characteristics and anticipated emotion in guiding the perception of risk. Copyright © 2007 John Wiley & Sons, Ltd.

KEY WORDS perceived control; anticipated regret; risk perception; voluntary risk-taking

### INTRODUCTION

There has been longstanding interest in how people make judgments about risk. This interest reflects the assumption that risk perception exerts considerable influence over our decisions and behaviors and reflects the clear observation that these *perceptions* are often at odds with the *actual* risk a behavior entails. For example, there has been considerable attention and concern over the threat posed by the spate of meat scandals such as bovine spongiform encephalopathy (BSE) and foot and mouth diseases—diseases that only

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a handful of people have ever contracted. At the same time, neglect of basic food hygiene, which kills thousands of people each year in the form of Salmonella poisoning, rarely captures the public's interest.

Risk perception research has been eager to understand how people arrive at judgments such as this. Normative theories argue that risk perception is based on two basic judgments: the *probability* that a negative outcome will occur and the *severity* of its consequences (Yates, 1992). Although these theories continue to enjoy widespread influence, it has become increasingly clear that other factors can have a significant impact on people's risk perception. One such factor shown to influence risk perception concerns the characteristics of the risk itself (Slovic, 1987).

Risk characteristics refer to the features of the risk, such as whether a risk is familiar or novel, natural or man made, or has immediate or delayed consequences. Perhaps the most notable risk characteristic is perceived control. A number of theorists have emphasized the importance of perceptions of control and have suggested that the desire to have an influence on our environment is a universal preference (Langer & Rodin, 1976). In the context of risk acceptability, people tend to prefer controllable over uncontrollable risks, as they see potentially hazardous behavior as less risky if they have some measure of control over the risk. For example, people prefer controllable risks that pose a high degree of risk over less risky but uncontrollable risks (Klein & Kunda, 1994), believe they are safer than others when the risk is controllable (Weinstein, 1984), and bet more money on games of skill than on games of chance, even when these games offer similar probabilities of success (Cohen & Hansel, 1959).

#### UNPACKING PERCEIVED CONTROL

Given the amount of research on the effect of perceived control on risk perception, it is surprising how little attention has been paid to what is actually meant by control (c.f. Harris, 1996). This is particularly interesting given that there are at least two clear aspects of most risky behavior that people can control: command over the outcome, and command over exposure to the risk itself. Perceived control was initially conceptualized as command over the outcome. For example, Slovic, Fischhoff, and Lichtenstein (1985) assessed perceived control over a number of potentially life-threatening activities by asking, 'If you are exposed to the risk, to what extent can you, by personal skill or diligence, avoid death?'

When people perceive command over *exposure* to the risk, the risk is said to be voluntary, as it describes whether the risk is one that people can willingly avoid. Volition thus reflects the nature of participation: the risk is either freely chosen or is imposed. Control, on the other hand, reflects people's ability to prevent negative outcomes *once* the risky behavior has been initiated—an appraisal that is independent of beliefs over whether or not exposure to the risk is voluntary.

Consider, for example, the use of illicit drugs. Drug use is most likely to be conceived as a voluntary risk, as no one has to incur the potential health, social, and legal risks of drug use unless they decide to use it. Yet this aspect of the risk is unrelated to the sense of control one may have over the effects of the drug, once it has been ingested. The risk of driving is also a helpful example of this distinction. In rural regions of the country, where there is limited public transportation, people may find driving to be a relatively involuntary risk (as there are no other options). However, city dwellers may perceive driving as a more voluntary decision, as they have numerous other transportation options. Yet once the decision has been made to drive, both groups do not likely differ in terms of their beliefs about being able to prevent an accident (perceived control).

Research interested in the influence of control on risk perception has generally failed to differentiate between these two constructs. In many risk perception studies, researchers assess control by simply asking, 'how much control do you have over the risk' (Harris, 1996). When asked this way, it is not clear whether 'control' relates to the outcome, exposure to the risk, or both.

