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Adapting a self-affirmation intervention for use in a mobile application for smokers

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Abstract Self-affirmation interventions can reduce defensive responses to threats to the self, but have had limited reach to the general population. We sought to create an effective and feasible version of the Kindness Questionnaire self-affirmation intervention for use on a mobile device outside the traditional university laboratory setting and by non-student participants. In an online experiment, 603 cigarette smokers (M_{age}= 37.5 years, SD = 10.2) were randomly assigned to one of six conditions in a 2 (Self-Affirmation: Self-Affirmation, No Self-Affirmation Control) × 3 (Example Type: Written, Imagined, No Examples) fully-crossed design. Participants read a message about the health harms of smoking. None of the self-affirmation variations were effective or feasible: the self-affirmation showed null effects on the primary outcomes of message acceptance, perceived message effectiveness, and reactance. It also backfired by reducing intentions to quit smoking and risk perceptions. Participants spent little time reading the health message, and those in the written self-affirmation condition infrequently provided detailed responses. Translating interventions developed and tested for efficacy in laboratory settings to "real-world" settings is necessary but challenging.

Keywords Self-affirmation · Smoking · Reactance · Behavioral intentions · Feasibility

Introduction

Cigarette smoking is the most common preventable cause of death in the U.S. (U.S. Department of Health and Human Services, 2014). Smoking cessation is difficult: many smokers relapse several times (Hughes et al., 2004). One barrier to cessation interventions is that smokers may react defensively (McQueen et al., 2013) to messages or images regarding the health consequences of continued smoking (McQueen et al., 2015). In particular, smokers may engage in reactance, which is characterized by anger, counterarguing, and perceiving threat to one's freedom (Hall et al., 2016; 2017). When people react defensively, they are more likely to avoid, deny, and dismiss personally relevant health information that could otherwise lead to engagement in preventive health behaviors (McQueen et al., 2013; van't Riet & Ruiter, 2013).

Self-affirmation interventions can reduce defensive responses to threatening information in multiple domains, including health, education, and relationships (Cohen & Sherman, 2014; Epton et al., 2015; Sweeney & Moyer, 2015). According to self-affirmation theory, people are motivated to view themselves positively and as having high integrity (Steele, 1988). When this positive self-view is threatened—such as by negative feedback about one's harmful smoking behavior—affirming other valued aspects of the self can decrease defensive responses. A self-affirmation is an "act that manifests one's adequacy and thus affirms one's sense of global self-integrity" (Cohen & Sherman, 2014, p. 337). Examples of affirming activities include spending time with friends, attending religious

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services, or writing about personally-important values (Cohen & Sherman, 2014). Multiple reviews (Cohen & Sherman, 2014; Harris & Epton, 2009; Schüz et al., 2017) and three meta-analyses (Epton et al., 2015; Ferrer & Cohen, 2018; Sweeney & Moyer, 2015) have shown that self-affirmations promote positive health-related outcomes such as message acceptance and greater behavior change intentions and actions.

Self-affirmation interventions have been conducted with smokers, who often respond defensively to smoking-related health information (Erceg-Hurn & Steed, 2011; Hall et al., 2016). However, the benefits of self-affirmation for smokers have been mixed; whereas multiple studies have shown that self-affirmation can benefit smokers (Armitage et al., 2008; Epton et al., 2014; Harris et al., 2007; Taber et al., 2016), a few have reported null or backfiring effects (Dillard et al., 2005; Schneider et al., 2012; Zhao et al., 2014). These mixed findings indicate a need for effective and disseminable self-affirmation interventions for this critical population.

There are multiple effective self-affirmation induction strategies (McQueen & Klein, 2006). One common strategy asks participants to review a list of values, choose one, and then write about why it is personally important (Cohen & Sherman, 2014). Another method—the Kindness Questionnaire—consists of 10 items asking participants if they have ever engaged in acts of kindness towards other people (Reed & Aspinwall, 1998). It is designed so that participants should be able to answer "yes" to all of the items. Participants also provide written examples for each item. This induces participants' perceptions of themselves as compassionate and kind through remembering past instances of personal kindnesses and allows participants to affirm a positive view of themselves. In the original use of this affirmation, female caffeine drinkers who self-affirmed engaged in less biased processing of information about the link between caffeine and breast disease (Reed & Aspinwall, 1998). A meta-analysis showed that the values and kindness self-affirmations were equally effective at promoting intentions and behavior (Sweeney & Moyer, 2015). Brief self-affirmation interventions can also be effective: some involve writing for 10 min or less (Cohen & Sherman, 2014) and one involves merely completing a single question stem (i.e., "If I feel threatened or anxious, then I will…") by choosing and writing one of four provided self-affirmations (e.g., "think about things that are important to me"; Armitage et al., 2011).

