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Self- affirmation increases defensiveness toward health risk information among those experiencing negative emotions: Results from two national samples

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Abstract

Objective—Self-affirmation can promote health behavior change and yield long-term improvements in health via its effect on receptiveness to risk information in behavior change interventions. Across two studies, we examined whether the emotional state of the person presented with health risk information moderates self-affirmation effectiveness.

Methods—Data were collected from two U.S. national samples (n=652, n=448) via GfK, an internet-based survey company. Female alcohol consumers completed an emotion induction (fear, anger, or neutral). They then completed a standard self-affirmation (or no-affirmation) essay-writing task, and subsequently received a health message linking alcohol to breast cancer.

Results—There was a significant interaction between emotion and self-affirmation conditions, such that self-affirmation reduced the specificity of health behavior change plans among those experiencing negative emotion (Study 1: B= −0.55, p<.001), with consistent but not significant effects for anger (Study 2: B= −.47, p=.069. Among self-affirmed participants, essays were rated as significantly less self-affirming for individuals experiencing negative emotion (or anger). Mediation analyses limited to the self-affirmation condition revealed an indirect effect of negative emotion condition on health behavior change plan specificity via self-affirmation ratings of essay content in Study 1: β=0.04, p=.041.

Conclusions—The salutary effect of self-affirmation on plan specificity was reversed with negative emotion. These findings may be attributed to disruption of the self-affirmation process. Individuals who enter interventions employing self-affirmation in a negative emotion state may be less prepared to benefit from other intervention content, and may even be less likely to change health behaviors as a result of the intervention.

Mounting evidence suggests that healthy behaviors can decrease disease risk and delay mortality (Fisher et al., 2002; Ford, Zhao, Tsai, & Li, 2011; Khaw et al., 2008; Pearson et al., 2002; Stefanek et al., 2009). Despite investments in developing health behavior change

interventions, such unhealthy behaviors persist. Many interventions involve presenting information about the health risks associated with a given behavior. Although presenting such information is important for motivating health behavior change, it also has the potential to "backfire." Individuals tend to be defensive in response to information suggesting their behavior puts them at increased risk for harm, which can manifest in motivated processing of the information (i.e., interpreting it as less credible) and less acceptance of the information (Jemmott, Ditto, & Croyle, 1986; Kunda, 1987).

This defensiveness may arise from a basic need to conceptualize oneself as competent and having integrity (Steele, 1988). Information suggesting one's behavior increases risk for disease threatens that need because it suggests one is actively making poor choices. For example, alcohol consumers' self-competence may be threatened by information about disease risk associated with drinking, because it suggests they are deliberatively making choices that are not in their own best interest. Thus, intervention content presenting health risk information associated with a given behavior must be presented carefully to avoid the potential for defensive processing that could lead to derogation of the health risk information and make the intervention less effective.

One means for offsetting defensiveness against risk information in health behavior change interventions is self-affirmation, or reflecting on one's self-competence and -integrity (Steele, 1988). Because self-affirmation bolsters a global sense of self and thus helps fulfill the need to feel competent, it has been shown to offset defensiveness in response to health risk information (e.g., Harris & Napper, 2005) and to reduce avoidance and increase seeking of personalized feedback about one's risk for disease (Ferrer et al., 2014; Howell & Shepperd, 2013; Taber et al., 2015a; 2015b). When paired with health risk information, self-affirmation can increase affective (i.e., worry) or experiential risk perceptions (i.e., "feelings" of risk) about the health threat (Klein, Harris, Zajac, & Ferrer, 2011) and result in intentions to change risky health behaviors (e.g., Armitage, Harris, Hepton, & Napper, 2008) and more specific plans for health behavior change (Ferrer, Shmueli, Bergman, Harris, & Klein, 2011). Self-affirmation may also promote actual health behavior change (Harris et al., 2014), and yield long-term improvements in health (i.e., BMI; Logel & Cohen, 2012). Self-affirmation is a particularly attractive intervention tool because it is "low-touch," in that it is relatively easy to administer, presents very low participant burden, and can be easily incorporated into existing interventions (e.g., Taber et al., in press).

Although self-affirmation is a powerful intervention tool, it is not always effective (e.g., Fry & Prentice-Dunn, 2005; Meier et al., 2015), and meta-analyses demonstrate a significant but modest effect (Epton et al., 2015; Sweeny & Moyer, 2015). Variations in effect suggest that self-affirmation's effectiveness may be moderated by individual differences or psychological factors (e.g., perceived susceptibility; see Good et al., 2011; Griffin & Harris, 2011; Hall, Zhao, & Shafir, 2014; Klein et al., 2011). Understanding when self-affirmation is most efficacious, versus when it holds less promise for facilitating health behavior change when paired with risk information, is the first critical step in maximizing the utility as an intervention tool that can complement and augment other intervention content. One promising moderator to examine is emotions and their role in the generation of risk perception and choice of information processing styles (Lerner & Keltner, 2001;

Loewenstein et al., 2001; Tiedens & Linton, 2001)- both of which are relevant to engagement with health risk information.

There are two ways in which emotion may modify the effects of self-affirmation. First, emotion may influence risk perceptions and risk-taking (i.e., risk propensities). Because individuals who have higher risk propensities are the most defensive against threatening messages (e.g., Griffin & Harris, 2011) and thus the most in need of affirmation, emotions that increase risk propensities may also benefit most from self-affirmation. Thus, individuals who believe their risk for disease is lower or engage in less risky behavior may be less defensive against threatening information and thus less in need of self-affirmation to offset defensiveness, whereas individuals who believe their risk is higher and engage in riskier behavior may be more defensive against such information. Emotions such as anger and happiness can promote optimistic risk perceptions and riskier behavior (Lerner & Keltner, 2000; 2001; Ferrer et al, 2016a; 2016b; Fessler et al., 2004). Thus, angry and happy individuals may have a greater need for self-affirmation to offset defensiveness against health risk information that is caused by high risk propensity in this context. Consistent with this hypothesis, Ferrer and colleagues (2011) demonstrated that self-affirmation's effectiveness was greatest for individuals high in (self-reported) positive affect/happiness.

A second means by which emotion may alter the effectiveness of self-affirmation inductions on reducing defensiveness against risk information is by disrupting the affirmation process *itself.* Because negative emotions predispose attention to negative information (Blaney, 1986; Bower, 1981), individuals experiencing negative emotion may have difficulty generating affirmations that are sufficiently positive or affirming. Similarly, because anger is focused on being transgressed against and righting the transgression (Lazarus, 1991; Frijda, 1996), the negative focus towards transgressors may prevent adequate focus on positive aspects of the self necessary to effectively self-affirm. Moreover, research suggests that self-affirmation may work, in part, by facilitating positive other-directed feelings (Armitage & Rowe, 2011; Crocker et al., 2005; Exline & Zell, 2009), a process which may be disrupted by negative, other-directed emotions.

