Self-Regulation and Protective Health Behavior:

How Regulatory Focus and Anticipated Regret Are Related to Vaccination Decisions

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Abstract

Objective: We examined how individual motivational orientations and anticipated regret are related to the protective health decision of vaccination behavior. ***Design:*** The proposed relations were examined in a large-scale sample (N = 3,168) and three medium-sized samples (N = 151, N = 194, N = 208). Questionnaires were applied to assess regulatory focus, anticipated regret, and vaccination behavior. ***Results:*** Increased prevention-focused self-regulation—which is represented by concerns about security-related goals, responsibilities, and obligations—was related to a greater likelihood of vaccination. Prevention-focused individuals' higher likelihood of getting vaccinated seems at least in part to be a consequence of anticipated regret for not vaccinating. Study 3 suggests that regulatory focus is less related to vaccination decisions when regret is increased by the decision-making context; that is, when information highlighting vaccination effectiveness and a low likelihood of adverse responses is provided. ***Conclusion:*** Prevention-focused self-regulation is related to a greater likelihood of engaging in health-protective behavior. This can be explained by prevention-focused individuals' greater tendency to anticipate regret about getting ill as a consequence of not adopting protective measures. If people perceive a protective measure such as a vaccination as highly effective, anticipated regret for not adopting it is generally increased, and individual differences in regulatory focus no longer predict the decision.

Keywords: self-regulation, regulatory focus, anticipated regret, protective health behavior, vaccination

Self-Regulation and Protective Health Behavior: How Regulatory Focus and Anticipated Regret Are Related to Vaccination Decisions

In order to promote protective health behavior, it is important to examine which factors influence such behavior. Previous research has shown that, for example, perceived risk of illness, perceived efficacy of a specific behavior, and self-efficacy are important predictors of health-protective behavior (e.g., Schwarzer, 1998, 1999; Schwarzer & Renner, 2000; Weinstein, 1983). Apart from such cognitive factors, health-related decisions are also influenced by anticipated negative emotions concerning the possible consequences of (nonprotective) behavior (e.g., Nelissen, de Vet, & Zeelenberg, 2011). The anticipation of specific emotions such as worry and regret has been found to be an even stronger predictor of protective health behavior than the perceived likelihood and perceived severity of the illness (Chapman & Coups, 2006; Li et al., 2012; Weinstein et al., 2007).

In previous research, less attention has been paid to individual personality-related factors—especially motivational orientations. There is some evidence, though, that a motivational orientation primarily concerned with security-related goals and strategies that help people to pursue goals vigilantly is more strongly related to preventive health care than a motivational orientation primarily concerned with growth-related goals and strategies that help people to pursue goals eagerly (Uskul, Keller, & Oyserman, 2008).

The aim of the present research was to further examine the effect of individual motivational orientations on protective health behavior by examining their effects on a specific behavior: vaccinating. We propose that a motivational orientation that is primarily concerned with security-related goals increases the anticipation of regret for getting a disease in the case of not vaccinating and therefore increases the willingness to vaccinate. However, we suppose that such a motivational orientation will no longer be an important determinant of the number of individuals vaccinated when information illustrating the effectiveness of the vaccination is

communicated and thus induces a similar anticipation of regret in those individuals who do not spontaneously anticipate regret.

Regulatory Focus Theory and Health Decisions

Regulatory focus theory (Higgins, 1997) proposes that individuals can adopt distinct motivational orientations in pursuing a goal: a promotion or a prevention focus. These two orientations determine which outcomes are most relevant for an individual and which strategies people adopt in order to attain goals or make decisions. Which of the two orientations is prevalent in an individual can be determined by a chronic or temporary preference for one or the other orientation. A chronic preference is assumed to develop during socialization (Keller, 2008), whereas a momentary preference can be induced by the situational context or by the characteristics of a decision task (Higgins, 1997).

Promotion-focused individuals are primarily concerned with achieving growth-related goals, hopes, and aspirations. They have a tendency to approach goals by using strategies characterized by eagerness and by trying to attain a match with a desired outcome (e.g., playing sports in order to achieve good health). Prevention-focused individuals are primarily concerned with security-related goals, responsibilities, and obligations. They have a tendency to approach goals by using strategies characterized by vigilance and by trying to avoid a mismatch with a desired outcome (e.g., avoiding the consumption of unhealthy food to maintain good health).

Results from previous studies suggest that prevention-focused individuals should be more likely than less prevention-focused or than promotion-focused individuals to engage in protective health behavior such as vaccinating because a prevention focus is related to a greater sensitivity to negative aspects and pessimistic forecasts and to the implementation of tools to prevent negative outcomes (Florack & Hartmann, 2007; Florack, Ineichen, & Bieri, 2009; Hazlett, Molden, & Sackett, 2011).We propose that there is a specific factor that should lead to protective health behavior in prevention-focused individuals: the anticipation of regret when experiencing an event that could have been avoided by protective behavior.

Anticipated Regret, Motivational Orientations, and Health Decisions

Asking people to imagine the negative emotions they might feel after engaging or not engaging in a specific behavior is a factor that can have a great impact on behavioral intentions in health contexts (Nelissen et al., 2011). In particular, the anticipation of regret about the possible negative consequences of certain behavior can affect health-related decisions. For example, people who anticipate strong regret for getting the flu after not being vaccinated show greater vaccination rates than people who anticipate low or no regret (Chapman & Coups, 2006; Weinstein et al., 2007). So far, several studies have shown that anticipated regret increases people's willingness to vaccinate against influenza or other diseases (Chapman & Coups, 2006; Weinstein et al., 2007; Wroe, Turner, & Salkovskis, 2004; Ziarnowski, Brewer, & Weber, 2008). Also, the effect of anticipated regret in promoting protective health behavior has been shown for a wide range of domains such as exercising, drug and alcohol consumption, smoking, weight loss, and cancer (Abraham & Sheeran, 2004; Connolly & Reb, 2005; Lawton, Conner, & McEachan, 2009; Nelissen et al. 2011; Smerecnik & Ruiter, 2011).

Anticipated regret affects decision behavior because it makes people aware of the possible negative consequences of a decision and elicits the motivation to engage in regret-avoiding behavior (Zeelenberg, Nelissen, Breugelmans, & Pieters, 2008). In previous research, we examined the relation between regret and motivational orientations in the context of life decisions (Florack, Keller, & Palcu, 2013; Leder, Florack, & Keller, 2013). Our results suggest that prevention-focused individuals are generally more inclined to anticipate regret related to duties and responsibilities and to ruminate about decision outcomes. Therefore, it is reasonable to assume that particularly in a context that is highly relevant for prevention-focused individuals—the context of protective health decisions—individuals with a strong prevention focus are more likely to show protective behavior than those with a lower prevention focus. It is also reasonable to assume that this behavior might be driven by anticipated regret. In less prevention-focused individuals, instead, an additional motivation boost provided by externally

activated anticipated regret may be necessary to increase their willingness to engage in health-protective behavior.