A good illustration of this problem is a study by Quadrel, Fischhoff, and Davis (1993) that measured the effects of control on risk perception by comparing events that differ in terms of controllability. For instance,

they compared plausibly controllable risks, such as unplanned pregnancy, with allegedly uncontrollable risks, such as air pollution. In the case of unplanned pregnancy, command over the outcome is confounded with command over exposure. The risk of unplanned pregnancy may be considered voluntary in the sense that one can completely avoid the risk through sexual abstinence, and for those who are sexually active, the risk may also be considered controllable in that people can take measures to prevent pregnancy (e.g., the birth-control pill or condoms).<sup>1</sup>

One reason why researchers have failed to distinguish between the control and volitional dimensions of risk may be that they believe that these constructs simply do not warrant distinction. However, in three studies we aim to demonstrate that the risk characteristics volition and control require distinction because they are different constructs that have opposing influence on risk perception. Specifically, we predict that appraisals of control decrease perceptions of risk, whereas appraisals of volition increase perceptions of risk. As mentioned previously, the relationship between control and risk perception has been well documented, and thus this half of the dual-prediction simply seeks to replicate this well-established finding.

The volitional dimension of risk, on the other hand, is a relatively unexplored construct. A core feature of volition is personal responsibility. When a risk is said to be voluntary it implies that the risk is not imposed upon the agent but rather is chosen freely. While people may generally find voluntary risks more *acceptable* (Starr, 1969) than involuntary risks, there is a downside to risks that are voluntary: in the event of a negative outcome it can, in addition to the objective loss, lead to regret over the decision. Regret is an unpleasant emotion that is said to be experienced when, (1) an obtained outcome compares negatively to a possible other outcome and (2) there is a sense of personal responsibility over obtaining the negative outcome (Gilovich & Medvec, 1995). An important feature of regret is that it can be anticipated and taken into account when making decisions (Loomes & Sugden, 1982). Consequently, people tend to avoid decisions that they anticipate might subsequently lead to regret, and this motivation has been shown to impact a wide range of behaviors. For instance, Josephs, Larrick, Steele, and Nisbett (1992) found that the threat of regret reduced the tendency to take risky decisions. Richard, van der Pligt, and de Vries (1996) tested the effects of anticipated regret on sexual risk-taking and Simonson (1992) examined anticipated regret in the context of consumer decision-making. Results of both studies show that anticipated regret can add to the prediction of behavioral expectations.

Thus our prediction that appraisals of volition increase risk perceptions hinges on the mediating role of anticipated regret. The prospect of taking a voluntary risk induces anticipated regret because it is relatively easy to imagine an alternative outcome and people thus feel responsible for their decision. Anticipated regret, in turn, leads to an increase in perceived risk as people weigh the additional costs of feeling regretful over the possible negative outcome.

## STUDY 1

The aim of the present study was to examine the notion that control and volition represent distinct characteristics of risky behavior. We predicted that control and volition have opposite effects on risk perception, with appraisals of control associated with lower perceived risk and appraisals of volition associated with higher perceived risk. The latter prediction was counter to traditional thinking about the relationship between volition and risk perception. A second goal of this study, then, was to demonstrate the process through which volition influences risk perception. We predicted that anticipated regret mediates the relationship between volition and risk perception.

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<sup>1</sup>We do not mean to suggest that unplanned pregnancy is always going to be construed as controllable and voluntary. We argue that risk characteristics are not objective and are instead based on people's beliefs about the risk. In this instance, unplanned pregnancy may not be appraised as controllable for those who are culturally or religiously forbidden to use contraceptives.

## Method

### *Participants*

Participants were 70 psychology undergraduates from the University of Amsterdam (48 of them were female and 22 were male), who participated for course credit. The ages of participants ranged from 18 to 36 years ( $M = 20.37$ ).