Across two studies, we examined whether self-affirmation and negative emotion interact to influence receptiveness to a health risk message about alcohol consumption.[i] Alcohol consumption is a modifiable risk factor for a host of health problems, including cancer and hypertension (Corrao et al., 2004). Breast cancer risk is particularly increased by alcohol (Seitz et al., 2012), even at modest levels of consumption (Bagnardi et al., 2013). As such, the message focused on breast cancer risk associated with alcohol consumption, and was targeted to women alcohol consumers.

Individuals were randomly assigned to completed an emotion induction task, where they wrote in detail about a time they were recently angry/sad (Study 1) or angry/fearful (Study 2), or about a room in their house (neutral condition in both studies). Then, they were randomly assigned to complete a self-affirmation induction, where they wrote about a value

[i]These studies also included two additional conditions: Study 1 included happiness and hope; Study 2 included happiness and surprise. However, the manipulations for these positive emotions were not effective, and thus these conditions are not discussed further.

they considered to be important and included details of how they upheld this value in their daily life, or about a value they considered to be less important and why it might be important to another person. The primary outcome of interest was the generation of specific health behavior change plans in response to health risk information, which have been shown to be facilitated by self-affirmation (Ferrer et al., 2011) and subsequently increase the likelihood of achieving a goal (Gollwitzer, 1999; Sheeran & Orbell, 2000). We also assessed behavioral intentions and three types of risk perceptions: deliberative (i.e., likelihood of a threat), affective (i.e., worry about a threat), and experiential (i.e., "gut-level" feelings of vulnerability to a threat) (Ferrer & Klein, 2015; Ferrer et al., 2016). In Study 1, we also recorded information-seeking, or whether individuals clicked a link to get more information about reducing alcohol consumption.

In Study 1, we induced sadness, consistent with negative emotion assessed in previous research (Ferrer et al., 2011), and anger, given its previous links to risky propensities (Lerner & Keltner, 2000; 2001; Ferrer et al, 2016a; 2016b; Fessler et al., 2004). The second study built on this methodology; however, due to imprecise differentiation among self-reported anger and sadness in Study 1, in Study 2 we induced anger and fear, as these are more differentiated. Across both studies, we coded self-affirmation essay content to assess the degree to which it was affirming and positive, as a window into how well the self-affirmation process occurred.

We predicted that emotion and self-affirmation would interact, such that angry individuals would benefit more from the self-affirmation induction than would sad, fearful, or neutral individuals (given that angry individuals would have the riskiest propensities). However, a competing prediction is that any negative emotion (including anger) would interfere with self-affirmation, such that essays in these conditions would be rated less affirming and/or positive, and thus be less effective.

Study 1

Method

Participants—Data were collected via the NSF-funded Time-Sharing Experiments for the Social Sciences (TESS) initiative by GfK,[ii] an internet-based survey company. The proposal for this study was peer-reviewed and approved through the TESS application process and archived on the TESS website (akin to pre-registration). In August 2012, 7959 women on the nationally representative standing GfK panel were selected to participate; 4532 of these responded to the email invitation by completing a screener, and those 697 who reported drinking the equivalent of 3+ alcoholic beverages/week and/or 3+ alcoholic beverages/sitting (the amount of alcohol specified as increasing breast cancer risk in the health risk information, derived from standard GfK panel screening items) were eligible to participate. Some participants deemed eligible by the screener were later excluded because responses indicated they did not drink (n=33); were pregnant (n=6); or had a history of breast cancer (n=6). The final n was 652. Mean age was 45.68 years (SD=16.60). The study remained open for the duration necessary to obtain 100 participants per condition, based on power

[ii] http://www.knowledgenetworks.com/ganp/irbsupport/

analysis specifying high power (.9) to detect a small effect *f* (.15), based on meta-analyses of effects of emotion on decision-making (Lench et al., 2011).

Procedure—The online study employed a 2 (self-affirmation, no-affirmation) x 3 (sadness, anger, neutral) design, with participants randomized to condition using true (as opposed to block) random assignment. The study was presented to participants as two ostensibly separate studies packaged together for convenience (following Lench et al., 2011).

In the "Life Events" study, participants completed a standard emotion induction (Strack, Schwarz, & Gschneidinger, 1985) in which they wrote in detail about a time they felt the angriest [saddest]. This induction produces reliable mild-to-moderate increases in emotion that have been associated with differential decision-making patterns (see Lench et al., 2011), and has been used successfully to induce emotion in internet studies (Ferrer, Taber, & Grenen, 2015).[iii] Neutral participants wrote about a room in their house (Burton & King, 2004). Immediately following the emotion induction, participants were asked to report the extent to which they felt happy, hopeful, sad, and angry (*1 = not at all* through *7 = extremely*). Then, participants completed a standard value affirmation task (McQueen & Klein, 2006), in which they were instructed to write an essay about a value that is important to themselves (self-affirmation) or a value that is not important to them but could be important to someone else (no-affirmation).

Participants were then immediately transitioned to the "Alcohol and Breast Cancer" study, where they read information about breast cancer risk associated with alcohol consumption (used successfully in previous studies; e.g., Klein & Harris, 2009), and completed a questionnaire. Following the study, participants were debriefed and asked not to discuss the study with other panelists.