The Present Research

Because prevention-focused individuals are more likely to think about negative events that threaten their actual state (e.g., the possibility of getting the flu when winter is approaching) than those with a lower prevention focus, we hypothesized that prevention-focused individuals are particularly concerned with implementing protective health behavior such as vaccinating. Because regret for not succeeding in protecting one's health represents a missed prevention focus goal, we further predicted that individuals with a prevention focus are likely to anticipate such a regret and that the relation between prevention focus strength and protective health behavior is at least partly mediated by the anticipation of regret for not succeeding in protecting one's health. However, we suppose that when regret is salient in the decision context, these individuals with a lower prevention focus can anticipate regret as well. Thus, we propose that differences in regulatory focus will become less important when anticipated regret for not vaccinating is increased in the context of decision making.

It should be noted that we formulated our hypotheses according to high or low prevention focus strength rather than according to a direct comparison between promotion and prevention. Because promotion and prevention represent two different dimensions of self-regulation, in our view, the effects of promotion- and prevention-focused individuals will not necessarily go in opposite directions. In the present paper, our assumptions and the underlying theory were mainly based on one dimension of self-regulation—prevention focus—because this dimension is most relevant to protective health behavior. In this case, formulating hypotheses concerning one dimension is not only in line with the theory (cf. Molden, Lee, & Higgins, 2008), but it also makes an important contribution toward further developing the theory with respect to this dimension. However, we measured and report the results for both dimensions in every study.

We examined our hypotheses in four studies. In Study 1, we assessed the relation between individual differences in prevention focus and vaccination in a large sample. In Studies 2a and 2b, we examined whether the relation between individual differences in prevention focus and vaccination is at least be partly mediated by the anticipation of regret for not vaccinating and getting the disease. In Study 3, we studied the effects of information that was expected to increase anticipated regret specifically in individuals with a lower prevention focus.

Study 1

The aim of this study was to examine whether regulatory focus as a motivational orientation would predict the decision to vaccinate against the flu. We assumed that predominantly prevention-focused individuals have a stronger tendency to vaccinate. This study drew on a large sample of respondents reporting their actual vaccination behavior.

Method

Participants and procedure. This study was based on data from the LISS panel of CentERdata conducted in the Netherlands. The LISS panel (Longitudinal Internet Studies for the Social sciences) consists of 5,000 households comprising 8,000 individuals. The panel is based on a true probability sample of households drawn from the population register by Statistics Netherlands. We used the questions from the health prevention study conducted in August 2010. Only participants who had answered all questions referring to regulatory focus, vaccination decision, gender, and age were included in the analyses. The health prevention study in August 2010 was completed by 3,725 participants. Among those, 3,239 also completed the regulatory focus measure a few months later (in February 2011). From this sample, seven participants were excluded due to missing values on the item assessing vaccination behavior, and 64 were excluded due to missing values (n=2) or conspicuous answering behavior as regards the regulatory focus items (n = 62; for example, participants who answered with 7 on all items resulting in a mean score that was equal to the scale maximum). The inclusion or exclusion of the mentioned participants did not affect the pattern of results reported below. The final sample

included 3,168 people (1,650 women, 1,518 men) with a mean age of 59.76 years (*SD* = 10.76). The questionnaire consisted of several personality and health measures, among those a measure of regulatory focus and an item referring to influenza vaccination behavior.

Measures

Regulatory focus. Regulatory focus was assessed with the regulatory focus measure (RFM; Lockwood, Jordan, & Kunda, 2002). The RFM has been previously applied in the area of health behavior (Lockwood et al., 2005; Murray, Derrick, Leder, & Holmes, 2008; Uskul et al., 2008). The RFM consists of nine items measuring promotion focus strength (e.g., "I frequently imagine how I will achieve my hopes and aspirations") and nine items measuring prevention focus strength (e.g., "I frequently think about how I can prevent failures in my life") with a 7-point response scale ranging from 1 (*completely disagree*) to 7 (*completely agree*). Both the promotion and prevention scales were internally consistent (Cronbach's α = .88 and .84). The two scales were positively correlated (r = .55, p < .01).

Vaccination behavior. Vaccination behavior was assessed with the following item in the LISS panel: "How many times have you had a flu shot in the past 5 years?" (0 = *none*, 1 = *once*, 2 = *twice*, etc.). This item was coded as a binary variable indicating whether participants had received a flu vaccination at least once in the past 5 years or none at all (0 = *none*, 1 = *at least once*).

Results

Of the 3,168 participants, 1,581 (49.9%) were vaccinated at least once in the last five years, whereas 1,587 (50.1%) were not. The relatively high vaccination rate can probably be explained by participants in this sample being over 40 years of age and the fact that the Netherlands have one of the highest vaccination rates among senior citizens in Europe (cf. Mereckiene et al., 2010). Indeed, age and vaccination behavior were positively correlated, r = .50, p < .01.

The relation of motivational orientations to vaccination behavior was tested in logistic regression analyses with promotion and prevention focus as predictors and vaccination behavior as the criterion. Results showed that prevention focus was positively related to being vaccinated at least once in the previous five years, $B = 0.30$, $OR = 1.35$, 95% CI [1.24, 1.47], $p < .001$. Promotion focus, instead, was negatively related to being vaccinated at least once in the previous five years, $B = -0.40$, $OR = 0.67$, 95% CI [.61, .73], $p < .001$. When age and gender were included as predictors in the analyses, age was a significant predictor with older people being more likely to have been vaccinated in the previous five years, $B = 1.28$, $OR = 3.60$, 95% CI [3.25, 3.99], $p < .001$. Both the positive relation of prevention focus and vaccination behavior, $B = 0.20$, $OR = 1.22$, 95% CI [1.11, 1.35], $p < .001$, and the negative relation of promotion focus and vaccination behavior, $B = -0.19$, $OR = 0.83$, 95% CI [.75, .91], $p < .001$, remained significant, indicating that regulatory focus predicts vaccination behavior when age and gender are controlled for.

Discussion

Analyses of data on vaccination behavior from a large sample showed that prevention-focused self-regulation was positively related to vaccinating against the flu, independent of age and gender. Promotion-focused self-regulation, instead, was negatively related to vaccinating against the flu. To our knowledge, this is the first study to show that vaccination behavior is related to regulatory focus.

Study 2a

As previous studies have shown that anticipated regret strongly motivates vaccination and other health-related decisions (e.g., Chapman & Coups, 2006), we aimed to further examine the role of anticipated regret in the relation between regulatory focus and vaccination behavior. Specifically, we assumed that the greater tendency of prevention-focused individuals to get vaccinated found in Study 1 could be explained by their general tendency to anticipate regret for negative consequences of an omitted vaccination. To test our hypothesis, we conducted a study

about a flu vaccine. We assessed regulatory focus, anticipation of regret, and the intention to vaccinate.

Method

Participants and procedure. One hundred fifty-one adults (99 women, 52 men) with a mean age of 39.71 (*SD* = 12.90) participated in this study. Participants were recruited via a German online panel, and the study was conducted online in February 2011. The online panel consists of participants recruited via a website of a German university. Nine participants who had indicated allergies or other diseases (*n* = 2), side effects from previous flu vaccines (*n* = 3), or needle phobia (*n* = 4) were excluded from the analysis, leaving a final sample of 142 participants.