### *Measures and procedure*

Participants were provided with a questionnaire that asked them to rate 20 potentially risky behaviors. The risk behaviors were initially generated from a list of risk behaviors previously used in the literature. From this initial list we then narrowed down a final set of risk behaviors through informal discussion among the authors. A loose criterion was that the risk should be relevant to an Amsterdam student sample. Examples include ecstasy use, eating genetically modified food, or cycling through Amsterdam.

Participants rated the extent of control, volition, anticipated regret, and risk they attributed to each potentially hazardous behavior. To reduce participant burden, each of the four constructs was measured with a single item.

*Volition.* Volition was assessed by asking participants to rate 'how difficult it would be to avoid X' on a 9-point scale from (1) *Not at all difficult* to (9) *Extremely difficult*. Higher scores thus reflect less volition. In all analyses volition scores were reversed so that increases in volition scores reflects more volition. We assessed volition in terms of difficulty avoidance as we felt it more closely relates to the way in which people tend to think about the volitional dimension of risk—is exposure to the risk avoidable—as opposed to is the risk voluntary. This conceptualization is in accordance with Vaughan (1993).

*Control.* Control was assessed by asking, 'if you were to X (use ecstasy, cycle in Amsterdam, and so forth), how much control would you have over the risks associated with X (ecstasy use)', on a 9-point scale from (1) *No control* to (9) *Complete control*. In the instructions participants were reminded that this question did not necessitate that they had or intended to perform these behaviors.

*Anticipated regret.* Anticipated regret was assessed by asking participants to rate 'how much regret you would feel if they experienced a negative outcome with X' on a 9-point scale from (1) *No regret* to (9) *Extreme regret*.

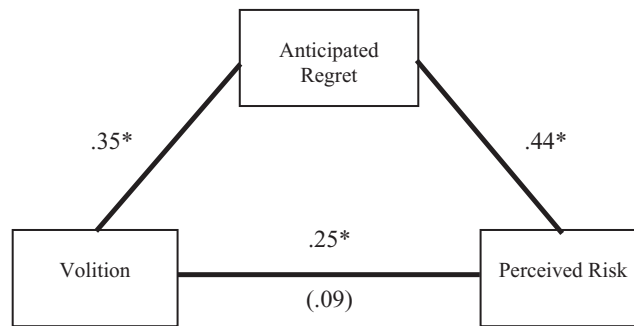
*Risk.* Finally, perceived risk was assessed by asking 'how great are the risks of X' on a 9-point scale from (1) *No risk* to (9) *Extreme risk*.

## Results and discussion

Results were organized around two sets of analyses. We first examined the broad notion that volition and control warrant distinction. We predicted that control is associated with decreased risk perception and volition is associated with increased risk perception. To test these predictions we calculated the average correlations across the 20 risk behaviors.<sup>2</sup> As expected, volition and control were not significantly correlated  $r = -0.06$ , ns. These findings suggest that the extent to which a risk is perceived as voluntary is unrelated to the extent to which the risk is perceived as controllable.

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<sup>2</sup>For three studies, all correlations involving volition or control partial out the influence of the other.



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

Figure 1. Mediation of volition to perceived risk by anticipated regret for 16 risky behaviours, Study 1

We next examined the effects of volition and control on risk perception. As expected, higher appraisals of volition were associated with greater perceived risk, ( $r = 0.25$ ,  $p = 0.03$ ).<sup>3</sup> In total, 16 of the 20 risks were significantly correlated in the predicted direction, with a range from 0.09 to 0.45. Control, on the other hand, on average correlated with risk perception in the expected direction, ( $r = -0.13$ , ns.), and twelve of the 20 risks were significant with a range from 0.05 to  $-0.39$ . Though we had expected a stronger negative relationship between control and risk perception, these findings provide initial evidence that control and volition have divergent effects on risk perception.

