

Self-Affirmation Before Exposure to Health Communications Promotes Intentions  
and Health Behavior Change By Increasing Anticipated Regret

Guido M. van Koningsbruggen<sup>1</sup>, Peter R. Harris<sup>2</sup>, Anjès J. Smits<sup>3</sup>, Benjamin  
Schüz<sup>4</sup>, Urte Scholz<sup>5</sup>, and Richard Cooke<sup>6</sup>

**Manuscript accepted for publication in Communication Research.**

1. VU University Amsterdam, The Netherlands
2. University of Sussex, United Kingdom
3. Randstad Inhouse Services, The Netherlands
4. University of Tasmania, Australia
5. University of Zurich, Switzerland
6. Aston University, United Kingdom

Correspondence concerning this article should be addressed to Guido M. van  
Koningsbruggen, Department of Communication Science, VU University  
Amsterdam, De Boelelaan 1081, 1081 HV Amsterdam, The Netherlands. Phone:  
+31205983087. Fax: +31205983733. E-mail: [g.m.van.koningsbruggen@vu.nl](mailto:g.m.van.koningsbruggen@vu.nl)

### **Abstract**

Health-risk information can elicit negative emotions like anticipated regret that may positively affect health persuasion. The beneficial impact of such emotions is undermined when target audiences respond defensively to the threatening information. We tested whether self-affirming (reflecting upon cherished attributes) before message-exposure can be used as strategy to enhance the experience of anticipated regret. Women were self-affirmed or not before exposure to a message promoting fruit and vegetable consumption. Self-affirmation increased anticipated regret and intentions reported following message-exposure and consumption in the week after the intervention; regret mediated the affirmation effect on intentions. Moreover, results suggest that anticipated regret and intentions are serial mediators linking self-affirmation and behavior. By demonstrating the mediating role of anticipated regret, we provide insights into how self-affirmation may promote healthy intentions and behavior following health message-exposure. Self-affirmation techniques could thus potentially be used to increase the effectiveness of health communication efforts.

*Keywords:* self-affirmation, anticipated regret, health communication, health behavior, persuasion

**Self-Affirmation Before Exposure to Health Communications Promotes Intentions and Health Behavior Change By Increasing Anticipated Regret**

Given its threatening nature, health-risk information can induce defensive responses from target audiences (e.g., Dillard & Shen, 2005; Liberman & Chaiken, 1992). Although defensive responses, such as message derogation and avoidance, keep negative emotions triggered by the health information at bay (De Wit, Das, & De Hoog, 2007; Witte, 1992), they can also undermine the beneficial effects these emotions may have on health behavior change (Dillard & Nabi, 2006). One such negative emotion is anticipated regret. Anticipated regret, the prospect of feeling regret after doing or not doing something, is an emotion that people typically take into account when making health-related decisions (e.g., Janis & Mann, 1977; Zeelenberg, 1999; Zeelenberg & Pieters, 2007). It has been demonstrated to have impressive motivational impact (Rivis, Sheeran, & Armitage, 2009; Sandberg & Conner, 2008).

Regret is a negative emotion that people experience when they believe that their current situation could have been improved by different decisions in the past (Sandberg & Conner, 2009). Zeelenberg and Pieters (2007) note that regret can be directed backwards (retrospective regret) or forwards (anticipated regret) and that regret is a complex, comparison-based emotion of self-blame. That is, people develop feelings of regret when comparing their current or anticipated situation with other possible situations / outcomes and in case of a negative evaluation of this comparison blame themselves for not having decided differently. Thus, regret

in contrast to other negative emotions requires that individuals have or had a choice in their behavioral decisions (Zeelenberg & Pieters, 2007).

Encouraging people to anticipate regret may motivate them to avoid it and thereby promote behavior change (Simonson, 1992). The anticipation of regret might be triggered by greater difficulty of the decision, the experience of timely consequences and of consequences that are important for significant social network members, and when new information on gains and losses related to the decision are received (Janis & Mann, 1977; Zeelenberg & Pieters, 2007). Health-related decisions fit this picture and anticipated regret has emerged as a significant predictor of health intentions and behavior (e.g., Ravis et al., 2009; Sandberg & Conner, 2008).

Specifically, research shows that expecting to regret future actions (or inactions) predicts a lower likelihood of actually engaging in these actions (or in a higher likelihood when anticipating regret about inactions). For instance, anticipated regret has been shown to predict intentions to reduce unhealthy behavior by drinking within safe limits (Cooke, Snihotta, & Schuz, 2007), not eating junk food (Richard, Van der Pligt, & De Vries, 1996), and taking exercise (Abraham & Sheeran, 2004). Importantly, anticipated regret adds to the prediction of health intentions over and above variables such as attitudes, subjective norms, and perceived behavioral control (e.g., Ravis et al., 2009; Sandberg & Conner, 2008). Moreover, experimental manipulations that make anticipated regret salient prior to intention formation lead to stronger intentions to behave healthily, more

healthy behavior and strengthen the intention-behavior relationship (e.g., Abraham & Sheeran, 2003, 2004; Sandberg & Conner, 2009, 2011). A recent meta-analysis further confirms that interventions that increase negative anticipated emotions like regret produce significant changes in health behavior (Sheeran, Harris, & Epton, 2014). Taken together, much research has demonstrated the beneficial effects of anticipated regret in health-decision making. Communication scholars thus face the challenge of finding ways to enable target audiences to experience anticipated regret without triggering defensive reactions.

Self-affirmation—a procedure in which people reflect on cherished values or attributes—may be one such way. Research has shown that self-affirmation prior to exposing individuals to health communication containing risk messages reduces defensive reactions and promotes health behavior change (Epton, Harris, Kane, Van Koningsbruggen, & Sheeran, in press; Harris & Epton, 2009; Sherman & Cohen, 2006), and the potential of this technique is being studied by, and gaining recognition among, communication scholars (e.g., Nan & Zhao, 2012; Napper, Harris, & Klein, 2014; Zhao & Nan, 2010; Zhao, Peterson, Kim, & Rolfe-Redding, in press).