After completing the regulatory focus scale, participants read a text about seasonal influenza and the influenza vaccine, providing them with information about influenza symptoms, possible side effects of the vaccine, as well as the probabilities of getting influenza and suffering adverse effects from the vaccine. Information given in the texts was taken from the webpage of the Robert Koch Institut (RKI)—the German central federal institution responsible for disease control and prevention—and was presented as factual information concerning influenza and the vaccine. Participants then indicated their anticipated regret and their vaccination decision. Finally, participants assessed the severity of the flu and evaluated the vaccine.

Measures

Regulatory focus. In this study, chronic regulatory focus was assessed with the chronic regulatory focus concerns measure (CRFC; Keller & Bless, 2008). The CRFC consists of nine items measuring promotion focus strength (e.g., "When I reach a goal that I have been working toward for a long time, I experience a state of euphoria") and nine items measuring prevention focus strength (e.g., "My life is often shaped by fear of failure and negative events"). The scale ranged from 1 (*completely disagree*) to 7 (*completely agree*). Both the promotion and the

prevention scales were internally consistent (Cronbach's α = .85 and .88). Promotion and prevention focus were not significantly correlated (r = .10, p = .229).

Vaccination decision. Participants indicated their decision to vaccinate: "Now please imagine again that you are facing the decision to get a flu vaccine. Which option would you choose?" The response was presented as a real decision: "I would not get vaccinated" (= 0), and "I would get vaccinated" (= 1).

Anticipated regret. We used three measures for the anticipation of regret. First, we measured the strength of anticipated regret for vaccinating and suffering adverse effects vs. not vaccinating and getting the disease on 11-point bipolar scale to assess which of the two options caused participants to anticipate more regret. Midpoint of the bipolar scales was 0. On the left, 5 indicated regret for not vaccinating ("I did not vaccinate and got the flu"), and, on the right, 5 indicated regret for vaccinating ("I got vaccinated and suffered adverse effects"). We applied the scale to four items ("I would regret my decision if …," "I would be more upset with myself if …," "I would be more likely to think that my decision was wrong if…," "I would be more likely to want to undo my decision if…"). The items were averaged into a single scale that we refer to as the *bipolar measure of anticipated regret* for vaccinating and suffering adverse effects or not vaccinating and getting the disease (Cronbach's α = .91). High values indicate regret for vaccinating and suffering adverse effects. In addition, participants indicated anticipated *regret for not vaccinating and getting the flu*, and anticipated *regret for vaccinating and nevertheless getting the flu* in the coming winter (cf. Chapman & Coups, 2006). The items read "Please imagine that you *do not get* a flu shot for the coming winter and then you get the flu—how much would you regret this?" and "Please imagine that you *get* a flu shot for the coming winter and then get the flu anyway—how much would you regret this?" (1 = *not much at all*, 7 = *very much*). The bipolar measure was assessed before the decision and the other two measures after the decision.

Perceived severity of the flu and evaluation of the vaccine. Finally, participants indicated their perceived severity of the flu (three items: "dangerous," "serious," "not grievous"; 1 = *not at all*, 9 = *very much*; Cronbach's α = .69), and the evaluation of the "safety" ("dangerous", "safe protection"; 1 = *not at all*, 9 = *very much;* Cronbach's α = .61), and the "necessity" ("important" and "unnecessary"; Cronbach's α = .74) of the vaccine.

Statistical procedures and analyses. In order to test our mediation hypothesis, which proposed that anticipated regret for not vaccinating mediates prevention-focused individuals' tendency to vaccinate, we relied on the widely used procedure suggested by Baron and Kenny (1986). First (path c), we tested for a relation between the predictor (prevention focus) and the criterion (vaccination decision). Second (path a), we tested the relation between the predictor and mediator (anticipated regret). Third (path b), we tested the relation between the mediator and criterion. Fourth (path c'), we tested whether the relation between the predictor and criterion would be reduced when adding the mediator to the model. In addition, further analyses were run using the PROCESS procedure for SPSS developed by Hayes (Preacher & Hayes, 2004; Hayes, 2013). This approach is based on estimating percentile-based bootstrap confidence intervals around the indirect effect. The analysis shows a CI for the indirect effect, and mediation is considered significant if the CI does not include zero. The same procedure was also followed in Studies 2b and 3. Also, a variation of this procedure was used for the simple slope tests in Study 3.

Results

Preliminary analyses. Forty participants out of 142 (28.2%) indicated that they would vaccinate if they had to make that decision, and 102 participants (71.8%) indicated that they would not vaccinate. These percentages correspond to average influenza vaccination rates in Germany (Robert Koch Institut, 2011). Prevention focus was positively related to regret for not vaccinating and getting the flu, $r = .24$, $p = .004$, and the vaccination decision, $r = .19$, $p = .025$, and promotion focus was positively related to perceived severity of the flu, $r = .19$, $p = .026$.

Neither promotion nor prevention focus was significantly related to the other regret measures or to the other variables (see Table 1).

Regulatory focus and vaccination decision. We examined the effect of regulatory focus on the decision to vaccinate by running a logistic regression analysis with promotion and prevention focus as predictors and the decision of whether to vaccinate or not as the criterion. The analysis revealed a significant effect of prevention focus, B = 0.40, OR = 1.49, 95% CI [1.01, 2.19], p = .043, showing that prevention focus was related to the willingness to vaccinate (see Table 2). A second analysis that also included perceived severity of the flu, evaluation of the vaccine (safety and necessity), age, and gender as predictors confirmed the effect of prevention focus, B = 0.74, OR = 2.09, 95% CI [1.10, 3.95], p = .024, and also showed a significant effect of the evaluation of the vaccine for both safety, B = .90, OR = 2.47, 95% CI [1.17, 5.21], p < .001, and necessity, B = 1.66, OR = 5.29, 95% CI [2.27, 12.31], p < .001. This indicates that evaluating the vaccine as safe and necessary is related to an increased willingness to vaccinate and also suggests that the effect of prevention focus strength is independent of the evaluation of the vaccine. Promotion focus strength did not contribute to the prediction of the vaccination decision in the regression models (see Table 2).

Mediation by anticipated regret for not vaccinating and getting the flu. In addition, we tested whether the correlation between prevention focus and the vaccination decision was mediated by the anticipation of regret for not vaccinating in the case of getting the flu (Baron & Kenny, 1986). As already reported above, prevention focus strength was positively correlated with anticipated regret for not vaccinating in the case of getting the flu (path a) and with the vaccination decision (path c). Anticipated regret for not vaccinating and getting the flu was also correlated with the vaccination decision, B = 1.86, OR = 6.44, 95% CI [3.61, 11.51], p < .001 (path b). Furthermore, a logistic regression with promotion focus, prevention focus, and anticipated regret for not vaccinating as predictors and the vaccination decision as the criterion showed a significant effect of anticipated regret for not vaccinating, B = 1.83, OR = 6.21, 95%

CI [3.46, 11.14], $p < .001$, whereas the effect of prevention focus was no longer significant, $B = .17$, $OR = 1.18$ 95% CI [0.69, 2.02], $p = .535$ (path c'). This result held also when perceived severity of the flu, evaluation of the vaccine (safety and necessity), age, and gender were added as predictors (see Table 2).