Measures—The main outcome measure was specificity of plans to change alcohol consumption behavior. To assess behavior change plan specificity, participants were asked, "If you have any interest in altering your alcohol consumption in the next 7 days, how will you go about it? Please list below any steps that you think you will take to reduce your alcohol consumption." Two independent coders (RF and KG) assessed whether steps mentioned a specific location (e.g., I will avoid bars), time (e.g., I will only drink Friday nights), amount of alcohol (e.g., I will stop after one drink), and type of drink (e.g., I will drink water rather than beer), consistent with Ferrer et al. (2011). Because women in this sample had a more diverse age and socioeconomic range than the study in which the initial coding scheme was developed (i.e., college students), an additional component of a specific plan was coded: not purchasing alcohol or keeping it in the house. Inter-rater reliability was

[iii]Upon examination of Study 1 data, we discovered a programming error, which resulted in participants' responses to the emotion elicitation writing task limited to 1024 characters. Exceeding this limit resulted in an error message, and participants were required to edit response to meet the limit. To examine the potential consequences of this error, we identified responses to the emotion elicitation writing task that were 925 characters or fewer; this criterion was selected by calculating the average number of characters per sentence in participants' responses, and determining the character limit for responses that were at least two average sentences shorter than the cut-off, a conservative approach to minimizing the likelihood that these participants ran into the cap and had to revise their responses to fit. The mean character count among the 17 control participants who exceeded this limit was 997 (SD = 21.42, range = 942–1023), and the mean character count among the 29 emotion condition participants who exceeded this limit was 990 (SD = 26.22, range = 932 – 1023). Excluding these participants from analyses did not affect the pattern and significance of findings, and thus we retained the full sample for analyses reported.

high, *K*s = .74–.87. Health behavior change plan scores ranged from 0 (no specifics) to 5 (place, amount, type, time, purchasing mentioned). This outcome was zero-inflated (233 0 responses; 70%), both because many participants left the field blank and because others penned vague responses (e.g., "I would just drink less."). However, among those who wrote plans, there was some variability among specificity, where 75 (23%) participants mentioned one detail; 21 (6%) mentioned two; and 2 (1%) mentioned three.

Two independent coders (RF and a post-baccalaureate fellow) coded the extent to which essays had content that was 1) self-affirming; and 2) positive. The main coder (RF) trained the secondary coder. Training involved assigning readings on self-affirmation, and instructions to rate the extent to which essay content was self-affirming and positive on a continuous 5-point scale. For self-affirmation ratings, an essay was scored a 1 if it mentioned the value was important but did not include any description of the self, any elaboration about the value's importance, or any examples about how the writer upheld the value in her daily life; the essay was scored a 5 if it included an elaboration of why the value was important to the writer and several examples of how the writer upheld the value in her daily life. For positivity ratings, an essay was scored a 1 if it included only negative content (e.g., a description of how someone else had failed to uphold the value; an essay was scored a 3 if it included relatively neutral affective content; and an essay was scored a 5 if it included exclusively positive content. Coders were blind to self-affirmation condition during the coding. Because these ratings were subjective, the two coders first coded ten essays, and then discussed the content of these essays to calibrate codes and come to consensus (these ten essays were not included in correlations). Then, the coders rated ten additional essays to ensure that the calibration had occurred. After the first consensus discussion, the subsequent ten essays were coded consistently, and as such no further calibration discussions occurred. Correlations among ratings were high (r=0.88 and r=0.86) and ratings were averaged.

Intentions were assessed by asking: "I intend to decrease my alcohol consumption in the next 7 days" (*1=definitely will not do - 7=definitely will do*). Deliberative risk perceptions were assessed with two items (r=.67): "How would you rate your chance of developing breast cancer" (*1=very low - 7=very high*), and "Overall, how do you think your chance of developing breast cancer compares to the average woman your age" (*1=much lower - 7=much higher*). Affective risk perceptions were assessed with two items (r=.63): "How worried are you about developing breast cancer because of your drinking behavior" and "How worried are you about your drinking behaviors" (*1=not at all worried - 7=very worried*). Experiential risk perceptions were assessed using an adapted version of the feeling-at-risk scale (Weinstein et al., 2007): "I feel very vulnerable to breast cancer" (*1=strongly disagree - 7=strongly agree*). Participants were also given the opportunity to click on a link to obtain additional information about alcohol cessation.[iv]

Analyses—Primary analyses of the health behavior change plan outcome involved Poisson regressions to account for the zero-inflated distribution, and were conducted in SAS 9.3. Other primary analyses involved analysis of variance (ANOVA) in SPSS 21. Analyses

[iv]Participants who clicked this link (n = 52) were directed to resources on the National Institute on Alcohol Abuse and Alcoholism website (http://rethinkingdrinking.niaaa.nih.gov/Thinking-about-a-change/).

controlled for age, education, and drinks in the past week,[v] and were weighted with post-stratification weights generated by GfK to control for bias associated with the sampling design.[vi]

Analyses were also conducted to determine whether interactions between emotion and self-affirmation conditions resulted because emotion disrupted the self-affirmation process; self-affirmation essay word count, essay self-affirming content ratings, and essay positivity content ratings were compared among emotion conditions. Structural equation models were run in Mplus 5 to examine whether differences in self-affirmation condition effects across emotion condition could be attributed to mediation by ratings of essay content (positivity and self-affirmation ratings). Specifically, we ran two separate models, examining whether negative emotion condition influenced behavior change plan specificity via mediational pathways through positivity or self-affirmation ratings. In all analyses, missing data were treated with listwise deletion.

Results

Induction Checks—Planned comparisons indicated that angry condition participants were indeed angrier than those in the neutral condition, $F(1,459) = 9.30$, $p = .002$, $d = .29$. Sad condition participants were significantly sadder than those in the neutral condition, $F(1,432) = 13.44$, $p < .001$, $d = .35$; however, sad participants were not significantly sadder than angry participants, $F(1,452) = 1.21$, $p = .27$, $d = .10$, nor were angry participants significantly angrier than sad participants $F(1,450) = 0.68$, $p = .41$, $d = .08$. Thus, induction checks suggested that the inductions were effective in increasing negative emotion, but did not work with specificity to change the discrete negative emotions targeted. Because the anger and sadness conditions did not differentiate based on self-reported emotions in the induction check (see below), all analyses beyond the induction check collapsed across these conditions (referred to as the negative emotion condition).[vii] We address this lack of differentiation in Study 2.

[v]These control variables were selected when the study was planned, given previous research showing that emotional experience changes with age (e.g., Carstensen et al., 2000); evidence of increased alcohol consumption among college educated individuals (e.g., Sathe et al., 2013); and research suggesting that self-affirmation is more effective as the health risk information becomes more relevant (here, the more drinks are consumed; e.g., Griffin & Harris, 2011). The pattern and significance of findings remained unchanged when these control variables were excluded.