We next examined our prediction that anticipated regret accounts for the observed negative relationship between volition and risk perception. We hypothesized that anticipated regret mediates the relationship between volition and risk perception. This prediction assumes the following relationship amongst the three variables: (1) volition (predictor) is positively associated with anticipated regret (mediator); (2) Volition (predictor) is positively associated with risk perception (outcome); (3) anticipated regret (mediator) is positively associated with risk perception (outcome) when controlling for volition (predictor). Correlations for the 20 behaviors were averaged (see Figure 1). As predicted, higher appraisals of volition were associated with more anticipated regret, ( $r = 0.35$ ,  $p = 0.01$ ). Higher appraisals of volition were also associated with greater perceived risk, ( $r = 0.25$ ,  $p = 0.05$ ). Finally, anticipated regret—controlling for volition—was positively associated with perceived risk ( $r = 0.44$ ,  $p = 0.01$ ).

More specific analyses revealed that 16 of the 20 behaviors met the conditions for mediations (Baron & Kenny, 1986). For these 16 risk behaviors, we used the Sobell test (MacKinnon & Dwyer, 1993) to determine whether anticipated regret carried the influence of volition to risk perception. We found that anticipated regret fully mediated twelve of the risks and partially mediated the remaining four (See Table 1, column 4). This finding confirms our prediction that anticipated regret mediates the relationship between volition and perceived risk.

Results support our prediction that, in the context of risk perception, appraisals of control and volition are distinct constructs that have opposite effects on risk perception. Appraisals of volition were significantly associated with an increase in perceived risk, whereas appraisals of control were associated with a decrease in perceived risk. These findings were consistent across a variety of potential risks. Results also suggest the process through which volition affects risk perception. Voluntary risks were associated with the anticipation of regret, which mediated the relationship between volition and risk perception.

<sup>3</sup>Correlations were averaged using Fisher's Z transformation.

Table 1. Correlations and Sobel significance tests for 16 risky behaviors

Variable	A/B	A/C	B/C	A/B (C)	Z
Cycling	0.23	0.32	0.52	0.07	2.48**
Eat GM food	0.42	0.43	0.67	0.09	3.35**
Walking at night	0.30	0.34	0.44	0.18	2.12*
Marijuana use	0.40	0.52	0.44	0.12	2.29*
Eat beef	0.35	0.46	0.63	0.07	3.38**
Skiing	0.34	0.23	0.33	0.20	1.46
Ecstasy use	0.25	0.50	0.42	0.05	2.54**
Contact sports	0.26	0.42	0.50	0.07	2.78**
Buying a stolen bike	0.24	0.28	0.36	0.13	1.94*
Eat chicken	0.24	0.24	0.33	0.11	1.75
Sunbathing	0.27	0.35	0.34	0.16	1.95*
Backpacking	0.21	0.20	0.44	0.13	1.69
Unsafe sex	0.27	0.31	0.51	0.14	2.31*
Mountain-climbing	0.33	0.31	0.34	0.23	1.96*
Cocaine use	0.25	0.35	0.31	0.15	1.84
Eat pork	0.31	0.35	0.53	0.10	2.63**

Note: Column headings refer to: A = Volition, B = Risk Perception, C = Anticipated Regret, and Z = Sobel significance statistic.  
\* $p < 0.05$ ; \*\* $p < 0.01$ .

## STUDY 2

Study 2 advanced the findings from the first study in a number of ways. In this study we again examined the relationship between control and volition, but this time in the context of a novel risk. The benefit of using a novel risk is that it provides for a more controlled setting: participants are required to base their judgments solely on the information provided to them, rather than on their often times considerable prior experience with the risk. We also wanted to address the weaker than expected relationship between control and risk perception found in Study 1. This may have been due to the restricted range of several of the variables. To overcome this problem, in the present study we manipulated perceptions of control by providing participants with a 500-word article about a novel health risk. Half of the participants were led to believe they had control over the risk while the other half were informed the risk was uncontrollable.<sup>4</sup>

Another goal of this study was to more closely examine the finding that anticipated regret mediated the relationship between volition and risk perception. This was achieved by using multi-item measures of relationship and risk perception, and by including a set of additional anticipated emotions that have been previously studied in the context of risk perception in order to evaluate whether the observed mediated relationship is specific to anticipated regret.