A test of mediation was conducted by applying the above-mentioned approach recommended by Preacher and Hayes (2004). The test was performed with 1,000 bootstrap resamples and a 95% CI, including promotion and prevention focus as predictors, anticipated regret for not vaccinating as the mediator variable, and vaccination decision as the criterion. The CI for the indirect effect of anticipated regret for not vaccinating ranged from 0.10 to 0.75, $B = .41$; $p < .05$, and did not include zero. Thus, the analysis supported the hypothesis that the anticipation of regret for not vaccinating and getting the flu mediated the effect of prevention focus on the vaccination decision.

Discussion

The results of Study 2a showed that prevention focus strength and anticipated regret for not vaccinating in the case of getting the flu were correlated with the decision to vaccinate against influenza, and, importantly, that anticipated regret for not vaccinating mediated the correlation between prevention focus strength and the vaccination decision. However, prevention focus strength was not correlated with anticipated regret for vaccinating and getting the flu or with the bipolar measure directly comparing anticipated regret for not vaccinating and getting the flu and anticipated regret for vaccinating and suffering from adverse effects. Perhaps we did not find a relation between prevention focus strength and anticipated regret for vaccinating and getting the flu because prevention-focused people may be particularly motivated to try to avoid a negative experience and may not even consider the possibility that a tool designed to help them avoid this negative experience (the vaccination) might sometimes fail. Furthermore, the bipolar measure contrasts two negative experiences that might occur: suffering from the flu versus

suffering from adverse effects. When presented explicitly in this way, both negative effects may be relevant for prevention-focused individuals.

Study 2b

A limitation of Study 2a is that we did not vary whether anticipated regret for not vaccinating and getting the flu was measured before or after the decision. Therefore, we conducted Study 2b to examine whether the effects observed in Study 2a would be stable if the order of the questions used to assess the decision and anticipated regret was counterbalanced.

Method

Participants and procedure. One hundred ninety-four adults (104 women, 90 men) with a mean age of 41.72 (*SD* = 11.01) participated in this study. The study was conducted online in January 2012, and participants were recruited by a German survey research institute. The institute provides participants for online surveys by selecting them from a large panel based on specific criteria such as age and gender. Participants are paid for taking part in the surveys. Nine participants who had indicated allergies or other diseases ($n = 2$), side effects from previous flu vaccines ($n = 4$), or needle phobia ($n = 3$) as reasons for or against vaccinating were excluded from the analyses, leaving a final sample of 185 participants.

After assessing chronic regulatory focus, participants read the same informative text about the flu and the flu vaccine as in Study 2a. In one condition, participants indicated their intention to vaccinate immediately after reading the text and then reported their anticipated regret. In the other condition, the order of the questions that referred to the decision and regret was reversed. Participants were randomly assigned to the two conditions.

Measures

Regulatory focus. As in Study 2a, regulatory focus was assessed by the chronic regulatory focus concerns measure (Keller & Bless, 2008; Cronbach's α: prevention = .90; promotion = .86). Promotion and prevention focus were positively correlated ($r = .32$, $p < .01$).

Anticipated regret and vaccination decision. We assessed *anticipated regret for not vaccinating and getting the flu*, and *anticipated regret for vaccinating and nevertheless getting the flu* with two separate items as in Study 2a (1 = *not at all*, 7 = *very much*). Furthermore, participants indicated their decision to vaccinate or not (vaccinate: 0 = *I would not get vaccinated,* 1 = *I would get vaccinated*), and if they had had the flu in the present winter (0 = *no,* 1 = *yes*), as well as if they had had a flu vaccination in the present winter (0 = *no,* 1 = *yes*).

Results

Preliminary analyses. Overall, 72 participants out of 185 (38.9%) indicated that they would vaccinate if they had to make that decision, and 113 participants (61.1%) indicated that they would not vaccinate. Further, 39 participants out of 185 (21.1%) indicated that they actually had gotten a flu shot in the present winter, and 146 participants (78.9%) indicated that they had not gotten one. The correlations between all measures are depicted in Table 3. Prevention focus was positively related to regret for not vaccinating and getting the flu, $r = .30$, $p < .001$, as well as to the vaccination decision, $r = .15$, $p = .038$. Promotion focus was positively related to regret for not vaccinating and getting the flu and to regret for vaccinating and nevertheless getting the flu, $r = .14$, $p = .049$, and $r = .15$, $p = .036$.

Regulatory focus and vaccination decision. We examined the effect of regulatory focus on the intention to vaccinate by running a logistic regression analysis with promotion and prevention focus as predictors and the decision of whether to vaccinate or not as the criterion. The analysis revealed a significant effect of prevention focus, $B = 0.38$, $OR = 1.46$, 95% CI [1.05, 2.02], $p = .023$. When the order of the presentation of the regret and decision questions was included in the regression equation, the effect of prevention focus on the vaccination decision remained significant, $B = 0.36$, $OR = 1.43$, 95% CI [1.03, 1.99], $p = .031$. Also, further including the interaction between the regulatory focus measures and the order of the regret and decision questions did not change the results (see Table 4).

Mediation by anticipated regret for not vaccinating and getting the flu. In addition, we tested whether the correlation between prevention focus and the vaccination decision would be mediated by the anticipation of regret for not vaccinating in the case of getting the flu (Baron & Kenny, 1986). As already reported above, prevention focus strength was positively correlated with anticipation of regret for not vaccinating in the case of getting the flu (path a) and with the vaccination decision (path c). Anticipated regret for not vaccinating and getting the flu was also correlated with the vaccination decision, B = 1.61, OR = 5.01, 95% CI [3.22, 7.77], $p < .001$ (path b). Furthermore, a logistic regression with promotion focus, preventions focus, and anticipated regret for not vaccinating as predictors and the decision to vaccinate as the criterion showed a significant effect of anticipated regret for not vaccinating, B = 1.73, OR = 5.62, 95% CI [3.47, 9.09], $p < .001$ (path b), whereas the effect of prevention focus was no longer significant, B = 0.01, OR = 1.01, 95% CI [0.65, 1.57], p = .966 (path c'; see Table 4). Again, including the order of the presentation of the decision and regret questions did not affect the results. Neither the main effect of order, B = -0.31, OR = 0.73, 95% CI [0.34, 1.59], p = .428, nor the interactions were significant, B = 0.38, OR = 1.46, 95% CI [0.63, 3.40], p = .38, for the interaction between order and promotion focus, and B = -0.09, OR = 0.92 95% CI [0.38, 2.20], p = .84, for the interaction between order and prevention focus. As in Study 2a, a test of mediation was conducted by applying the approach recommended by Preacher and Hayes (2004). The test was performed with 1,000 bootstrap resamples and a 95% CI, including promotion and prevention focus as predictors, anticipated regret for not vaccinating as the mediator variable, and the vaccination decision as the criterion. The CI for the indirect effect of anticipated regret for not vaccinating ranged from 0.17 to 0.81, B = .48; $p < .01$, and did not include zero. Thus, the analysis supported the hypothesis that the anticipation of regret for not vaccinating and getting the flu mediated the effect of prevention focus on the vaccination decision.