[vi]The sample for the study is drawn from a nationally representative, probability-based panel of non-institutionalized U.S. adults who are recruited using statistically valid sampling techniques. Weights are designed to reduce bias due to nonresponse and potential undercoverage within each experimental cell. There are small fluctuations in the panel size due to ongoing recruitment, voluntary withdrawal, and involuntary retirement of high-tenured panel members. Since members have been recruited using different probability-based sampling methods across time, there are different factors that influence the selection probability of a panel member into a given study. Weighting the sample within each experimental condition ensures that each cell is representative of the population of interest (i.e., female alcohol consumers), and that analyses reflect the demographic makeup of this population. In sum, incorporating survey weights controls for biased statistical estimates that could be derived from the complex sampling design, in the context of the experimental design for the current study. After an experiment is conducted, GfK generates a weight for each participant that accounts for selection probabilities and is adjusted to known population totals to compensate for differential nonresponse and sampling frame. The following target distributions are applied using an iterative proportional fitting algorithm to compute final weights: gender, age, race-ethnicity, primary language, education, census region, metropolitan region, internet access, household income, and home ownership status. A quality control check is applied to each weight to identify any extreme outliers to minimize the variance inflation that will result due to unequal weighting.

[vii]We also conducted ancillary analyses restricted to the anger vs. neutral conditions. The pattern and significance of results did not change in these ancillary analyses.

Main analyses—Table 1 contains means and standard deviations stratified by study condition. Table S1 contains correlations between outcome variables stratified by condition. For information-seeking, the distribution of clicks to seek additional information was as follows: Self-affirmation negative emotion: 16 (7%); no-affirmation negative emotion: 23 (11%); self-affirmation neutral emotion: 5 (5%); no-affirmation neutral emotion: 8 (7%).

Health behavior change plans—As expected, in the neutral emotion condition, the self-affirmation condition generated more specific health behavior change plans than the no-affirmation condition (B=0.50, p=.026, d=0.66). In the full sample, there was no significant effect of either self-affirmation (B = −0.23, p = .065, d = −0.30) or negative emotion (B = 0.07, p = .448, d = 0.09). However, and importantly, there was a significant interaction between emotion and self-affirmation conditions (B = −1.03, p < .001, d = −1.70; Figure 1 Top Panel), such that self-affirmation *reduced* the specificity of health behavior change plans among those in the negative emotion condition (B = −0.55, p < .001, d = −0.75). Analyses restricted to the no-affirmation condition indicate that negative emotion significantly increased behavior change plan specificity (β = 0.58, p = .004, d = 0.80).

Risk perceptions and intentions—Self-affirmation condition had a direct effect on experiential risk perceptions, F(1, 640)=28.66, p=.002, d=0.42, such that affirmed participants had higher experiential risk perceptions than non-affirmed participants. Emotion did not directly influence experiential risk perceptions (F(1,640)=1.20, p=.274, d=0.09), nor was there an interaction (F(1,640)=1.25, p=.264, d=0.09). There were no significant main or interactive effects on deliberative (self-affirmation: F(1,636)=1.01, p=.315, d=0.08; emotion F(1,636)=0.34, p=.563, d=0.05; interaction: F(1,636)=2.56, p=.110, d=0.13) or affective risk perceptions (self-affirmation: F(1,638)=0.60, p=.440, d=0.06; emotion F(1,638)=1.52, p=.218, d=0.10; interaction: F(1,638)=.17, p=.681, d=0.03). There were no significant main or interactive effects on self-reported behavioral intentions (self-affirmation: F(1,643)=0.54, p=.463, d=0.06; emotion F(1,643)=0.56, p=.455, d=0.06; interaction: F(1,643)=0.20, p=.653, d=0.04).

Information-seeking—Self-affirmation produced significantly less information-seeking, compared to no-affirmation (OR = 0.35, 95% CI = 0.190.66,5.29, p = .001). There was a main effect of negative emotion, such that those in the negative emotion condition were more likely to seek information than those in the neutral condition (OR = 2.30, 95% CI = 1.16,4.72, p = .024). There was no significant interaction between self-affirmation and negative emotion in predicting information seeking (OR = 0.33, 95% CI = 0.08,1.43, p = .143).

Ratings of essay content—Self-affirmed participants wrote a mean of 50.72 words (SD=42.61). Participants in the self-affirmation condition wrote more affirming content in their essays than did participants in the no-affirmation condition (β = .46, p < .001, d = 1.04), confirming the fidelity of the induction. Compared to the neutral condition, participants in the negative emotion conditions wrote significantly fewer words in their essays (β = −.17, p = .002, d = −0.35). The interaction between self-affirmation condition and emotion condition on essay word count was not significant, F(1, 652) = 2.77, p = .097.

There was a significant interaction between self-affirmation condition and emotion condition on ratings of self-affirming content in essays, $F(1, 652) = 23.42$, $p < .001$. The interaction between self-affirmation condition and emotion condition on positivity ratings was not significant, $F(1, 652) = 3.59$, $p = .058$. Importantly, among self-affirmed participants, those in the negative emotion condition wrote essays rated as significantly less self-affirming ($\beta = -.30$, $p < .001$, $d = -0.63$) than those in the neutral emotion condition. However, note that even within the negative emotion condition, self-affirmed participants wrote more affirming essays than did non-affirmed participants ($\beta = .39$, $p < .001$, $d = 0.97$). Thus, negative emotion only partially disrupted the self-affirmation process; participants in these conditions were still self-affirmed.

Mediation Analyses—Analyses limited to the self-affirmation condition revealed that self-affirming ratings predicted health behavior change plans ($\beta = .15$, $p = .046$, $d = 0.32$), and the indirect effect of negative emotion condition on health behavior change plans via self-affirmation rating was significant ($\beta = 0.04$, $p = .041$; Figure 2 Top Panel). Positivity rating did not significantly predict health behavior change plans ($\beta = .09$, $p = .152$), nor was the indirect effect of negative emotion on behavior change plans significant ($\beta = .04$, $p = .222$). Similarly, essay word count did not significantly predict health behavior change plans ($\beta = .04$, $p = .519$), nor was the indirect effect of negative emotion on health behavior change plans significant ($\beta = .02$, $p = .495$). Thus, reduced specificity of behavior change plans in the negative emotion condition may be explained by the self-affirming content in essays, but not the positivity of the essays or their length.

Discussion

This study suggests that negative emotion may interrupt the effects of self-affirmation condition on defensiveness toward health risk information. Individuals who received an anger or sadness induction generated significantly less specific health behavior change plans when affirmed, compared to when not affirmed. We also found that those in the no-affirmation conditions who received an anger or sadness induction generated significantly more specific health behavior change plans than those in the neutral condition. Just as importantly, analyses also suggest that the attenuation of self-affirmation induction effectiveness among individuals experiencing negative emotion may be due, in part, to a disruption of the self-affirmation *process* itself. Individuals in the negative emotion condition generated significantly less affirming essays, and the self-affirming content of these essays mediated the effect of negative emotion on health behavior change plans in the self-affirmation condition. Although those in negative emotion conditions also generated less positive essays, and essays with fewer words, neither of these variables was a significant mediator of effects – what mattered most was how well the participant had self-affirmed. Finally, we found that, among those in the no-affirmation condition, the negative emotion induction increased plan specificity and information-seeking.