Finally, we explored the relationship between objective risk (by 'objective' risk we refer to the probability of experiencing a negative outcome) and perceived risk. We examined the notion that in many circumstances people with the lowest objective risk (those who seldom engage in the behavior) might be those who also perceive the risk to be most voluntary (because it is easily avoided). If so, low objective risk should also be associated with higher anticipated regret and, in turn, higher perceived risk. Thus, the volition-anticipated regret relationship may in some instances inflate perceptions of risk for those with the least objective risk.

<sup>4</sup>At this stage we choose not to manipulate volition for a variety of reasons. First among them is that we wanted to replicate the mediational effect observed in Study 1 using a novel personal risk. We also believe that as a risk characteristic, volition is better conceptualized as a continuum than as a dichotomy. Although Study 1 demonstrates that a wide variety of risks are appraised to some extent as voluntary, we argue that there are few purely involuntary personal risks. Such a risk would have to be universally considered completely unavoidable. With a few exceptions (we manipulate volition in Study 3), few personal risks meet this criterion.

## Method

### *Participants*

Participants were 103 psychology undergraduates from the University of Amsterdam (72 female and 31 male), who participated for course credit. The ages of participants ranged from 18 to 38 years ( $M = 20.88$ ).

### *Measures and procedure*

Participants were presented with one of two 500-word articles describing Listeria, a rare disease that is found in meat products. The first section of the article was identical for all participants and it provided basic information about the disease, including its origins, prevalence, and symptoms. The second section of the article focused on ways of preventing Listeria. In the control condition people were told, 'Preventing Listeria is up to you . . . You can eliminate your chances of contracting Listeria by using proper hygiene in the kitchen and fully cooking meat'. Thus, these participants were led to believe that if they purchased meat (the volitional aspect of the risk), they were then able, through skill and knowledge, to prevent the illness. In the no control condition people were told, 'There is no way to insure that the meat you purchase does not contain Listeria . . . The Listeria virus can survive at temperatures much higher than most viruses, so cooking meat does not reduce your chances of contracting the illness.' Concluding the experiment, participants were told about the goals of the study and were given information about the Listeria disease.

*Manipulation check.* To insure that the manipulation of control was successful we asked participants, 'How much control do you have over preventing the contraction of Listeria in the meat you have purchased?' On a scale from (1) *No control* to (9) *Complete control*.

*Risk perception.* Risk perception was measured with two, 9-point scale items (Cronbach's  $\alpha = 0.71$ ). Participants were asked, 'What are the risks of contracting Listeria?' ranging from (1) *Not at all risky* to (9) *Extremely risky*, and 'How great are the risks of contracting Listeria?' ranging from (1) *Extremely small* to (9) *Extremely great*.

*Volition.* Volition was measured with three, 9-point items that varied by duration of meat avoidance (Cronbach's  $\alpha = 0.93$ ). Participants were asked, 'How difficult would it be to not eat meat for . . . the next week, the next six months, and the next year?' on a scale ranging from (1) *Not at all difficult* to (9) *Extremely difficult*. In all analyses volition scores were reversed so that increases in volition scores reflect more voluntary appraisals.

*Anticipated emotion.* We assessed four anticipated emotions: regret, disappointment, anger, and fear. Each emotion was measured with one 9-point item. For the regret item, for example, participants were asked, 'How much regret would you feel if you contracted Listeria by eating meat?' ranging from (1) *No regret* to (9) *Extreme regret*.