Discussion

The results of Study 2b are congruent with the results of Study 2a. Again, prevention focus strength and anticipated regret for not vaccinating and getting the flu were positively correlated with the vaccination decision. Importantly, the correlation between prevention focus strength and the vaccination decision was mediated by anticipated regret for not vaccinating and getting the flu. As in Study 2a, prevention focus strength was not correlated with anticipated regret for vaccinating and getting the flu. The order of reporting anticipated regret before or after the decision did not affect these findings.

Study 3

The previous studies consistently showed that prevention focus strength was related to vaccinating and that the inclination of prevention-focused individuals to anticipate regret was at least partly responsible for this effect. An important question is whether providing information about the vaccine's characteristics can elevate anticipated regret in individuals with a lower prevention focus and mitigate the differences between individuals with a high and low prevention focus. Based on decision justification theory (Connolly & Zeelenberg, 2002), we proposed that information about the effectiveness of a vaccine would fulfill this function and would lead to an increased anticipation of regret and increased vaccination rates in individuals with a lower prevention focus.

Researchers have repeatedly argued (Connolly & Zeelenberg, 2002; Reb & Connolly, 2010) that the intensity of anticipated regret is influenced by the justifiability of the decision in the case of a bad outcome. Decision justification theory (Connolly & Zeelenberg, 2002) proposes that the intensity of anticipated regret for a decision (e.g., not vaccinating) increases when the decision is not based on reasons that are able to adequately justify the decision and when self-blame is likely in the case of a bad outcome. An effective way of increasing the justification in this sense is to inform the decision maker that a vaccine has been extensively tested, resulting in a strong protective effect and a low likelihood of adverse effects. Indeed, it is more difficult to justify not vaccinating when the vaccine is effective.

We assumed that an increase in anticipated regret as a consequence of being informed about the effectiveness of the vaccine would be more likely for individuals with a low prevention focus strength who usually do not anticipate regret, whereas individuals with a high prevention focus strength tend to anticipate regret for not protecting themselves with a vaccination anyway. Indeed, research has provided similar asymmetric effects in other areas. For example, Herzenstein, Posavac and Brakus, (2007) found that the salience of risk affected prevention-focused individuals less than other individuals because prevention-focused individuals take risk factors into account even when these factors are not explicitly emphasized.

To test our hypotheses, we provided participants with a scenario about an EHEC vaccine and varied the information about the effectiveness of the vaccine. Furthermore, we measured regulatory focus and anticipated regret. The EHEC disease is a serious infection associated with severe complications. Symptoms of the diseases caused by the bacterium enterohaemorrhagic E. coli (EHEC) include abdominal cramps and diarrhea. In serious incidents, the infection may lead to a life-threatening disease (World Health Organization, 2011). The spread of the disease was being discussed in the media when the study was conducted.

Method

Participants and procedure. Two hundred eight adults (104 women, 104 men) with a mean age of 46.50 (*SD* = 13.30) participated in this study. Two participants who had indicated allergies as a reason for not vaccinating were excluded from the analysis, leaving a final sample of 206 participants. The study was conducted online in June 2011 shortly after an EHEC breakout in Germany (see Robert Koch Institut, 2012). Participants were recruited by the same German survey research institute as in Study 2b. After assessing chronic regulatory focus, participants read an informative text about EHEC and a fictitious vaccine against it. Afterwards, they indicated their anticipated regret and their vaccination decision.

Effectiveness of the vaccine (manipulation). Participants were randomly assigned to read one of two different versions of the text. One version described the vaccine as extensively

tested and stated that its protection against the disease was high and adverse effects were unlikely (*high effectiveness condition*); the other version mentioned that the vaccine had been authorized due to the recent EHEC breakout and that little was known about its effectiveness and potential adverse effects (*unknown effectiveness condition*). For ethical reasons, before reading the text about EHEC, participants were informed that they were about to read a hypothetical scenario and that there was actually no vaccine against EHEC. After reading this information, all participants gave their informed consent and declared that they had read and understood that no vaccine against EHEC actually existed.

Measures

Regulatory focus. As in Study 2b, regulatory focus was assessed with the chronic regulatory focus concerns measure (Keller & Bless, 2008; Cronbach's α: prevention = .90; promotion = .86). Promotion and prevention focus were positively correlated ($r = .19$, $p < .01$).

Anticipated regret and vaccination decision. We assessed *anticipated regret for not vaccinating and getting EHEC*, and *anticipated regret for vaccinating and nevertheless getting EHEC* with two separate items as in the previous studies by applying an 11-point scale (1 = *not at all*, 11 = *very much*), and also applied the bi-polar measure as in Study 2a. Furthermore, participants indicated their decision to vaccinate or not (vaccinate: 0 = *I would not get vaccinated,* 1 = *I would get vaccinated*).

Severity of the disease and evaluation of the vaccine. In addition, participants reported their perceived severity of EHEC ("dangerous," "serious," "not grievous"; scale end-points 1 = *not at all*, 9 = *very much*; Cronbach's α = .61), the evaluation of the "safety" ("dangerous", "safe protection"; 1 = *not at all*, 9 = *very much;* Cronbach's α = .55), and the "necessity" ("important" and "unnecessary"; 1 = *not at all*, 9 = *very much;* Cronbach's α = .72) of the vaccine.

Results

To prepare the data for the regression analyses (cf. Aiken & West, 1991), we mean-centered all continuous variables. In addition, we effect-coded the experimental manipulation of the effectiveness of the vaccine (-1 = unknown effectiveness, 1 = high effectiveness).

Preliminary analyses. Overall, 87 participants out of 206 (42.0%) indicated that they would get vaccinated if they had to make that decision, and 119 participants (58.0%) indicated that they would not get vaccinated. The correlations between the applied measures are depicted in Table 5. Both prevention and promotion focus were positively related to regret for not vaccinating and getting EHEC (prevention: $r = .29$, $p < .001$; promotion: $r = .17$, $p = .014$) and to the perceived severity of EHEC (prevention: $r = .13$, $p = .062$; promotion: $r = .14$, $p = .045$). As in the previous studies, prevention focus was also positively related to the decision to vaccinate, $r = .15$, $p = .028$. Prevention and promotion were not related to the other measures of anticipated regret and other variables (see Table 5).

Effects of effectiveness and regulatory focus on the evaluation of the vaccine (manipulation check). We computed multiple regression analyses with the effectiveness of the vaccine as a predictor and the evaluation of the vaccine – safety and necessity – as the criterion. We found that the effectiveness manipulation successfully affected the evaluation of the vaccine for both safety, $\beta = .25$, $t(204) = 3.63$, $p < .001$, and necessity, $\beta = .12$, $t(204) = 1.75$, $p = .082$. Participants evaluated the vaccine to be safer and more necessary in the high compared to the unknown effectiveness condition. Further, when adding regulatory focus and the interaction of the effectiveness manipulation and regulatory focus as predictors, the interaction between prevention focus strength and effectiveness of the vaccine was significant for necessity, $\beta = -.16$, $t(200) = -2.27$, $p = .024$. An inspection of the slopes at 1 *SD* above and below the mean revealed that individuals with low prevention focus strength evaluated the vaccine as more necessary in the high effectiveness condition in comparison with the low effectiveness condition, $\beta = .71$, $t(201) = 2.86$, $p = .005$. Those with high prevention focus strength, instead, evaluated the vaccine as equally necessary in both conditions, $\beta = -.11$, $t(201) = -.42$, $p = .672$. All other main effects

and interactions were not significant, *p*s > .214. The interaction between prevention focus strength and effectiveness of the vaccine was not significant for safety, β = -.08, $t(200) = -1.17$, $p = .243$. Nevertheless, separate regression analyses for the high and low effectiveness conditions with promotion and prevention focus strength as predictors showed that the effect of prevention focus strength on safety approached significance in the low effectiveness condition, β = .18, $t(100) = 1.79$, $p = .076$, but was not significant in the high effectiveness condition, β = .01, $t(100) = 0.07$, $p = .945$.