Although these results clearly point to negative emotion as a limiting condition for the effectiveness of self-affirmation as an intervention tool, potentially through a disruption of the self-affirmation process, a limitation of this study is that the negative emotion inductions did not satisfactorily distinguish anger and sadness. Thus, we designed Study 2 to more

carefully differentiate between discrete negative emotion states by both refining the induction and selecting more differentiated discrete negative emotions to target (anger and fear).

Study 2

Method

Participants—Data were again collected via GfK, via TESS. As in Study 1, the proposal was peer reviewed and approved through the TESS application process, and was archived on the TESS website. In February 2015, 16,261 female panelists were selected. Women were eligible if they had no personal history of cancer, and reported drinking more than five drinks per week in a screener (selected as a more stringent inclusion criterion than in Study 1, as effects of self-affirmation condition are increased with information relevance (Griffin & Harris, 2011), and derived with screening items tailored for this study). Of the 9706 who responded to the email invitation by completing a screener, 747 were eligible, and 448 completed the study. Mean age was 48.09 years (*SD*=16.08).

Procedure—The online study employed a 2 (self-affirmation, no-affirmation) x 3 (fear, anger, neutral) randomized design. The design was identical to Study 1, except that fear was induced instead of sadness. Moreover, the induction was refined to more effectively induce emotions, based on a meta-analysis of internet-administered emotion inductions (Ferrer et al., 2015). Specifically, instructions were modified such that participants in the emotion conditions were asked to write in detail about a time they *recently* felt the emotion.

Measures—Measures in Study 2 were identical to those in Study 1, with one exception: deliberative risk perceptions were assessed with one item assessing comparative risk perceptions (the absolute risk perception item employed in Study 1 was omitted from Study 2 due to survey size limitations). The health behavior change plans outcome was generated by two coders (RF and an independent contractor). Inter-rater reliability was high, *K*s=.82–.88.[viii] Again, this outcome was zero-inflated (283 zero responses; 63%), but had variability among those who wrote plans, such that 87 (19%) participants mentioned one detail; 53 (12%) mentioned two; 20 (5%) mentioned three; 4 (1%) mentioned 4; and 1 (< 1%) mentioned all five.

Two independent coders (RF and the same post-baccalaureate fellow who coded essays for Study 1) coded the extent to which essays had content that was 1) self-affirming; and 2) positive. The training process and coding scheme were identical to Study 1. Coders were blind to the condition corresponding to each essay during the coding. Correlations among these ratings were high (*r*=0.89 and *r*=0.84, respectively) and ratings were averaged.

Analyses—Data analyses followed the same strategy as Study 1; however, because anger and fear were differentiated in the induction check, planned comparisons were conducted in

[viii]Participants were also given the opportunity to link to additional information about the link between alcohol and breast cancer; however, only 19 participants clicked the link (self-affirmation anger: 2 [3%]; no-affirmation anger: 6 [8%]; self-affirmation fear: 2 [3%]; no-affirmation fear: 2 [3%]; self-affirmation neutral: 4 [5%]; no-affirmation neutral: 3 [[4%]), and these data were not analyzed.

SAS 9.3 to examine whether the interaction between emotion and self-affirmation conditions differed in the fear and anger conditions. Moreover, in analyses of behavior change plans, the three-level emotion condition was dummy-coded into two predictors (anger and fear); these, along with self-affirmation condition, were entered into a Poisson Regression predicting behavior change plan specificity. After main effects were evaluated, a second regression was conducted including the interaction between anger and self-affirmation conditions and the interaction between fear and self-affirmation conditions.

Results

Induction Checks—Angry condition participants were angrier than neutral participants, $t(445) = 6.83$, $p < .001$, $d = .65$. Fear condition participants were more fearful than neutral participants, $t(445) = 2.51$, $p = .007$, $d = .24$. Fear condition participants were also more fearful than anger condition participants, $t(445) = 2.15$, $p = .032$, $d = .20$, and anger condition participants were angrier than fear condition participants $t(445) = 3.97$, $p < .001$, $d = .38$, as intended.

Main analyses—Table 2 contains means and standard deviations stratified by condition. Table S1 contains correlations among outcome variables stratified by experimental condition.

Health behavior change plans—There was no main effect of self-affirmation condition ($B = 0.06$, $p = .692$), anger ($B = 0.03$, $p = .852$), or fear ($B = -0.02$, $p = .902$). There was a significant interaction between anger and self-affirmation conditions ($B = 0.62$, $p = .048$; Figure 1 Bottom Panel), such that self-affirmation did not influence behavior change plans among neutral participants ($B = .270$, $p = .139$), but the negative association in the anger condition approached significance ($B = -.47$, $p = .069$). Moreover, in the no-affirmation condition, anger resulted in more specific behavior change plans than did neutral emotion ($B = .43$, $p = .039$), an effect not observed in the self-affirmation condition ($B = -.28$, $p = .216$). The interaction between fear and self-affirmation conditions was not significant ($B = -.13$, $p = .731$)."

Risk perceptions and intentions—Planned comparisons indicated that angry participants had greater deliberative risk perceptions than fearful participants, $F(1,434) = 5.06$, $p = .025$, and neutral participants, $F(1,434) = 6.49$, $p = .011$. No other significant effects of emotion or self-affirmation conditions were observed (see Table S2).

Self-affirmation ratings of essay content—Analyses examined whether emotion condition influenced the self-affirmation process itself, rather than modifying the effect of self-affirmation inductions. Self-affirmed participants wrote a mean of 77.74 words (SD=80.56). Across all participants, individuals in the self-affirmation condition wrote essays rated as more self-affirming than those in the no-affirmation condition ($\beta = .41$, $p < .001$, d =0.93), confirming the fidelity of the induction. The interaction between self-affirmation condition and emotion condition on essay word count was not significant, $F(1, 442) = 0.39$, $p = .678$. Tukey's test indicated that neutral emotion participants' essay word counts did not differ significantly from angry (p=.455) participants. Moreover, fearful

participants' word counts did not differ significantly from angry (p=.752) or neutral (p=.145) participants' essay counts.