In the present research, we capitalize on the beneficial effects of self-affirmation in reducing defensiveness and test whether, as a result, it reduces the tendency to resist the induction of regret and enables individuals to experience anticipated regret in response to persuasive health communications as part of the natural response to health risk information, with all the consequences for adaptive

behavior change as discussed above. If it does, it provides practitioners with a strategy to encourage target audiences to acknowledge the affective implications of personally relevant health messages (Harris & Napper, 2005). Moreover, the present research adds to theory by investigating whether anticipated regret is one of the mediating mechanisms by which self-affirmation promotes intentions to engage in health behavior and actual behavior change.

### **Self-affirmation and Health Persuasion**

According to self-affirmation theory (Steele, 1988) people are highly motivated to protect their view of themselves as “adaptively and morally adequate” (p. 262), that is, as “good and appropriate” individuals (Sherman & Cohen, 2006, p. 186). From the perspective of this theory, messages designed to encourage people to change their health-related behavior can threaten their sense of being a good and appropriate person and trigger a need to restore this sense. By downplaying, minimizing, or avoiding health messages people can restore this sense easily, without giving up their unhealthy behavior, as illustrated by the tendency of targeted audiences to respond defensively to health messages (Dillard & Shen, 2005; Liberman & Chaiken, 1992).

However, the theory further proposes that affirming valued sources of self-worth unrelated to the threat (e.g., important personal qualities, cherished values or attributes) can buffer threats to the self, reducing the impact of these threats on subsequent responses (Sherman & Cohen, 2006). According to the theory, this possibility exists because people are primarily concerned with maintaining their

*global* sense of self-integrity, rather than maintaining perceived self-worth in a specific domain. Thus, if people can affirm an unrelated domain of self-worth (e.g., being a friendly person), this will reduce the need to respond defensively to a subsequent threat in another domain (e.g., health) because people realize that their sense of self-integrity does not solely depend on the appraised implications of the provoking threat (Sherman & Cohen, 2006). This way, self-affirmation can become a source of objectivity and make people more open-minded and responsive toward information that would otherwise elicit defensiveness (Steele, 1988).

A growing number of studies on health persuasion has tested and confirmed this line of reasoning (Harris & Epton, 2009). In these studies, self-affirmation is usually manipulated by having participants complete scales or write about a cherished value (McQueen & Klein, 2006). Studies suggest that self-affirmation reduces message derogation and increases message acceptance, risk perceptions, and intentions to take precautions regarding health risks such as smoking, excessive caffeine consumption, sun tanning, alcohol consumption, type 2 diabetes, and unsafe sex (e.g., Armitage, Harris, Hepton, & Napper, 2008; Harris, Mayle, Mabbott, & Napper, 2007; Harris & Napper, 2005; Jessop, Simmonds, & Sparks, 2009; Nan & Zhao, 2012; Reed & Aspinwall, 1998; Sherman, Nelson, & Steele, 2000; Van Koningsbruggen & Das, 2009; Van Koningsbruggen, Das, & Roskos-Ewoldsen, 2009; Zhao & Nan, 2010). It has also been shown that self-affirmation produces beneficial changes in predictors of health behavior change,

such as attitudes toward the behavior, behavioral control, self-efficacy, response efficacy, and pre-behavioral steps necessary to make actual behavior possible (for a review, see Harris & Epton, 2009).

Of note, evidence suggests that self-affirmation can promote actual changes in health behavior. For instance, Epton and Harris (2008) offered participants an opportunity to self-affirm by reflecting on past acts of kindness or not before exposing them to a message designed to promote the consumption of fruit and vegetables. Compared with non-affirmed participants, self-affirmed participants increased their fruit and vegetable consumption during the following week. Self-affirmation thus appears to be an effective way to reduce defensive reactions toward persuasive health communications in targeted audiences, and to promote healthy intentions and behaviors.

### **Self-affirmation and Anticipated Regret**

In addition to the effects on the variables reported above, self-affirmation has been shown to enhance the reported experience of affective responses, including the experience of other-directed affect (Crocker, Niiya, & Mischkowski, 2008) and of anticipatory emotions, such as anxiety, fear and worry (see Harris & Epton, 2009, for a review), in response to health-risk messages. This greater readiness to report affective responses, including the experience of negative affect, is considered to be one of the key consequences of reduced defensiveness following self-affirmation (Harris & Epton, 2009). Extending this line of evidence to the experience of anticipated regret seems relatively straightforward (also see Klein,

Harris, Ferrer, & Zajac, 2011). However, to date no published studies have assessed the impact of self-affirmation on anticipated regret.

Additional but indirect support for the idea that self-affirmation may influence the experience of anticipated regret comes from research showing that self-affirmation increases the reported experience of perceived vulnerability and risk perceptions (e.g., Harris & Napper, 2005; Klein et al., 2011; Sherman et al., 2000), variables that are known to predict anticipated regret (e.g., Chapman & Coups, 2006; Moser & Aiken, 2011). In addition, although more speculative, self-affirmation encourages people to focus on the “big picture” (Wakslak & Trope, 2009, p. 927)—for example by, eliciting higher levels of construal (Schmeichel & Vohs, 2009; Sherman et al., 2013; Wakslak & Trope, 2009)—and promotes consideration of the longer-term dangers of maintaining their current behavior (Harris, 2011). This is relevant to the current investigation because it has been shown that people who focus more on the future implications of their behavior are more likely to experience feelings of anticipated regret (Morison, Cozzolino, & Orbell, 2010; Orbell & Hagger, 2006). Thus, these lines of research are also consistent with the prospect that self-affirmed individuals will experience greater anticipated regret. As a consequence, we hypothesized that self-affirmation reduces any tendency to minimize (and thus increases) the experience of anticipated regret in response to a health message.

In addition, we expected that the increase in anticipated regret resulting from a self-affirmation induction would affect intention formation and subsequent health

behavior. Theoretically, self-affirmation decreases people's sensitivity to "the evaluative implications of the immediate situation" and thereby promotes adaptive responses to threatening information (Sherman & Cohen, 2006, p. 187). In the language of theories of threat appeals in health communication (e.g., Leventhal, 1970; Witte, 1992), self-affirmation is thus assumed to reduce fear control (associated with minimizing negative affective reactions) which, in turn, should result in increased danger control (associated with motivation to think about the health message and adaptive behavioral actions) (also see Harris, 2011). Based on these theoretical considerations, as well as on research showing that intentions have a causal impact on behavior (Webb & Sheeran, 2006), and that effects of anticipated regret on behavior appear to be mediated by intentions (Rivis et al., 2009), we propose and will test the following three-step pathway: Self-affirmation is expected to increase the experience of anticipated regret in response to health communication, which will increase intentions which, in turn, will increase levels of healthy behavior.