In line with our assumptions, this shows that the manipulation generally affected the perceived safety of the vaccine and that this effect was in part stronger for participants with low prevention focus strength. Further, the manipulation particularly affected the perceived necessity of vaccination for participants with low prevention focus strength. This is noteworthy, since the description of the vaccine as safe protection was quite explicit in the high compared to the low effectiveness condition, whereas neither of the conditions directly referred to the necessity of vaccinating.

Effects of effectiveness and regulatory focus on anticipated regret for not vaccinating. Based on the results of Studies 2a and 2b, we hypothesized that prevention focus strength would predict the anticipation of regret for not vaccinating and getting the disease. However, we also supposed that the explicit description of the vaccination as effective would increase the anticipation of regret for not vaccinating in the case of getting the disease in individuals who usually do not anticipate regret for not vaccinating (individuals with low prevention focus strength). To examine our hypotheses, we first computed multiple regression analyses with the effectiveness of the vaccine, regulatory focus, and the interaction of the two variables as predictors and anticipated regret for not vaccinating and getting the disease as the criterion. In line with the results of Studies 2a and 2b, we found that prevention focus strength predicted anticipated regret for not vaccinating and getting the disease, β = .26, $t(200) = 3.77$, $p < .001$. Furthermore, the interaction between prevention focus strength and effectiveness of the

vaccine approached significance, β = -.13, $t(200) = -1.93$, $p = .055$. An inspection of the slopes at 1 *SD* above and below the mean presented in Figure 1 revealed that for individuals with low prevention focus strength, the level of anticipated regret for not vaccinating was higher in the high effectiveness condition in comparison with the low effectiveness condition, β = .85, $t(201) = 2.98$, $p = .003$. For those with high prevention focus strength, instead, the level of anticipated regret for not vaccinating was equally high in both conditions, β = .01, $t(201) = 0.02$, $p = .984$. All other main effects and interactions were not significant, ps > .094. This shows that the anticipation of regret was high for participants with high prevention focus strength even when the effectiveness of the vaccine was unknown. The additional information about the effectiveness did not further strengthen the anticipation of regret in these individuals and enhanced it for those with low prevention focus strength to a level that no longer significantly differed from individuals with high prevention focus strength, β = .12, $t(100) = 1.22$, $p = .224$. The differences between high and low prevention focus strength were accentuated when the effectiveness of the vaccine was unknown, β = .40, $t(100) = 4.33$, $p < .001$.

Effects of effectiveness and regulatory focus on the vaccination decision. We also tested the effects of the effectiveness of the vaccine and regulatory focus on the vaccination decision. In detail, we computed a logistic regression analysis with the effectiveness of the vaccine, regulatory focus, and the interaction of the two variables as predictors and the vaccination decision as the criterion. In line with the results of Studies 2a and 2b, we found an effect of prevention focus strength on the vaccination decision, $B = 0.35$, $OR = 1.42$, 95% CI [1.04, 1.92], $p = .026$. In addition, we observed a main effect of the effectiveness of the vaccine on the vaccination decision, $B = 0.39$, $OR = 1.45$, 95% CI [1.10, 1.98], $p = .009$. The willingness to vaccinate increased with an increase in prevention focus, and in the high effectiveness condition, the willingness to vaccinate was higher (50% of the participants decided to vaccinate) than in the low effectiveness condition (34% of participants decided to vaccinate). All other main effects and interactions were not significant, ps > .320. Although the interaction between

prevention focus strength and the effectiveness manipulation was not significant, B = -0.15, OR = 0.86, 95% CI [0.63, 1.16], p = .320, separate logistic regression analyses for the high and low effectiveness conditions with promotion and prevention focus strength as predictors showed that the prediction of the vaccination decision by prevention focus strength was significant in the low effectiveness condition, B = 0.50, OR = 1.66, 95% CI [1.07, 2.56], p = .023, but not in the high effectiveness condition, B = 0.19, OR = 1.21, 95% CI [0.79, 1.87], p = .380. In none of the conditions did promotion focus strength predict the vaccination decision, ps > .460.

Anticipation of regret for not vaccinating as a mediator of regulatory focus effects on the vaccination decision. Based on the results of Studies 2a and 2b, we hypothesized that prevention focus strength would predict the anticipation of regret for not vaccinating and the vaccination decision and that the effect of prevention focus strength on the vaccination decision would be mediated by the anticipation of regret for not vaccinating. We also assumed that this effect would occur only in the unknown effectiveness condition. Indeed, as reported above, there was no significant effect of prevention focus strength on the vaccination decision in the high effectiveness condition. Hence, in this condition, mediation was not possible.

In the unknown effectiveness condition, the basic requirements for a mediation to occur were fulfilled. As reported above, we observed a significant effect of prevention focus strength on anticipated regret for not vaccinating in the case of getting the disease (path a) and on the decision to vaccinate (path c). Furthermore, anticipated regret for not vaccinating and getting the disease was positively correlated with the vaccination decision, B = 1.66, OR = 5.27, 95% CI [2.63, 10.55], p < .001 (path b). The prediction of the vaccination decision by prevention focus strength was no longer significant when anticipated regret for not vaccinating was included in the regression equation (path c'), B = 0.06, OR = 1.06, 95% CI [0.62, 1.80], p = .833, whereas anticipated regret for not vaccinating was a significant predictor, B = 1.83, OR = 6.22, 95% CI [2.77, 13.96], p < .001. Again, a test of the mediation was conducted applying the approach recommended by Preacher and Hayes (2004). With 1,000 bootstrap resamples, the CI ranged

from 0.26 to 1.31, $B = .69$ $p < .01$, and did not include zero. The analysis supports the hypothesis that the anticipation of regret for not vaccinating and getting EHEC mediated the effect of prevention focus on the vaccination decision.

Discussion

In Study 3, we again found that prevention focus strength predicted a vaccination decision; in this case, for a vaccination for a different disease than in the previous studies. When the vaccination was described as being officially approved but in an early phase of application, prevention focus strength was correlated with the anticipation of regret for not vaccinating and with a high willingness to vaccinate. In this condition, the prediction of the vaccination decision was mediated by the anticipation of regret. When the effectiveness of the vaccination was described as highly effective and having a low likelihood of adverse effects, prevention focus strength was not correlated with anticipated regret. Indeed, the data suggest that the description of the vaccine as highly effective increased the anticipation of regret for not vaccinating in the case of getting the disease and in particular for individuals low in prevention focus, who were less likely to spontaneously anticipate such regret when no effectiveness information was available. For individuals low in prevention focus, this increment in anticipated regret then increased the willingness to vaccinate to a level that is typical for individuals high in prevention focus.