The interaction between self-affirmation condition and emotion condition on ratings of self-affirming essay content was significant, $F(1, 442) = 3.50$, $p = .031$. Moreover, angry participants' essays were rated as substantially less self-affirming than neutral participants' essays (p=.026). Fearful participants' essays did not differ in self-affirming content compared to angry participants' (p=.214) nor neutral participants' essays (p=.700). The interaction between self-affirmation condition and emotion condition on positivity ratings of essay content was also significant, $F(1, 442) = 9.18$, $p < .001$. Although the positivity of angry participants' essays did not differ from that of neutral participants' essays (p=.142), angry participants wrote essays deemed as less positive than fearful participants (p=.016). Note, however, that the self-affirmation process did not seem to be disrupted entirely among angry participants; even those in the anger condition wrote more self-affirming essays in the self-affirmation condition, compared to no-affirmation ($\beta = .38$, $p < .001$, $d = 0.87$). There were no differences in the positivity of content rated in fearful and neutral participants' essays (p=.577).

Mediation Analyses—Analyses limited to the self-affirmation condition showed that extent of self-affirmation ratings significantly predicted health behavior change plans ($\beta = 0.25$, $p = .002$), and the indirect effect of anger on health behavior change plans via self-affirmation rating was not significant but was in the expected direction ($\beta = .06$, $p = .090$; Figure 2 Bottom Panel). The other possible mediator (positivity) was not significant; positivity rating did not significantly predict health behavior change plans ($\beta = -.01$, $p = .954$), nor was the indirect effect of anger on health behavior change plans significant ($\beta = -.01$, $p = .954$).

Discussion

This study further supports the notion that negative emotion – here, anger specifically – can modulate the effectiveness of self-affirmation as an intervention tool that would reduce defensiveness to health risk information. We found that angry participants benefited significantly *less* from the self-affirmation inductions, compared to those in the neutral and fear conditions. Moreover, angry participants had *greater* deliberative risk perceptions for breast cancer regardless of self-affirmation condition. Although these findings contradict evidence suggesting that anger triggers optimistic risk perceptions (Lerner & Keltner, 2000; 2001), they are, however consistent with emerging evidence suggesting that anger decreases risk perceptions and risk-taking only among men, and may even raise risk perceptions among women (Ferrer et al., 2016b; Fessler et al., 2004). Thus, anger may have facilitated more pessimistic risk perceptions because the sample was comprised exclusively of women. From this perspective, the finding that self-affirmation inductions were more beneficial for individuals in the fear and neutral conditions – conditions where risk perceptions were greater and thus there was greater need for self-affirmation and potential for benefit – is consistent with the predictions that those with the greatest need to offset risk propensities would benefit most from affirmation.

Nonetheless, the finding that self-affirmation inductions were detrimental in the anger condition suggests an additional explanation, beyond a greater need for affirmation in the fear and neutral conditions. Results were somewhat consistent with the idea that the self-affirmation process itself may be disrupted: the anger condition participants wrote significantly less affirming essays, although mediation analyses linking self-affirmation condition to health behavior change plans in the anger condition were not significant (perhaps owing to reduced power, as this study was not powered for complex mediation analyses within cells). Future research is necessary to shed light on mechanisms underlying the reversal of effectiveness of self-affirmation inductions among angry individuals.

General Discussion

Self-affirmation holds tremendous promise as a relatively "low-touch" intervention tool that can augment other intervention components (i.e., risk information) by offsetting defensiveness. However, variable effects suggest the possibility that self-affirmation inductions are not always effective (Epton et al., 2015; Sweeny & Moyer, 2015), and it is critical to identify moderating conditions under which self-affirmation inductions are more or less promising as an intervention tool. Across two studies, we found that negative emotions- and perhaps anger in particular – can be one such moderator. Among neutral emotion participants, patterns were consistent with previous research suggesting that self-affirmation reduces defensiveness, resulting in more specific behavior change plans (e.g., Ferrer et al., 2011). However, and more importantly, the salutary effect of self-affirmation condition on plan specificity was *reversed* in negative emotion conditions (Study 1), and in the anger condition (Study 2). Moreover, the self-affirmation induction had a (negative) main effect on information-seeking (Study 1), although restricted variability on this outcome limits more definitive interpretations of this outcome. Taken together, both studies suggest that the interaction between negative emotion/anger and self-affirmation conditions on health behavior change plans may be attributed, at least in part, to disruption of the affirmation process.

These findings have implications for the use of self-affirmation inductions as health behavior change intervention tools. Individuals who enter an intervention in a negative emotional state may be less primed to benefit from other intervention content, and may even be less likely to change health behaviors as a result of the intervention. This problem may be exacerbated in contexts in which negative emotions are more prevalent among intervention recipients. Behavior change interventions for populations with disproportionately high levels of negative emotions (e.g., those experiencing elevated distress) may be less ideal candidates for the use of self-affirmation induction as an intervention tool (although future research is necessary to examine whether self-affirmation interacts with chronic negative emotions). For example, interventions designed to change health behaviors among those diagnosed with cancer may need to rely on other intervention content to reduce defensiveness against health risk information, given elevated levels of distress in this population (e.g., Lam et al., 2012; Yanez et al., 2013). Moreover, it may be necessary to carefully consider the use of self-affirmation inductions in interventions designed to change behaviors that are used as secondary emotion regulatory strategies. For example, individuals who leverage smoking as a means for coping with stress may experience heightened negative emotions during the quit

process (Cohen et al., 1990; Shiffman et al., 1996), and thus may benefit from self-affirmation inductions in intervention content presented to motivate quitting, but self-affirmation inductions may be less effective in intervention content administered to facilitate sustained cessation after the quit attempt has already occurred. Additional research is necessary to examine these possibilities.

The finding that negative emotion/anger may modulate the effectiveness of self-affirmation inductions by disrupting the affirmation process itself provides important information for refining self-affirmation intervention tools to improve their effectiveness among individuals in negative emotional states. Presumably due to facilitating a negative informational focus (Blaney, 1986; Bower, 1981; Lazarus, 1991; Frijda, 1996) individuals in negative states were less able to generate affirming essay content. Indeed, difficulty in self-affirmation may be compounding or recursive, given research suggesting that inability to generate a requested number of arguments to support an attitude results in weaker endorsement of that attitude (Haddock, Rothman, & Schwarz, 1996). A similar effect may occur when individuals are not able to write in adequate or convincing detail about how they uphold an important value, where difficulty in generating self-affirming content is actually self-disavowing. Although self-affirmation is most often facilitated via the procedures employed in these studies (i.e., essay writing; see McQueen & Klein, 2006), there are other means by which self-affirmation can be facilitated, which may be more effective for those who have difficulty self-generating affirming content. For example, some studies affirm individuals by asking a series of questions designed to be answered in the affirmative (e.g., Reed & Aspinwall, 1999). Because these questions are affirming when answered in the affirmative and do not require any self-generated content, it is possible they would be more effective among those in negative emotional states. Future research should address this.