### **The Present Study**

We randomly allocated female participants to a self-affirmation or control task before they read a message regarding the health-promoting effects of fruit and vegetables. The health message promoted the (national) Nutrition Center's recommendation to eat at least two portions of fruit and 200 grams of vegetables every day. The message included a description of health risks associated with eating insufficient fruit and vegetables, which implicitly addresses feelings of

anticipated regret, but did not include explicit elements designed to trigger this emotion. This was done to provide a clear test of our idea that self-affirmation would reduce any tendency to minimize (and thus would increase) anticipated regret experienced as part of the natural response to health risk information. That is, consistent with the regret literature we assume that people take anticipated regret into account when making health-related decisions, such as whether or not to eat sufficient fruit and vegetables (e.g., Janis & Mann, 1977; Zeelenberg, 1999; Zeelenberg & Pieters, 2007). The health topic and message were adopted from earlier work that demonstrated significant effects of self-affirmation on behavior (Epton & Harris, 2008). This allows us to conceptually replicate earlier research and to extend it by investigating potential mediating effects of anticipated regret.

Anticipated regret and intentions were measured after exposure to the message. In order to examine effects on behavior, participants completed a one-week follow-up in which they reported their fruit and vegetable consumption in the previous seven days. Derived from the theoretical analysis described above and previous empirical findings, we tested the following hypotheses:

*Hypothesis 1a (H1a):* Self-affirmation before exposure to a health communication message will increase anticipated regret expressed in response to that message.

*Hypothesis 1b (H1b):* Self-affirmation before exposure to a health communication message will increase healthy intentions expressed following that message.

*Hypothesis 1c (H1c):* Self-affirmation before exposure to a health communication message will promote healthy behavior following that message.

*Hypothesis 2a (H2a):* Anticipated regret will mediate the effect of self-affirmation on intentions.

*Hypothesis 2b (H2b):* The hypothesized effect of self-affirmation on behavior (H1c) will be mediated by anticipated regret and intentions. Anticipated regret and intentions will follow a serial mediation.

## **Methods**

### **Design and Participants**

The study was conducted via the internet and participants were recruited through banners placed on the university website. The inclusion criteria (female, age below 47, Body Mass Index (BMI) between 18 and 30) were chosen to facilitate comparison with the Epton and Harris (2008) study and because previous research has shown that underweight and obese people differ from normal and overweight people in the way they process food-related information and regulate their eating behavior (e.g., Mela, 2006; Nasser, 2001; Vaidya & Malik, 2008). This left a total of 91 female participants, who were randomly assigned to either the self-affirmation ( $n = 42$ ) or no-affirmation conditions ( $n = 49$ ). As compensation, participants could take part in a lottery in which they could win gift vouchers and university students could also request course credits.

### **Procedure**

Participants were informed that they would participate in several separate studies. The first study was announced as a study about consumption patterns concerning several nutrients, and included a measure of baseline behavior. Participants then completed the self-affirmation manipulation, which was introduced as research on personality characteristics. Next, they read a message regarding the health-promoting effects of fruit and vegetables. Participants were informed that this message was being developed for a forthcoming health campaign and that we were interested in their opinion. After reading the health message, participants completed the measures assessing anticipated regret and intentions. They also responded to some other questions (e.g., age, gender, weight and height to determine participants' BMI). Seven days after initial participation, a hyperlink was sent by e-mail to each participant in which we measured their consumption of fruit and vegetables in the previous week. Participants were unaware that they would be contacted again.

### **Materials and Measures**

**Baseline behavior.** Prior to the manipulation, participants indicated on how many days of the last seven days they had consumed the guideline amounts of two portions of fruit and 200 grams of vegetables. Specifically, they responded to the question: "In the last seven days, on how many days did you eat two portions of fruit and 200 grams of vegetables?" (*0 days, 1 day, 2 days, 3 days, 4 days, 5 days, 6 days, 7 days*). Participants were given detailed information about portion sizes before completing the baseline measure.

**Self-affirmation manipulation.** Participants were self-affirmed using the method developed by Napper, Harris, and Epton (2009). In the self-affirmation condition, participants were asked to complete a task that supposedly measured their “personal strengths”, in which they completed 32 items that focused their minds on important self-values (e.g., value of humanity; “I am never too busy to help a friend”). They rated these items using a 5-point scale (*very much unlike me/unlike me/neutral/like me/very much like me*). In the control condition, participants were told that the task measured “the way in which people make judgments about the personal strengths of other people” and in their case answered the same set of items thinking about the qualities of a celebrity (David Beckham). Responses were also given on a 5-point scale, with “him” replacing “me”. Thus, the crucial difference is that the self-affirmation condition created a mindset focusing on important self-values, whereas the control condition did not (see Napper et al., 2009, for a validation of this manipulation).

**Health message.** The message outlined the health benefits of fruit and vegetable consumption, described how such consumption is thought to promote health, and included suggestions for how to increase consumption. The message was similar to the one used by Epton and Harris (2008), but the recommendation followed the guidelines of the (national) Nutrition Center to eat at least two portions of fruit and 200 grams of vegetables every day.

**Anticipated regret.** Anticipated regret was measured using two items ( $r = .84, p < .001$ ): “If I did not succeed in eating at least two portions of fruit and 200

grams of vegetables every day in the next week, I would feel regret” and “If I did not succeed in eating at least two portions of fruit and 200 grams of vegetables every day in the next week, I would feel upset” (based on Abraham & Sheeran, 2004). Responses were given on a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*).

**Intentions.** Intentions were measured using three items ( $\alpha = .93$ ): “I intend to eat at least 200 grams of vegetables and two portions of fruit each day, in the next 7 days”, “I want to eat at least 200 grams of vegetables and two portions of fruit each day, in the next 7 days”, and “I will try to eat at least 200 grams of vegetables and two portions of fruit each day, in the next 7 days” (based on Cooke et al., 2007). Responses were given on a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*).

**Behavior (one-week follow-up).** Participants indicated on how many days they had consumed two portions of fruit and 200 grams of vegetables in the previous seven days (cf. the measure of baseline behavior). Similar to the assessment of baseline consumption they were given detailed information about portion sizes before completing this measure.