## Results and discussion

### *Effects of control and volition on risk perception*

The manipulation of control was successful as participants in the control condition reported higher appraisals of control ( $M = 6.80$ ) than participants in the no control condition ( $M = 3.27$ ,  $F(1,102) = 90.21$ ,  $p < 0.0001$ ). The manipulation also affected perceptions of risk. As predicted, participants in the control condition reported lower ratings of risk ( $M = 3.69$ ) than participants in the no control condition ( $M = 4.50$ ,  $F(1,102) = 4.45$ ,  $p = 0.04$ ). However, as in Study 1, higher appraisals of volition were associated with greater

perceived risk, ( $r = 0.31, p = 0.001$ ). This confirms our prediction that control and volition exert opposing influence on risk perception.

#### *Volition, anticipated regret, and risk perception*

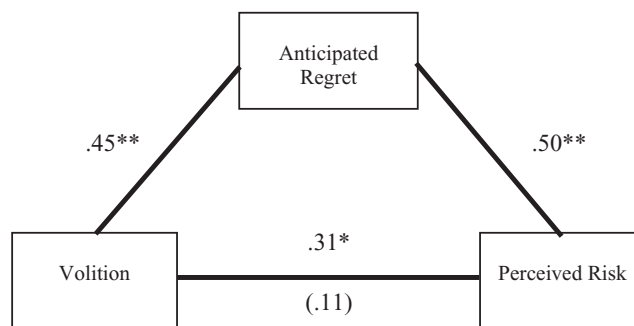
We next examined the relationships among volition, anticipated emotions, and risk perception. Using the same general strategy employed in Study 1, we tested whether anticipated regret mediates the relationship between volition and risk perception. We subsequently tested whether volition was related to any other anticipated emotions. As predicted, higher appraisals of volition were associated with more anticipated regret ( $r = 0.45, p = 0.001$ ). Higher appraisals of volition were also associated with greater perceived risk ( $r = 0.31, p = 0.001$ ). Finally, anticipated regret—controlling for volition—was positively associated with perceived risk ( $r = 0.50, p = 0.001$ ). Using the Sobell test to determine whether anticipated regret carried the influence of volition to risk perception, we found that anticipated regret fully mediated the relationship between volition and risk perception ( $z = 3.24, p = 0.001$ ) (see Figure 2).

We next examined whether volitional appraisals were related to other anticipated emotions. As predicted, volition did not correlate with any other anticipated emotion. Correlations ranged between 0.05–0.19. This suggests that the relationship between volition and risk perception is driven specifically by anticipated regret.

#### *Objective vs. subjective risk*

Lastly, we compared participants' past meat consumption ratings with ratings of volition, anticipated regret, and risk perception in order to test the notion that people with the lowest objective risk have the greatest perceived risk. In support of this idea, past meat consumption was negatively correlated with volition ( $r = -0.75, p = 0.001$ ). In other words, the less meat participants tended to consume, the more voluntary they perceive meat consumption to be. Likewise, meat consumption was negatively correlated with anticipated regret ( $r = -0.35, p = 0.001$ ) and perceived risk ( $r = -0.28, p = 0.005$ ). Thus, the less often participants eat meat, the more anticipated regret and the more perceived risk they report over contracting Listeria, demonstrating that the people with the lowest objective risk can perceive the risk to be greatest.

The results of this study confirm and expand upon the findings from Study 1. In the context of a novel risk, we found that control and volition had opposite effects on risk perception, and that anticipated regret fully mediated the relationship between volition and risk perception. This relationship seems to be specific to anticipated regret, as volition did not correlate with other related emotions. Finally, we found tentative evidence for the notion that the volition-anticipated regret relationship may in some instances inflate perceptions of risk for those with the least objective.