We found that negative emotion (and anger specifically) led to more specific behavior change plans in the no-affirmation condition, as well as more information-seeking (in Study 1). There are several mechanisms that may underlie this effect. One possibility is that individuals experiencing negative emotion may respond to the risk information by developing plans for the least risky course of action (i.e., reducing alcohol consumption). This possibility is consistent with research suggesting that risk perceptions are increased by negative emotions (i.e., anger) among women (Ferrer et al., 2016b), and that gender moderates the effect of anger on risk-taking (Ferrer et al., 2016a; Fessler et al., 2004). It is also possible that these effects are driven by the motivational/functional nature of negative emotion (e.g., Keltner & Gross, 1999) and anger specifically (e.g., Harmon-Jones et al., 1998). In absence of self-affirmation inductions, negative emotion may trigger action tendencies that translate to more specific health behavior change plans.

Of note, self-affirmation condition did not directly influence intentions for reducing alcohol consumption, nor was there in interaction between emotion and self-affirmation conditions for this outcome. This is not inconsistent with other studies on self-affirmation and alcohol consumption (Ferrer et al., 2011; Meier et al., 2015). Moreover, the effect on specific health behavior change plans is notable, and arguably more consequential, given that such specific plans increase the likelihood of achieving a goal above and beyond intentions (Gollwitzer, 1999; Sheeran & Orbell, 2000). However, the clinical meaningfulness of significant

differences reported (less than 0.30 on a scale from 0–5) remains unclear. As such, future research should examine whether behavior change plans generated by self-affirmation inductions result in actual behavior change (and whether self-affirmation may trigger behavior change among those in a negative emotional state even without generating specific behavior change plans). Given that self-affirmation ostensibly facilitates behavior change by reducing defensiveness to health risk information and thus priming motivation to leverage other resources to facilitate behavior change (Sherman & Cohen, 2014), it follows that disruptions of the self-affirmation process resulting in less motivation to change behavior or less specific behavior change plans would extend to actual behavior change (that is, if self-affirmation cannot facilitate behavior change plans, it seems unlikely that it will influence actual behavior).

These studies have a number of additional limitations, including lack of differentiation between anger and sadness in the first study, limiting conclusions about the role of specific negative emotions in disrupting the self-affirmation process. Future research should examine whether emotion specificity plays a role in self-affirmation, or whether general affect is the critical moderator. Moreover, future research should examine the role of both general and discrete positive emotions. Given the focus on breast cancer in the health message, study conclusions are also limited in that they may differ by gender. Future research should examine whether the effectiveness of self-affirmation inductions is moderated by emotions among men. This is particularly important given that men respond to negative emotions such as anger with riskier perceptions and behaviors than do women (Ferrer et al., 2016a; Ferrer et al., 2016b; Fessler et al., 2004). The conclusions in Study 2 are also limited in that the simple effects of self-affirmation condition were not significant, although the interaction between the two was significant in the full sample. Similarly, the simple effects of self-affirmation condition in the neutral emotion condition only approached significance. Reduced statistical power in stratified analyses may underlie this pattern, and results were consistent with the notion that self-affirmation inductions are more beneficial in the neutral condition and less beneficial in the anger condition.

These limitations are offset by a number of strengths, including the use of large national samples and replication across two studies. Although the data contain ambiguities with respect to consistency, they raise caution regarding a relatively “low touch” intervention often seen as a panacea in health behavior change research, and highlight generative avenues for future research. Findings have important implications for incorporation of self-affirmation inductions as a tool that can complement health risk information in health behavior change interventions. This may be particularly important when the interventions are targeted to populations with high levels of negative emotion, or for interventions that target cessation of behaviors used to regulate negative emotions. Although self-affirmation inductions have tremendous promise as a tool that may improve health outcomes, translation efforts must take care to give attention to the emotional context before incorporating self-affirmation inductions into health behavior change interventions.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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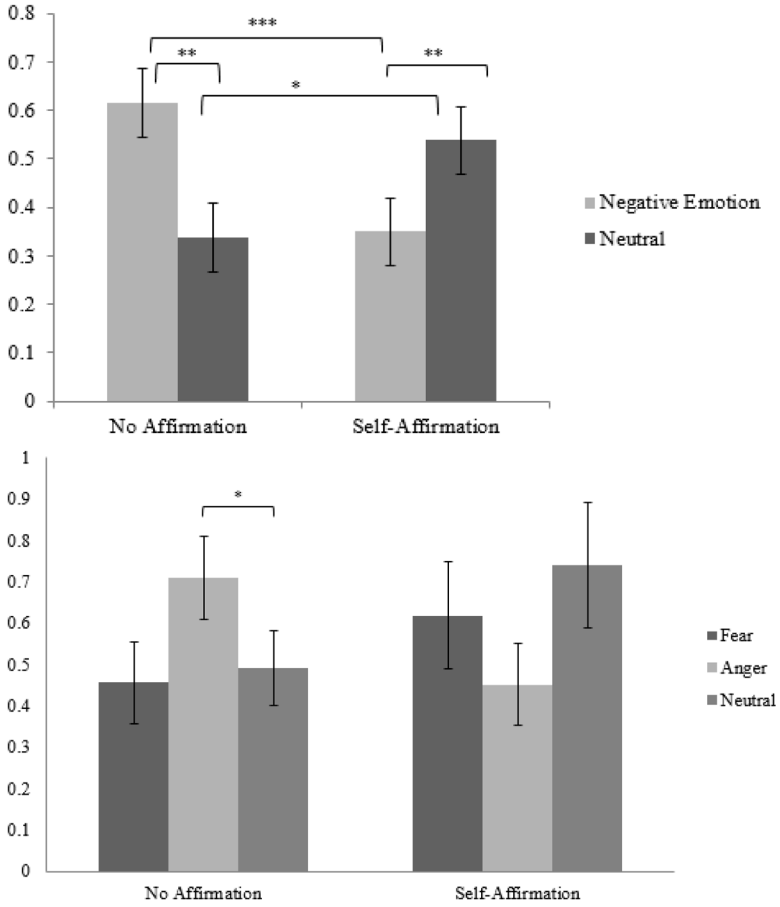

Figure 1.

Behavior Change Plans (mean and standard error). **Top Panel:** Experiment 1. **Bottom Panel:** Experiment 2.