It should be mentioned that a limitation of this study is that, for ethical reasons, we had to inform participants at the beginning that the vaccine was fictitious. This may have influenced the emotions and cognitions involved in their decision. On the other hand, due to the EHEC breakout and the strong presence of the topic in the media at the time of data collection, involvement in the topic per se can be assumed to have been quite high. This probably contributed to participants being able to imagine themselves in the position of making this decision with emotional involvement.

General Discussion and Conclusions

The present research examined the influence of regulatory focus and anticipated regret on protective health behavior. We examined the role of regulatory focus and anticipated regret with regard to an influenza vaccine (Studies 1, 2a, 2b) and a fictitious EHEC vaccine during an EHEC breakout (Study 3). In line with our predictions, across a large sample (Study 1) and three other broad samples (Studies 2a, 2b, and 3), we found that prevention-focused individuals are more likely to vaccinate than individuals with a lower prevention focus. Furthermore, we consistently found (Studies 2a, 2b, and 3) that the anticipation of regret for not vaccinating and getting the disease mediated the effects of prevention focus strength on vaccination behavior. In addition, Study 3 showed that describing a vaccine as effective and as having a low likelihood of adverse effects increased anticipated regret for not vaccinating in individuals with a reduced prevention focus to a level that was found in individuals with a strong prevention focus. Thus, when the vaccine was described as very effective and having low adverse effects, differences in chronic prevention focus strength were no longer significant predictors of the evaluation of the vaccine – particularly as far as the perceived necessity of vaccinating is concerned – and vaccination behavior. Interestingly, just providing information about a disease as was done in Studies 2a and 2b is not sufficient to eliminate the differences between individuals high and low in prevention focus. The results of the present research imply that indeed information about the vaccine that reduces the justifiability for not vaccinating leads to equal vaccination intentions in individuals high and low in prevention focus, but not information about the disease alone.

Based on recent research that has shown that prevention-focused self-regulation is linked to pessimistic forecasts (Hazlett et al., 2011), we argue that individuals with a chronic inclination for prevention-focused self-regulation should be more likely to apply means to avoid negative events with the goal of protecting their health and well-being. The action of vaccinating is a means for protecting one's health and maintaining positive well-being. The results of the present studies support our reasoning and are in line with research that has shown that a prevention focus

predicts the maintenance of protective behavior in smoking and weight loss interventions (Fuglestad, Rothman, & Jeffery, 2008).

More importantly, the present studies reveal insights into the process that drives the protective health behavior of prevention-focused individuals. Obviously, prevention-focused individuals anticipate more regret for not vaccinating than those with a lower prevention focus. Recent research has shown that prevention-focused individuals are likely to anticipate regret related to duties and responsibilities (Leder et al., 2013). The present studies extend this line of research by demonstrating that this inclination to anticipate regret leads to actions to protect health. In concert with findings by Chapman and Coups (2006), the present studies point to the importance of anticipated regret as a main driver of health decisions. As we did in the present studies, Chapman and Coups found that vaccination decisions are correlated with anticipated regret. However, Chapman and Coups did not examine the effects of regulatory focus in their research.

The main contribution of the present paper is the finding that anticipated regret is a mediator between prevention focus strength and a vaccination decision. However, we also showed that it is necessary to distinguish between different kinds of regret. While prevention focus strength correlated with regret for not vaccinating, prevention focus strength and anticipated regret for vaccinating and getting the respective disease were not correlated. Obviously, for prevention-focused individuals, regret for the omission of a preventative action is more important than regret for the commission of a preventative action with failed effects. This implication of the present studies fits the concept of regulatory focus well (Higgins, 1997). Moreover, it extends previous research that found stronger *regret for actions* than for inactions in prevention-focused individuals (Roese, Hur, & Pennington, 1999). The current data suggest that prevention-focused individuals anticipate strong *regret for inaction* (in this case, not vaccinating) when taking action would have served the basic strategy of a prevention focus to protect their

current state of well-being. Hence, the link between regret for action and prevention focus strength is less general than might be expected on previous research.

In addition, an important contribution of the current research is that the difference in vaccination behavior between individuals high and low in prevention focus can be decreased when a high degree of effectiveness of the vaccine is communicated in the context of the vaccination decision. We found that such a communication increases anticipated regret for not vaccinating and getting the disease in particular for those individuals with a low prevention focus strength who usually anticipate a lower level of regret for not vaccinating. This finding has important implications for health communication practices. It implies that it is of high importance to stress the effectiveness of a vaccine when there is scientific evidence supporting it. In line with decision justification theory (Connolly & Zeelenberg, 2002), we propose that other kinds of communication that enhance the justifiability of vaccinating and reduce the justifiability of not vaccinating increase the willingness to vaccinate as well. For example, such communication might also be applied in the context of childhood immunizations when parents have to make decisions for their children. Future research should further examine the effects of this kind of communication for different types of protective health behavior. Because regret for not succeeding in protecting one's health represents a missed prevention focus goal, we suppose that the relation between prevention focus strength and protective health behavior is mediated by the anticipation of regret for not succeeding in protecting one's health in several different health domains.

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Table 1

Study 2a: Descriptives and Bivariate Correlations

	M	*SD*	2	3	4	5	6	7	8	9
1 Promotion	5.24	0.88	.10	.11	-.06	-.02	.19*	.03	.01	.14
2 Prevention	4.20	1.19	-	.24**	.00	.04	.10	-.10	-.03	.19*
3 Anticipated regret for *not* vaccinating and getting the flu	3.16	2.06		-	-.21*	-.60**	.45**	.40**	.68**	.67**
4 Anticipated regret for vaccinating and getting the flu	5.18	2.06			-	.31**	-.17*	-.26**	-.32**	-.34**
5 Bipolar measure of anticipated regret	6.96	2.95				-	-.37**	-.53**	-.61**	-.55**
6 Perceived severity of the flu	5.22	1.84					-	.14	.50**	.35**
7 Evaluation of vaccine (safety)	5.70	1.91						-	.52**	.44**
8 Evaluation of vaccine (necessity)	4.87	2.33							-	.59**
9 Vaccination decision (0 = no, 1 = yes)	.28	.45								-

Note. High values of the bipolar measure of regret indicate anticipation of regret for vaccinating and experiencing adverse effects compared to not vaccinating and getting the disease.