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

Figure 2. Mediation of volition to perceived risk by anticipated regret for novel risk, Study 2



## STUDY 3

In the final study, we manipulated volition in order to test its direct effect on anticipated regret and perceived risk. We predicted that participants in the voluntary condition would report both greater anticipated regret (but not other anticipated emotions) and greater perceived risk than participants in the involuntary condition. We also took a closer look at how volition influences risk perception. As in the previous two studies, perceived risk was assessed using a global measure of risk. In this study we also measured the *probability* of the risk. We argue that anticipated regret increases risk perception because it compounds the consequences or magnitude of the risk—in addition to the negative objective consequences of the risk (e.g., breaking one's leg), the risk also carries negative emotional consequences (e.g., not forgiving oneself for taking the risk). Yet the addition of emotion-based negative consequences should not influence judgments about the probability of incurring a negative outcome. With this in mind, we predict no difference in ratings of risk probability between the two conditions.

**Method***Participants*

Participants were 68 psychology undergraduates from the University of Amsterdam (47 among them were female and 21 were male), who participated for course credit. The ages of participants ranged from 18 to 28 years ( $M = 20.56$ ).

*Measures and procedure*

Participants were presented with one of two 500-word articles describing Chloroform, a rare water-borne illness.<sup>5</sup> The first section of the article was identical for all participants and it provided basic information about the illness, including its origins, prevalence, and symptoms. The second section of the article focused on the risk of exposure. In the involuntary condition, participants were told, 'Chloroform is a risk you can't avoid. There is no way to insure that the water you drink does not contain Chloroform. Water processing plants test for the presence of Chloroform and, though rare, some contaminated water does reach the consumer. Chloroform can be contracted through both tap and bottled water, as well as many fruit juices.' Participants in the voluntary condition were told, 'Chloroform is a risk you can avoid. Water processing plants test for the presence of Chloroform and, though rare, some contaminated water does reach the consumer. However, you can eliminate your exposure to Chloroform by not drinking tap water'. Concluding the experiment, participants were told about the goals of the study and were given information about the Chloroform disease.

*Manipulation check.* To insure that the manipulation of volition was successful we asked participants, 'How difficult is it to avoid exposure to Chloroform for the next week?' on a scale from (1) *Not at all difficult* to (9) *Extremely difficult*.

*Risk perception.* Global consequence of the risk was measured with two, 9-point scale items (Cronbach's  $\alpha = 0.74$ ). Participants were asked, 'What are the risks of contracting Chloroform?' ranging from (1) *Not at all risky* to (9) *Extremely risky*, and 'How great are the risks of contracting Chloroform?' ranging from (1) *Extremely small* to (9) *Extremely great*. Probability of the risk was measured with one 9-point scale item. Participants were asked, 'What is the likelihood of contracting Chloroform?' ranging from (1) *Not at all likely* to (9) *Extremely likely*.

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<sup>5</sup>Although in the English language the word 'Chloroform' refers to an actual substance, in the Dutch language 'chloroform' does not refer to anything (it does not appear in the Dutch dictionary). During the debriefing participants did not express doubt about the validity of the cover story.

*Anticipated emotion.* We assessed four anticipated emotions: regret, disappointment, anger, and fear. Each emotion was measured with one 9-point item. For the regret item, for example, participants were asked, 'How much regret would you feel if you contracted Chloroform?' ranging from (1) *No regret* to (9) *Extreme regret*.

## Results and discussion

### *Manipulation check*

The manipulation was successful. Participants in the involuntary condition rated it significantly more difficult to avoid contracting chloroform ( $M = 5.24$ ) than participants in the voluntary condition ( $M = 3.20$ ,  $F(1,67) = 13.30$ ,  $p = 0.001$ ).