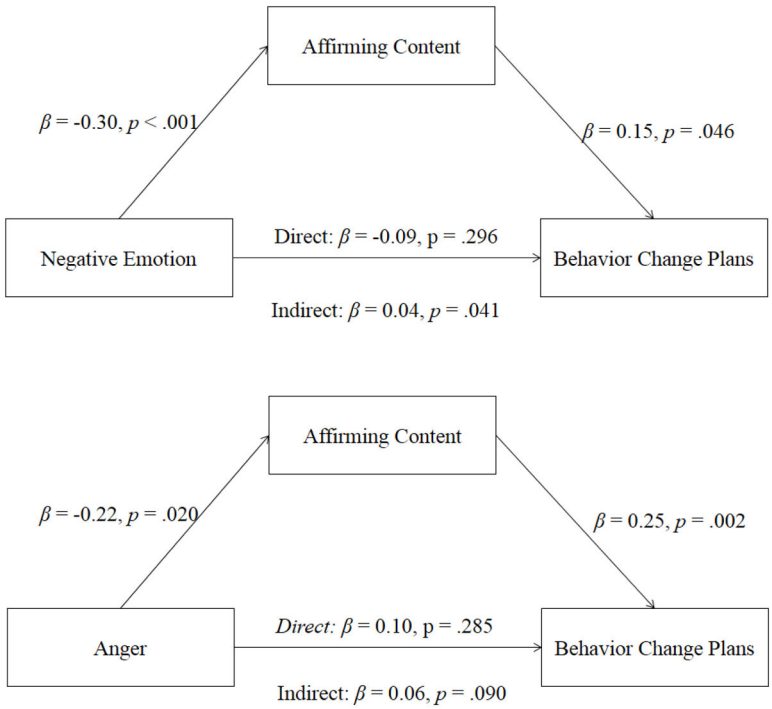

Figure 2.

Mediation analyses (self-affirmation condition). **Top Panel:** Experiment 1*. **Bottom Panel:** Experiment 2.

Table 1

Study 1 Weighted Mean (*SD*) by Experimental Condition

	SA Neutral *n* = 106[1]	**SA Negative *n* = 225[2]**	**NA Neutral *n* = 110[3]**	**NA Negative *n* = 211[4]**
Behavior Change Plans	0.54 (0.81)[A]	0.35 (0.59)[B]	0.34 (0.61)[B]	0.62 (0.83)[A]
Intentions	3.67 (2.18)	3.74 (2.02)	3.47 (1.95)	2.70 (2.04)
Deliberative Risk Perceptions	3.50 (1.44)	3.26 (1.29)	3.23 (1.13)	3.32 (1.37)
Affective Risk Perceptions	2.12 (1.37)	2.19 (1.50)	1.98 (1.13)	2.14 (1.37)
Experiential Risk Perceptions[5]	3.21 (1.90)	2.89 (1.65)	2.61 (1.56)	2.60 (1.70)
Essay Word Count[6]	52.8 (42.1)	48.2 (41)	38.4 (31.2)	29.2 (25.4)
Self-affirmation Rating[5]	2.52 (1.29)[A]	1.76 (1.08)[B]	1.06 (0.50)[C]	1.03 (0.60)[C]
Positivity Rating	3.35 (1.44)	2.76 (1.43)	2.75 (1.41)	2.61 (1.45)

Note: SA = Self-affirmation Condition; NA = No-affirmation condition; Shared letter subscripts in each row are not significantly different ($p < .05$) and are provided only for outcomes with a significant interaction.

[1] Data were missing from 1 participant for experiential risk perceptions.

[2] Data were missing from 3 participants for intentions and 3 participants for affective risk perceptions

[3] Data were missing from 2 participants for experiential risk perceptions and 2 participants for experiential risk perceptions

[4] Data were missing from 6 participants for intentions and 2 participants for affective risk perceptions

[5] Significant main effects with SA > NA.

[6] Significant main effects with Neutral > Negative.

Table 2

Study 2 Weighted Mean (*SD*) by Experimental Condition

	SA Neutral ***n*** **= 77**[1]	**SA Anger** ***n*** **= 76**	**SA Fear** ***n*** **= 68**[2]	**NA Neutral** ***n*** **= 75**[3]	**NA Anger** ***n*** **= 78**	**NA Fear** ***n*** **= 74**[4]
Behavior Change Plans	0.74 (1.06)^{AB}	0.45 (0.83)^{AB}	0.62 (1.04)^{AB}	0.49 (0.76)^{A}	0.71 (1.12)^{B}	0.46 (0.83)^{AB}
Intentions	3.34 (1.92)	3.77 (1.90)	3.40 (1.89)	3.44 (1.76)	3.52 (2.00)	3.37 (1.86)
Deliberative Risk Perceptions[5]	3.70 (1,30)	3.83 (1.50)	3.75 (1.31)	3.69 (1.09)	4.27 (1.29)	3.59 (1.34)
Affective Risk Perceptions	3.10 (1.94)	3.33 (1.85)	3.50 (1.63)	3.30 (1.54)	3.44 (1.55)	3.19 (1.56)
Experiential Risk Perceptions	2.86 (1.41)	3.23 (1.85)	2.30 (1.51)	2.76 (1.43)	3.05 (1.65)	2.83 (1.47)
Essay Word Count	90.8 (88.3)	75.3 (77.5)	65.6 (73.4)	51.2 (41.3)	41.9 (33.3)	33.9 (26.3)
Self-affirmation Rating[6]	2.35 (1.44)^{A}	1.75 (1.46)^{B}	2.16 (1.46)^{AB}	1.20 (0.70)^{C}	1.12 (0.61)^{C}	0.90 (0.59)^{D}
Positivity Rating[7]	2.93 (1.39)^{AB}	2.50 (1.56)^{BC}	3.17 (1.38)^{A}	3.12 (1.28)^{A}	3.08 (1.31)^{A}	2.39 (1.53)^{C}

Note: Shared letter subscripts in each row are not significantly different ($p < .05$) and are provided only for outcomes with a significant interaction.

[1] Data were missing from 1 participant for behavior change plans and 1 participant for affective risk perceptions.

[2] Data were missing from 1 participant for affective risk perceptions

[3] Data were missing from 1 participant for behavior change plans and 3 participants for intentions

[4] Data were missing from 1 participant for deliberative risk perceptions.

[5] Significant main effect with Anger > Fear, Neutral

[6] Significant main effect with SA > NA

[7] Significant main effect with Fear > Anger