## Results

Participants’ age ( $M = 22.01$ ,  $SD = 2.81$ ), BMI ( $M = 21.50$ ,  $SD = 2.36$ ), and baseline behavior ( $M = 2.32$ ,  $SD = 2.01$ ) did not differ between conditions, all  $F_s < 1$ , suggesting successful randomization. Regression analyses tested the effects of condition (coded, control = 0, self-affirmed = 1) on the dependent

measures (H1a-H1c). To control for individual differences in level of fruit and vegetable consumption prior to the manipulation, baseline behavior (standardized) was entered as a control variable in the analyses.

### **Time 1 Measures**

**Anticipated regret.** Baseline behavior was significantly related to anticipated regret,  $B = 0.55$ ,  $SE = 0.14$ ,  $t = 3.93$ ,  $p < .001$ ,  $\eta^2_p = .15$ . Importantly, the analysis also revealed a significant effect of condition,  $B = 0.85$ ,  $SE = 0.28$ ,  $t = 3.06$ ,  $p = .003$ ,  $\eta^2_p = .10$ , showing that self-affirmed participants reported higher levels of anticipated regret ( $M = 3.82$ ,  $SE = 0.20$ , 95%  $CI = 3.42-4.22$ ) than non-affirmed participants ( $M = 2.97$ ,  $SE = 0.19$ , 95%  $CI = 2.60-3.35$ ). The model  $R^2$  was .22.

**Intentions.** Baseline behavior was significantly related to intentions,  $B = 0.73$ ,  $SE = 0.14$ ,  $t = 5.24$ ,  $p < .001$ ,  $\eta^2_p = .24$ . Importantly, the analysis also revealed a significant effect of condition,  $B = 0.67$ ,  $SE = 0.28$ ,  $t = 2.42$ ,  $p = .018$ ,  $\eta^2_p = .06$ , showing that self-affirmed participants reported greater intentions ( $M = 5.08$ ,  $SE = 0.20$ , 95%  $CI = 4.68-5.49$ ) than non-affirmed participants ( $M = 4.41$ ,  $SE = 0.19$ , 95%  $CI = 4.04-4.79$ ). The model  $R^2$  was .27.

### **One Week Follow-Up**

Time 2 data (i.e., data on the behavioral measure) were available from 32 (76%) affirmed and 33 (67%) non-affirmed participants. There were no differences on Time 1 measures between participants who did and those who did

not participate at follow-up,  $F_s < 1-1.42$ ,  $p_s = .77-.24$ , all  $\eta^2_{ps} < .02$ . Missing value analysis further indicated that the values were missing completely at random (Little's MCAR test:  $\chi^2(4) = 4.33$ ,  $p = .36$ ). To preserve the power of the analysis, missing data on the behavioral measure were therefore imputed using the expectation maximization algorithm in SPSS (Enders, 2001).

**Behavior.** Baseline behavior was significantly related to behavior at follow-up,  $B = 1.25$ ,  $SE = 0.14$ ,  $t = 8.97$ ,  $p < .001$ ,  $\eta^2_p = .48$ . Importantly, the analysis also revealed a significant effect of condition,  $B = 0.85$ ,  $SE = 0.28$ ,  $t = 3.06$ ,  $p = .003$ ,  $\eta^2_p = .10$ , showing that self-affirmed participants reported consuming two portions of fruit and 200 grams of vegetables on more days ( $M = 3.20$ ,  $SE = 0.20$ , 95%  $CI = 2.80-3.61$ ) than did non-affirmed participants ( $M = 2.35$ ,  $SE = 0.19$ , 95%  $CI = 1.97-2.73$ ). The model  $R^2$  was .50.<sup>1,2</sup>

### Mediation Analysis on Intentions

To test whether anticipated regret mediated the effect of self-affirmation on intentions (H2a), we used a bootstrapping procedure to compute the 95% confidence interval around the indirect effect (i.e., the path through the mediator) using the PROCESS macro in SPSS (model 4; Hayes, 2013). The paths for the model can be derived from Figure 1 (displaying the serial multiple mediation model) and their corresponding coefficients and 95% confidence intervals from Table 1. Condition was entered along with anticipated regret and baseline behavior as a covariate. The path from condition to anticipated regret ( $a1$ ) was

significant and anticipated regret had a direct effect on intentions ( $d21$ ). The significant effect of condition on intentions became non-significant when anticipated regret was controlled for ( $a2$ ). Results revealed that the indirect effect via anticipated regret equaled 0.46,  $SE = 0.16$ , 95%  $CI = 0.19-0.82$ , suggesting a significant indirect effect of self-affirmation on intentions via anticipated regret (mediation).

### **Mediation Analysis on Behavior**

To test whether self-affirmation indirectly influenced behavior through causally linked multiple mediators of anticipated regret and intentions (H2b), a serial mediation analysis (model 6 in PROCESS) was conducted with bootstrap methods (Hayes, 2013). The paths for the full process model are illustrated in Figure 1 and their corresponding coefficients and 95% confidence intervals are provided in Table 1. Condition was entered along with both potential mediators simultaneously and baseline behavior as a covariate. Both the total effect ( $c$ ) of condition on behavior and the total direct effect ( $c'$ ) when controlling for the mediators were significant. The specific indirect effects through anticipated regret only (M1) and through intentions only (M2) were not significant. However, when testing serial multiple mediation, the specific indirect effect of condition on behavior through both anticipated regret and intentions (M1 & M2) was significant, supporting H2b. The indirect effect via both mediators equaled 0.15,  $SE = 0.08$ , 95%  $CI = 0.03-0.35$ . Because the bootstrap confidence interval is entirely above zero, this indirect effect is significantly positive (serial mediation).

Thus, self-affirmation increased anticipated regret in response to the health message (as  $a1$  is positive), which in turn was related to greater intentions to meet the recommended guidelines (as  $d21$  is positive) and these greater intentions translated into healthier behavior during the following week (because  $b2$  is positive).<sup>3</sup>

[Figure 1 here]

[Table 1 here]

### **Discussion**

The present research investigated whether self-affirmation would increase people's experience of anticipated regret in response to persuasive health communications. Participants were randomly allocated to a self-affirmation or control condition before reading a message promoting the benefits of fruit and vegetable consumption. Self-affirmation increased participants' anticipated regret (H1a) and their intentions to conform to the national guideline to eat at least two portions of fruit and 200 grams of vegetables every day (H1b). Moreover, self-affirmed participants reported consuming the recommended amounts of fruit and vegetables on more days during the week following the experimental manipulation than did non-affirmed participants (H1c).