We first examined the effect of volition on anticipated regret, as well as other anticipated emotions (disappointment, fear, and anger). Results confirmed our predictions. Participants in the voluntary condition reported significantly higher anticipated regret ( $M = 5.60$ ) than those in the involuntary condition ( $M = 3.70$ ,  $F(1,67) = 11.36$ ,  $p = 0.001$ ). The volition manipulation did not exert significant influence on fear, anger, or disappointment, however (all  $F$ s  $< 1$ ). These findings demonstrate that, in the event of a negative outcome, people anticipate experiencing regret when the risk is perceived to be voluntary. Voluntary appraisals of risk do not seem to give rise to other, related anticipated emotions, however.

We next examined the effects of the manipulation on the perceived risk of contracting Chloroform. As in Studies 1 and 2, we used a global measure of risk perception. As predicted, perceived risk was higher in the voluntary condition ( $M = 4.11$ ) than in the involuntary condition ( $M = 3.12$ ,  $F(1,67) = 6.86$ ,  $p = 0.01$ ). Ratings of risk probability in the voluntary condition ( $M = 5.86$ ) did not differ from ratings in the involuntary condition ( $M = 5.94$ , ns.). Thus, participants perceived the voluntary risks to be greater than involuntary risks despite the fact that they judged the risks to be equally likely.

## GENERAL DISCUSSION

Perception of control has featured prominently in research interested in how people make judgments about risk. As such, control requires clear conceptual and operational definitions. Yet little attention has been paid to what is meant by control. In the present studies we argue that the typical conceptualization of control is too broad as it fails to distinguish between command over the outcome (control), and command over exposure to the risk itself (volition). In support of this view, we found that volition and control were distinct constructs that had opposing influence on risk perception. Results showed that control led to a decrease in perceived risk, while volition increased perceived risk. Conceptually, our usage of the term volition is related to Ajzen's 'volitional control' or 'perceived behavioral control' (Ajzen, 1991). In his theory of planned behavior, Ajzen focuses on the role of volitional control in the context of attitude-behavior models, and argues that low volitional control tends to decrease the impact of attitudes on behavior.

We examined the *process* by which volition impacts risk perception. Results provide initial evidence for our prediction that this relationship was mediated by anticipated regret. Regret is an unpleasant emotion that is experienced when people imagine how a negative outcome could have been better. Interestingly, the mediated relationship was specific to anticipated regret, as volition did not relate to a host of other emotions relevant to risk perception. This finding supports increasing evidence for the role of emotion-specific influences on risk perception (Lerner & Keltner, 2001). These findings also suggest how anticipated emotion influences risk perception. Anticipated regret influenced global measures of risk but did not affect judgments about the likelihood of the risk occurring. These findings suggest that the role of emotion in perceptions of risk and decision-making is best captured by measuring risk broadly, rather than assessing specific dimensions of risk, such as risk probability and acceptability.

The notion that voluntary risks increase assessments of risk diverges from past theorizing and research on the relationship between volition and risk perception. Slovic (1987) found that people regard voluntary risks

as more acceptable than involuntary risks, and Starr (1969) suggested that voluntary risks are 1000 times more acceptable than involuntary risks. However, these studies focused on societal risks (e.g., nuclear waste) rather than personal risks (e.g., ecstasy use). This is an important distinction. As people are unlikely to consider themselves responsible for societal risks, volition should not be associated with regret (as personal responsibility is a core feature of regret), and thus not affect perceived risk.

Future research should continue to explore the consequences of, and the process behind, the counterintuitive finding that voluntary risks are perceived to be more risky. The present studies indicate that this effect is due to the mediating role of anticipated regret. However, from these studies alone it is difficult to completely rule out additional mechanisms that might drive this effect. Another avenue for future research is to extend these findings to applied domains. Take, for example, how this work could be used to predict how people will react to future health scares, such as bird flu. If, for instance, we learn that people perceive poultry consumption to be an involuntary risk (i.e., people could not imagine going without chicken), whereas people view fish consumption as relatively more voluntary, it would suggest that consumers would be more vulnerable to health scares involving poultry than fish. In this way, this work could help researchers to make sense of people reactions to past risks and to predict the public's reaction to future risks.

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