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

Table 2

Predictors of the Vaccination Decision (Study 2a), Results from a Series of Logistic Regression Analyses

	Vaccination decision (0 = no, 1 = yes)							
	B	*OR* (95% CI)	*B*	*OR* (95% CI)	*B*	*OR* (95% CI)	*B*	*OR* (95% CI)
Promotion	0.30	1.34 (0.89, 2.02)	0.35	1.41 (0.82, 2.42)	0.26	1.29 (0.79, 2.11)	0.34	1.41 (0.80, 2.47)
Prevention	0.40*	1.49 (1.01, 2.19)	0.74*	2.09 (1.10, 3.95)	0.17	1.18 (0.69, 2.02)	0.50	1.65 (0.77, 3.57)
Regret for not vaccinating					1.83**	6.21 (3.46, 11.14)	1.53*	4.60 (2.03, 10.39)
Perceived severity flu			0.20	1.23 (0.67, 2.23)			-0.03	1.03 (0.51, 2.08)
Evaluation of vaccine (safety)			0.90*	2.47 (1.17, 5.21)			1.22*	3.38 (1.31, 8.74)
Evaluation of vaccine (necessity)			1.66**	5.29 (2.27, 12.31)			0.90+	2.46 (0.96, 6.35)
Age			-0.40	0.67 (0.36, 1.22)			-0.51	0.60 (0.30, 1.21)
Gender			-0.42	0.66 (0.19, 2.23)			-0.81	0.44 (0.10, 1.91)

+ $p < .07$. * $p < .05$. ** $p < .01$.

Table 3

Descriptives and Bivariate Correlations (Study 2b)

	M	*SD*	2	3	4	5
1 Promotion	5.15	0.90	.32**	.14*	.15*	-.02
2 Prevention	4.00	1.25	-	.30**	-.02	.15*
3 Regret for *not* vaccinating and getting the flu	3.30	2.10		-	-.29**	.62**
4 Regret for vaccinating and getting the flu	4.77	2.21			-	-.38**
5 Vaccination decision (0 = no, 1 = yes)	.39	0.49				-

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

Table 4

Predictors of the Vaccination Decision (Study 2b), Results from a Series of Logistic Regression Analyses

	Vaccination decision (0 = no, 1 = yes)									
	B	*OR* (95% CI)	*B*	*OR* (95% CI)	*B*	*OR* (95% CI)	*B*	*OR* (95% CI)	*B*	*OR* (95% CI)
Promotion	-0.17	0.84 (0.61, 1.16)	-0.17	0.84 (0.61, 1.16)	-0.37*	0.69 (0.45, 1.05)	-0.42*	0.66 (0.44, 0.97)	-0.55*	0.57 (0.34, 0.97)
Prevention	0.38*	1.46 (1.05, 2.02)	0.36*	1.43 (1.03, 1.99)	0.38*	1.47 (0.97, 2.21)	0.01	1.01 (0.65, 1.57)	0.02	1.02 (0.58, 1.78)
Regret for not vaccinating							1.73**	5.62 (3.47, 9.09)	1.71**	5.54 (3.42, 8.97)
Order condition (-1 = decision - regret, 1 = regret - decision)			-0.38	0.68 (0.37, 1.25)	-0.38	0.68 (0.37, 1.26)			-0.31	0.73 (.34, 1.59)
Order Condition x Promotion					0.50	1.66 (0.85, 3.23)			0.38	1.46 (0.63, 3.40)
Order Condition x Prevention					-0.08	0.92 (0.46, 1.82)			-0.09	0.92 (0.38, 2.20)

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

Table 5

Descriptives and Bivariate Correlations (Study 3)

	M	*SD*	2	3	4	5	6	7	8	9
1 Promotion	5.42	0.87	.19**	.17*	-.01	.04	.14*	.06	.09	.07
2 Prevention	3.98	1.22	-	.29**	.10	.12	.13+	.09	.02	.15*
3 Regret for *not* vaccinating and getting EHEC	7.35	3.07		-	-.04	.55**	.41**	.45**	.57**	.59**
4 Regret for vaccinating and nevertheless getting EHEC	7.65	3.38			-	-.21**	-.00	-.23**	-.14*	-.20**
5 Bipolar measure of anticipated regret	7.05	2.86				-	.34**	.51**	.47**	.58**
6 Perceived severity EHEC	8.16	1.93					-	.20**	.49**	.30**
7 Evaluation of vaccine (safety)	6.30	2.20						-	.53**	.52**
8 Evaluation of vaccine (necessity)	7.08	2.54							-	.58**
9 Vaccination decision (0 = no, 1 = yes)	.42	0.49								-

Note. High values of the bipolar measure of regret indicate anticipation of regret for vaccinating and experiencing adverse effects compared with not vaccinating and getting the disease.

+ $p < .05$ (one-tailed). * $p < .05$. ** $p < .01$.

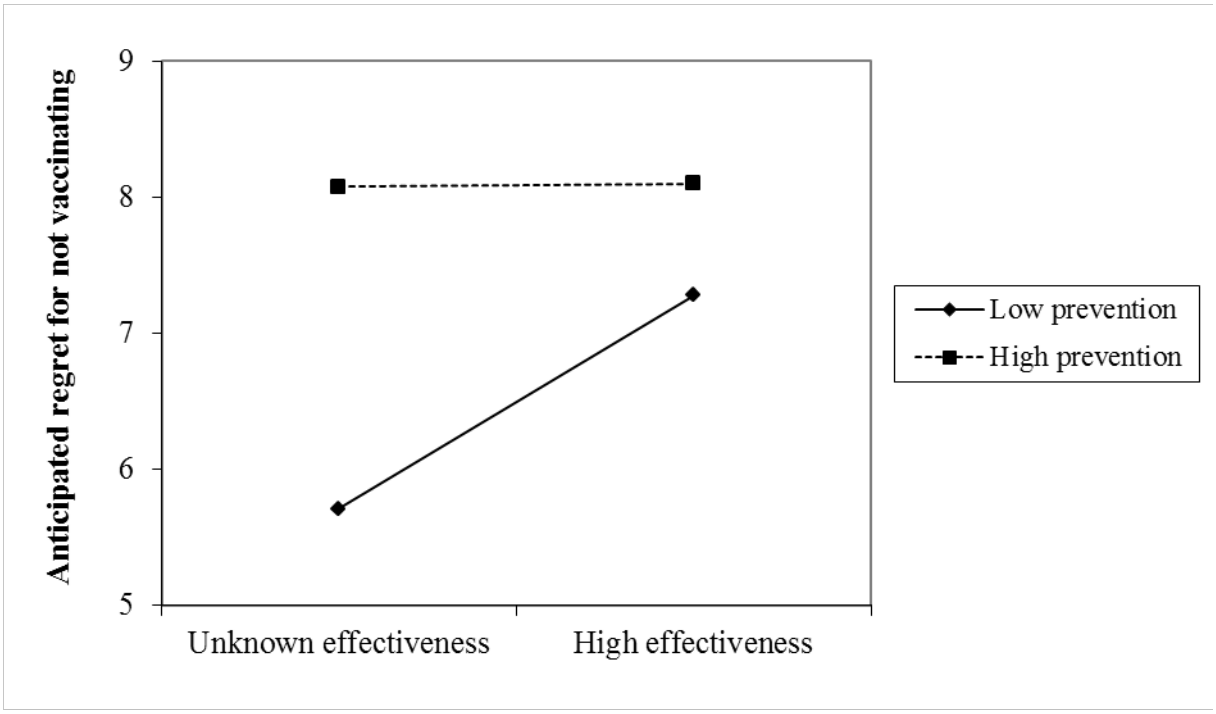

Figure 1. Anticipated regret as a function of prevention focus and effectiveness of the vaccination plotted at 1 *SD* above and below the mean (Study 3).