Consistent with previous research, we showed that self-affirmation promotes healthy intentions and influences subsequent adaptive behavior (e.g., Epton & Harris, 2008; Harris & Napper, 2005; Sherman et al., 2000; Van Koningsbruggen & Das, 2009). In addition, the current findings are the first to demonstrate that

self-affirmation enhances the reported experience of anticipated regret in response to a health message. Strong negative affective reactions to health-risk information can elicit maladaptive responses to such information (e.g., "fear control"; Witte, 1992), and dampen the beneficial effects certain emotions can have. Self-affirmation may thus provide a strategy to enable target audiences to experience anticipated regret without becoming defensive and consequently engage in "danger control" (Witte, 1992) activities instead.

The observed increases in anticipated regret mediated the beneficial effects of self-affirmation on adaptive behavioral intentions. Thus self-affirming increased the prospect of feeling regret about not eating sufficient fruit and vegetables on reading the message and this, in turn, promoted the formation of intentions to meet the recommended guidelines. The current findings thus suggest that increasing anticipated regret may be one of the mechanisms by which self-affirmation can promote healthy intentions. Moreover, self-affirmation indirectly influenced behavior through both anticipated regret and intentions (serial mediation). Thus, this research demonstrated for the first time that anticipated regret enhanced by self-affirmation influenced behavior through intentions, which clarifies an important way in which self-affirmation may exert effects on health behaviors. This is also consistent with previous findings showing that, in general, anticipated regret does not directly predict behavior but exerts a positive influence through its effect on behavioral intentions (Rivis et al., 2009).

A question that arises from the present findings concerns the process through which self-affirmation heightens the experience of anticipated regret. Our assumption is that it reduces the tendency to defensively minimize the experience of anticipated regret fostered by a health message. Several lines of evidence support this idea. First, the effects of self-affirmation on anticipated regret are consistent with evidence that self-affirmation encourages reported experience of negative affective responses to health-risk messages (see Harris & Epton, 2009, for a review). Second, as suggested earlier, recent findings have demonstrated that self-affirmation triggers higher levels of construal (Schmeichel & Vohs, 2009; Sherman et al., 2013; Wakslak & Trope, 2009), which makes people adopt a longer term perspective (Trope & Liberman, 2003). Self-affirmation thus appears to facilitate consideration of the longer-term implications of maintaining one's current behavior on reading the health message. In turn, this heightened attention to the future probably intensifies the experience of anticipated regret (Morison et al., 2010; Orbell & Hagger, 2006). Whether self-affirmation boosts anticipated regret by focusing people specifically on the future implications of their behavior could be an important avenue for future research.

Related to this issue, it is important to note that the present research did not include message-processing measures because we first wanted to provide a clear test of whether self-affirmation influenced anticipated regret. While our results establish such a link, future studies should also include processing measures (e.g., see Zhao et al., in press, for such a measure) to further investigate

the links between self-affirmation, message processing, and anticipated regret. Such an approach would allow for a more fine-grained analysis of the mechanisms by which self-affirmation triggers anticipated regret.

Further research should also address whether self-affirmation boosts anticipated regret in response to health communication messages that focus on health-compromising behaviors such as smoking or binge drinking. That is, in the present research we focused on a health-promoting behavior, and assessed anticipated regret in terms of inaction (i.e., If I did *not* do x, I would regret it). However, anticipated regret regarding health-compromising behavior is usually assessed in terms of action (e.g., If I did do x, I would regret it). Distinguishing between these two types of behavior would provide a more comprehensive test of the value of self-affirmation for inducing anticipated regret in target audiences.

### **Practical Implications**

The current findings suggest that self-affirmation techniques could be used to increase the effectiveness of health communication campaigns in general, and of campaigns that promote fruit and vegetables consumption in particular. However, the self-affirmation manipulation used in the present research as well as many others (for an overview, see McQueen & Klein, 2006) are relatively time-consuming and difficult to apply as an intervention, particularly in mass communications. Encouraging, however, are findings reported by Jessop and colleagues (2009) who successfully integrated a simplified self-affirmation task into a health promotion leaflet that led to positive results. Clearly, more research

is needed to develop and investigate the effectiveness of simplified self-affirmation manipulations in different media; self-affirmation techniques that make personal values or cherished attributes salient could be easily used in online health campaigns, smart phone applications used in health promotion, and interpersonal communication settings, such as diet and nutrition programs that involve counseling by dietitians.

### **Limitations**

The present research has several limitations that need to be acknowledged. First, a self-report measure of consumption was used, which may have led participants to under- or over-estimate their fruit and vegetable intake. We strove to guard against potential reporting bias by providing participants with detailed information about portion sizes before completing the consumption measures. In addition, our findings conceptually replicate earlier work, which employed a reliable and validated diary measure (Epton & Harris, 2008). Nonetheless, future research should seek more objective measures of consumption. Second, our research focused on female (and predominantly student) samples. The extent to which our findings can be generalized to other samples thus remains open. It is also important to replicate the current findings using bigger samples since the sample in the current study was relatively small.

Third and most important, because we measured anticipated regret and intentions at the same time points, the mediational analyses are correlational and limit our certainty about the causal order. Thus, it is important to remain cautious

when interpreting the current results of the mediation analyses. Therefore, it is crucial that future studies replicating our results should establish a temporal order between anticipated regret and intentions in order to more precisely follow the causal chain approach assumed when testing mediation.<sup>4</sup> A related limitation is that we did not simultaneously test other known mediators of self-affirmation, such as sensitivity to argument strength (Correll, Spencer, & Zanna, 2004), attentional bias toward the threatening components in health messages (Klein & Harris, 2009), increases in response- and self-efficacy (Epton & Harris, 2008), feelings of personal vulnerability (Klein et al., 2011), or decreases in message derogation (Van Koningsbruggen & Das, 2009). Testing multiple mediators simultaneously in future studies will provide insights into the relative importance of anticipated regret as a mediator relative to other mediators of the effects of self-affirmation on intentions and health behavior.

Future research can also profit from manipulating both self-affirmation and presence of the health message within one experimental design. This would provide a test of the implicit assumption that it is about receiving a self-affirmation in combination with a health message that is responsible for changing intentions and behavior. The current study could not address this question since all participants received a health message. It would also be important to further investigate the effects of measuring anticipated regret because previous research has shown that this may in itself produce changes in health behavior (e.g., Sandberg & Conner, 2009). Moreover, it would then be possible to test whether

anticipated regret in the current study was a result of answering the questions or a result of being exposed to the health message. Future studies with this design should also assess other emotions (e.g., fear, anxiety) in addition to anticipated regret. This would provide insight into the importance of anticipated regret relative to other emotions that can be induced by health messages as well as its applicability across different situations (e.g., in response to anti-smoking ads the primary emotion perhaps could be fear instead of anticipated regret). A final limitation of the current study is thus that we only assessed the emotion of anticipated regret in one particular situation.

In conclusion, the present work showed that self-affirming people before exposing them to a persuasive health communication enhanced anticipated regret and promoted intention formation and health behavior change. The findings thus provide a strategy to bolster readiness to experience anticipated regret in target audiences without inducing defensiveness. Moreover, by demonstrating the potential mediating role of anticipated regret, this research provides novel insights into how self-affirmation may promote the formation of healthy intentions that lead to improvements in health behavior. Together, the findings suggest that self-affirmation techniques could potentially be used to increase the effectiveness of health communication efforts.

## References

- Abraham, C., & Sheeran, P. (2003). Acting on intentions: The role of anticipated regret. *British Journal of Social Psychology, 42*, 495-511. doi: 10.1348/014466603322595248
- Abraham, C., & Sheeran, P. (2004). Deciding to exercise: The role of anticipated regret. *British Journal of Health Psychology, 9*, 269-278. doi: 10.1348/135910704773891096
- Armitage, C. J., Harris, P. R., Hepton, G., & Napper, L. (2008). Self-affirmation increases acceptance of health-risk information among UK adult smokers with low socioeconomic status. *Psychology of Addictive Behaviors, 22*, 88-95.
- Chapman, G. B., & Coups, E. J. (2006). Emotions and preventive health behavior: Worry, regret, and influenza vaccination. *Health Psychology, 25*, 82-90. doi: 10.1037/0278-6133.25.1.82
- Cooke, R., Sniehotta, F., & Schuz, B. (2007). Predicting binge-drinking behaviour using an extended TPB: Examining the impact of anticipated regret and descriptive norms. *Alcohol and Alcoholism, 42*(2), 84-91. doi: 10.1093/Alcalc/Ag1115
- Correll, J., Spencer, S. J., & Zanna, M. P. (2004). An affirmed self and an open mind: Self-affirmation and sensitivity to argument strength. *Journal of Experimental Social Psychology, 40*, 350-356. doi: 10.1016/j.jesp.2003.07.001

- Crocker, J., Niiya, Y., & Mischkowski, D. (2008). Why does writing about important values reduce defensiveness? Self-affirmation and the role of positive other-directed feelings. *Psychological Science, 19*, 740-747. doi: 10.1111/j.1467-9280.2008.02150.x
- De Wit, J. B. F., Das, E., & De Hoog, N. (2007). Self-regulation of health communications: A motivated processing approach to risk perception and persuasion. In M. Hewstone, H. Schut, J. De Wit, K. Van den Bosch & M. Stroebe (Eds.), *The scope of social psychology: Theory and applications* (pp. 209-226). Hove, UK: Psychology Press.
- Dillard, J. P., & Nabi, R. L. (2006). The persuasive influence of emotion in cancer prevention and detection messages. *Journal of Communication, 56*, S123-S139. doi: 10.1111/j.1460-2466.2006.00286.x
- Dillard, J. P., & Shen, L. J. (2005). On the nature of reactance and its role in persuasive health communication. *Communication Monographs, 72*, 144-168. doi: 10.1080/03637750500111815
- Enders, C. K. (2001). A primer on maximum likelihood algorithms available for use with missing data. *Structural Equation Modelling, 8*, 128-141. doi: 10.1207/S15328007SEM0801\_7
- Epton, T., & Harris, P. R. (2008). Self-affirmation promotes health behavior change. *Health Psychology, 27*, 746-752. doi: 10.1037/0278-6133.27.6.746

- Epton, T., Harris, P. R., Kane, R., Van Koningsbruggen, G. M., & Sheeran, P. (in press). The impact of self-affirmation on health-behavior change: A meta-analysis. *Health Psychology*. doi: 10.1037/hea0000116
- Finlayson, G., King, N., & Blundell, J. E. (2007). Is it possible to dissociate 'liking' and 'wanting' for foods in humans? A novel experimental procedure. *Physiology and Behavior*, *90*, 36-42. doi: 10.1016/j.physbeh.2006.08.020
- Harris, P. R. (2011). Self-affirmation and the self-regulation of health behavior change. *Self and Identity*(3), 304-314. doi: 10.1080/15298868.2010.517963
- Harris, P. R., & Epton, T. (2009). The impact of self-affirmation on health cognition, health behaviour and other health-related responses: A narrative review. *Social and Personality Psychology Compass*, *3*, 962-978. doi: 10.1111/j.1751-9004.2009.00233.x
- Harris, P. R., Mayle, K., Mabbott, L., & Napper, L. (2007). Self-affirmation reduces smokers' defensiveness to graphic on-pack cigarette warning labels. *Health Psychology*, *26*, 437-446. doi: 10.1037/0278-6133.26.4.437
- Harris, P. R., & Napper, L. (2005). Self-affirmation and the biased processing of threatening health-risk information. *Personality and Social Psychology Bulletin*, *31*, 1250-1263. doi: 10.1177/0146167205274694

- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York: The Guilford Press.
- Janis, I. L., & Mann, L. (1977). *Decision making: A psychological analysis of conflict, choice, and commitment*. New York, NY: Free Press.
- Jessop, D. C., Simmonds, L. V., & Sparks, P. (2009). Motivational and behavioural consequences of self-affirmation interventions: A study of sunscreen use among women. *Psychology and Health, 24*, 529-544. doi: 10.1080/08870440801930320
- Klein, W. M. P., & Harris, P. R. (2009). Self-affirmation enhances attentional bias toward threatening components of a persuasive message. *Psychological Science, 20*, 1463-1467. doi: 10.1111/j.1467-9280.2009.02467.x
- Klein, W. M. P., Harris, P. R., Ferrer, R. A., & Zajac, L. E. (2011). Feelings of vulnerability in response to threatening messages: Effects of self-affirmation. *Journal of Experimental Social Psychology, 47*, 1237-1242. doi: 10.1016/J.Jesp.2011.05.005
- Leventhal, H. (1970). Findings and theory in the study of fear communication. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 5, pp. 119-186). San Diego, CA: Academic Press.
- Liberman, A., & Chaiken, S. (1992). Defensive processing of personally relevant health messages. *Personality and Social Psychology Bulletin, 18*, 669-679. doi: 10.1177/0146167292186002

- McQueen, A., & Klein, W. M. P. (2006). Experimental manipulations of self-affirmation: A systematic review. *Self and Identity, 5*, 289-354. doi: 10.1080/15298860600805325
- Mela, D. J. (2006). Eating for pleasure or just wanting to eat? Reconsidering sensory hedonic responses as a driver of obesity. *Appetite, 47*, 10-17. doi: 10.1016/j.appet.2006.02.006
- Morison, L. A., Cozzolino, P. J., & Orbell, S. (2010). Temporal perspective and parental intention to accept the human papillomavirus vaccination for their daughter. *British Journal of Health Psychology, 15*, 151-165. doi: 10.1348/13S910709X437092
- Moser, S. E., & Aiken, L. S. (2011). Cognitive and emotional factors associated with elective breast augmentation among young women. *Psychology and Health, 26*, 41-60. doi: 10.1080/08870440903207635
- Nan, X., & Zhao, X. (2012). When does self-affirmation reduce negative responses to antismoking messages? *Communication Studies, 63*, 482-497. doi: 10.1080/10510974.2011.633151
- Napper, L., Harris, P. R., & Epton, T. (2009). Developing and testing a self-affirmation manipulation. *Self and Identity, 8*, 45-62. doi: 10.1080/15298860802079786
- Napper, L., Harris, P. R., & Klein, W. M. P. (2014). Combining self-affirmation with the extended parallel process model: The consequences for

- motivation to eat more fruit and vegetables. *Health Communication*, 29, 610-618. doi: 10.1080/10410236.2013.791962
- Nasser, J. (2001). Taste, food intake and obesity. *Obesity Reviews*, 2, 213-218. doi: 10.1046/j.1467-789X.2001.00039.x
- Orbell, S., & Hagger, M. (2006). Temporal framing and the decision to take part in type 2 diabetes screening: Effects of individual differences in consideration of future consequences on persuasion. *Health Psychology*, 25, 537-548. doi: 10.1037/0278-6133.25.4.537
- Reed, M. B., & Aspinwall, L. G. (1998). Self-affirmation reduces biased processing of health-risk information. *Motivation and Emotion*, 22, 99-132. doi: 10.1023/A:1021463221281
- Richard, R., Van der Pligt, J., & De Vries, N. (1996). Anticipated affect and behavioral choice. *Basic and Applied Social Psychology*, 18(2), 111-129.
- Rivis, A., Sheeran, P., & Armitage, C. J. (2009). Expanding the affective and normative components of the theory of planned behavior: A meta-analysis of anticipated affect and moral norms. *Journal of Applied Social Psychology*, 39, 2985-3019.
- Sandberg, T., & Conner, M. (2008). Anticipated regret as an additional predictor in the theory of planned behaviour: A meta-analysis. *British Journal of Social Psychology*, 79, 589-606. doi: 10.1348/014466607X258704

- Sandberg, T., & Conner, M. (2009). A mere measurement effect for anticipated regret: Impacts on cervical screening attendance. *British Journal of Social Psychology, 48*, 221-236. doi: 10.1348/014466608X347001
- Sandberg, T., & Conner, M. (2011). Using self-generated validity to promote exercise behaviour. *British Journal of Social Psychology, 50*, 769-783. doi: 10.1111/j.2044-8309.2010.02004.x
- Schmeichel, B. J., & Vohs, K. (2009). Self-affirmation and self-control: Affirming core values counteracts ego depletion. *Journal of Personality and Social Psychology, 96*, 770-782. doi: 10.1037/a0014635
- Sheeran, P., Harris, P. R., & Epton, T. (2014). Does heightening risk appraisals change people's intentions and behavior? A meta-analysis of experimental studies. *Psychological Bulletin, 140*, 511-543. doi: 10.1037/a0033065
- Sherman, D. K., & Cohen, G. L. (2006). The psychology of self-defense: Self-affirmation theory. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology* (Vol. 38, pp. 183-242). San Diego, CA: Academic Press. doi:10.1016/S0065-2601(06)38004-5.
- Sherman, D. K., Hartson, K. A., Binning, K. R., Purdie-Vaughns, V., Garcia, J., Taborsky-Barba, S., . . . Cohen, G. L. (2013). Deflecting the trajectory and changing the narrative: How self-affirmation affects academic performance and motivation under identity threat. *Journal of Personality and Social Psychology, 104*, 591-618. doi: 10.1037/a0031495

- Sherman, D. K., Nelson, L. D., & Steele, C. M. (2000). Do messages about health risks threaten the self? Increasing the acceptance of threatening health messages via self-affirmation. *Personality and Social Psychology Bulletin*, *26*, 1046-1058.
- Simonson, I. (1992). The influence of anticipating regret and responsibility on purchase decisions. *Journal of Consumer Research*, *19*, 105-118. doi: 10.1086/209290
- Steele, C. M. (1988). The psychology of self-affirmation: Sustaining the integrity of the self. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 21, pp. 261-302). New York: Academic Press. doi:10.1016/S0065-2601(08)60229-4.
- Trope, Y., & Liberman, N. (2003). Temporal construal. *Psychological Review*, *110*, 403-421. doi: 10.1037/0033-295X.110.3.403
- Vaidya, V., & Malik, A. (2008). Eating disorders related to obesity. *Therapy*, *5*, 109-117. doi: 10.2217/14750708.5.1.109
- Van Koningsbruggen, G. M., & Das, E. (2009). Don't derogate this message! Self-affirmation promotes online type 2 diabetes risk test taking. *Psychology and Health*, *24*, 635-649. doi: 10.1080/08870440802340156
- Van Koningsbruggen, G. M., Das, E., & Roskos-Ewoldsen, D. R. (2009). How self-affirmation reduces defensive processing of threatening health information: Evidence at the implicit level. *Health Psychology*, *28*, 563-568. doi: 10.1037/a0015610

- Wakslak, C. J., & Trope, Y. (2009). Cognitive consequences of affirming the self: The relationship between self-affirmation and object construal. *Journal of Experimental Social Psychology, 45*, 927-932. doi: 10.1016/j.jesp.2009.05.002
- Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological Bulletin, 132*, 249-268. doi: 10.1037/0033-2909.132.2.249
- Witte, K. (1992). Putting the fear back into fear appeals: The extended parallel process model. *Communication Monographs, 59*, 329-349. doi: 10.1080/03637759209376276
- Zeelenberg, M. (1999). Anticipated regret, expected feedback and behavioral decision making. *Journal of Behavioral Decision Making, 12*, 93-106. doi: 10.1002/(SICI)1099-0771(199906)12:2<93::AID-BDM311>3.0.CO;2-S
- Zeelenberg, M., & Pieters, R. (2007). A theory of regret regulation 1.0. *Journal of Consumer Psychology, 17*, 3-18. doi: 10.1207/s15327663jcp1701\_3
- Zhao, X., & Nan, X. (2010). Influence of self-affirmation on responses to gain- vs. loss-framed anti-smoking messages. *Human Communication Research, 36*, 493-511. doi: 10.1111/j.1468-2958.2010.01385.x
- Zhao, X., Peterson, E., Kim, W., & Rolfe-Redding, J. (in press). Effects of self-affirmation on daily vs. occasional smokers' responses to graphic warning labels. *Communication Research*. doi: 10.1177/0093650212465433

### Acknowledgements

The work in this article was supported by the 2010 European Health Psychology Society Networking Grant.

## Footnotes

1. Using listwise deletion ( $n = 65$ ) showed similar effects of baseline behavior ( $B = 1.28$ ,  $SE = 0.20$ ,  $t = 6.58$ ,  $p < .001$ ,  $\eta^2_p = .41$ ) and condition ( $B = 0.80$ ,  $SE = 0.39$ ,  $t = 2.07$ ,  $p = .043$ ,  $\eta^2_p = .07$ ). The model  $R^2$  was .44.
2. We also included a measure of perceived ease of meeting the guidelines at the one-week follow-up. Participants indicated how easy it had been for them to eat sufficient vegetables and fruit in the last 7 days (1 = *not easy*, 7 = *very easy*). We do not discuss this measure in the main text because we included this measure for exploratory reasons and using listwise deletion ( $n = 65$ ) revealed no effect of condition.
3. The hypotheses were also tested in a separate laboratory study that was similar to the study reported in the main text, except for using a different and more distal behavioral measure. Whereas the main study assessed behavior at a one-week follow-up, this study consisted of one session in which we used a computerized food-choice task as a proxy of behavior. This task assessed participants' preference for fruit and vegetables over high-calorie alternatives by using a forced choice methodology (based on Finlayson, King, & Blundell, 2007). Using similar inclusion criteria as in the main study, 42 female students were randomly assigned to either the self-affirmation ( $n = 19$ ) or no-affirmation conditions ( $n = 23$ ). Results were similar to the main study, but self-affirmation did not have an effect on the food-choice task (refuting

- H1c). The food-choice task may have been less suitable as dependent variable because participants completed this blatant measure immediately after they had read about the benefits of fruit and vegetable consumption, thereby possibly inducing demand characteristics. Because the main study included a more proximal behavioral measure as well as a bigger sample, we focus on this study in the main text. Details of the separate laboratory study can be obtained from the corresponding author.
4. We also ran reverse mediation models for the analyses on intentions (H2a) and behavior (H2b). The outcomes further underscore the importance of establishing a temporal order in future research. The alternative indirect path for H2a (self-affirmation [X] → intentions [M] → anticipated regret [Y]) proved to be weaker than the hypothesized mediational chain, though it was significant (indirect effect = 0.36, *SE* = 0.17, 95% *CI* = 0.06-0.76). The alternative indirect path for H2b (self-affirmation [X] → intentions [M1] → anticipated regret [M2] → behavior [Y]) was not significant as the bootstrap confidence interval included zero (indirect effect = 0.008, *SE* = 0.06, 95% *CI* = -0.08-0.14).

Table 1

*Path coefficients and confidence intervals from the serial multiple mediation model estimated using PROCESS*

<i>H2b: serial mediation on behavior</i>			
Path estimates	Coeff. ( <i>SE</i> )	LLCI	ULCI
a1	0.85 (0.28)**	0.30	1.40
a2	0.21 (0.25)	-0.28	0.70
d21	0.55 (0.09)***	0.37	0.73
b1	0.02 (0.12)	-0.22	0.26
b2	0.32 (0.12)**	0.08	0.56
c	0.85 (0.28)**	0.30	1.41
c'	0.62 (0.28)*	0.06	1.18
Indirect effects	Effect ( <i>SE</i> )	LLCI	ULCI
Total	0.23 (0.14)	-0.03	0.52
M1	0.02 (0.12)	-0.20	0.26
M2	0.07 (0.09)	-0.07	0.29
M1 & M2	0.15 (0.08)†	0.03	0.35

*Note.* \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ ; † significant indirect effect; LLCI = 95% lower-limit confidence interval; ULCI = 95% upper-limit confidence interval. All effects controlled for baseline behavior. a1 = path from self-affirmation condition to anticipated regret; a2 = path from self-affirmation

condition to intentions;  $d21$  = path from anticipated regret to intentions;  $b1$  = path from anticipated regret to behavior;  $b2$  = path from intentions to behavior;  $c$  = path from self-affirmation condition to behavior in the model without mediators;  $c'$  = path from self-affirmation condition to behavior in the model with all mediators included;  $M1$  = anticipated regret;  $M2$  = intentions.

## Figure Captions

*Figure 1.* Illustration of the serial multiple mediation model with anticipated regret (M1) and intentions (M2) as proposed mediators of the effect of self-affirmation condition (X) on behavior (Y). All effects controlled for baseline behavior.