One key gap in the self-affirmation literature is that many health-related self-affirmation interventions were developed and administered primarily with university student samples in controlled laboratory settings (Epton et al., 2015; Sweeney & Moyer, 2015). Few studies have tested whether self-affirmation interventions can be scaled up for widespread public health use (Schüz et al., 2017). Although self-affirmation interventions have been administered online (DiBello et al., 2015; Epton et al., 2014; Kamboj et al., 2016; Mays & Zhao, 2016; Memish et al., 2017; Nan & Zhao, 2012; Schumann, 2014; Taber et al., 2016; van Koningsbruggen & Das, 2009; Zhao & Nan, 2010), many targeted students, and few adapted interventions specifically for mobile phone use. Most Americans own smartphones (77%), with 20% accessing the internet solely through a phone (Pew Research Center, 2018). Thus, self-affirmation interventions that can be effectively administered on mobile phones could increase their reach, especially to adults with minority racial backgrounds and those with lower incomes, who are more likely to be dependent on phones for internet use (PRC, 2018).

One of the few studies that used mobile technology to implement a self-affirmation intervention attempted to promote smoking cessation among adult smokers who enrolled in a text-based, national smoking cessation program. Participants received self-affirmation text messages periodically throughout a 42-day period (e.g., "Quitting is hard! When you feel a craving, think of a time you learned from a mistake."). The content of the affirmation referred to potential threats (e.g., when you feel a craving) and encouraged participants to think of their strengths (e.g., learning from a mistake), but participants were not asked to provide the written responses that many self-affirmation interventions include. The intervention showed only modest success: self-affirmed smokers reported greater cessation rates, but only among the 6.4% of the sample who responded to the 6-week follow-up survey (Taber et al., 2016).

Study purpose and hypotheses

To fill these identified gaps in the literature, we sought to translate the Kindness Questionnaire self-affirmation intervention (Reed & Aspinwall, 1998) into a form that could be effectively and feasibly administered on a mobile device outside the experimental controls of a research laboratory. One key barrier in the translation process is that typing on a smartphone is difficult. Therefore, we chose the Kindness Questionnaire because, in its original form, it requires less writing than the values essay. To further reduce the writing required, we also tested two simplified versions (i.e., imagined examples and no examples). We targeted cigarette smokers for the intervention because their tendency towards defensive responding (Erceg-Hurn & Steed, 2011; Hall et al., 2016) made them a relevant test case for our efforts and because there is a need for an effective, feasible, and disseminable self-affirmation intervention for smokers.

Primary Outcomes We examined the effect of self-affirmation on the primary outcomes of message acceptance, perceived message effectiveness, and reactance because a basic premise of self-affirmation theory is that affirming the self makes people more capable of processing messages non-defensively (Ferrer & Cohen, 2018). Intentions is one of the most proximal influences on volitional behavior change (Webb & Sheeran, 2006) and self-affirmations can increase intentions to engage in health behaviors (Epton et al., 2015; Sweeney & Moyer, 2015). Consistent with the broader self-affirmation literature, including most studies with cigarette smokers, we hypothesized that smokers who completed a self-affirmation intervention before being exposed to a psychologically threatening health message would report greater message acceptance, greater perceived message effectiveness, less reactance, and higher intentions to quit smoking compared to smokers who did not receive a self-affirmation intervention. We also hypothesized that the imagined examples and no examples versions would outperform the original control conditions, as the adaptations were intended to reduce burden associated with writing and therefore increase completion of the intervention.

Secondary Outcomes We further examined the effect of self-affirmation on a set of key health-related cognitions and affects that have been shown to predict health behavior: self-efficacy, perceived cognitive risk and "feelings of risk" (also called affective risk), response efficacy, anticipated regret, perceived severity, and worry (Brewer et al., 2016; Janssen et al., 2014; Sheeran et al., 2014, 2016). These outcomes were considered secondary because there was less empirical research supporting the link between self-affirmation interventions and these outcomes (e.g., self- and response efficacy and anticipated regret vs. message processing) or because the outcomes were considered to be less proximal predictors of actual behavior (e.g., perceived risk, worry, and behavior vs. intentions). We hypothesized that self-affirmations would lead to more positive secondary outcomes. We had no directional hypothesis about how abbreviating the self-affirmation intervention might affect secondary outcomes.

Feasibility Outcomes Interventions that are not feasible, due to complex administration or participant unwillingness to complete them, are unlikely to be effective (Bowen et al., 2009). Thus, we explored whether the length of the intervention was associated with time to complete the self-affirmation intervention, time to read the health message, and the number and quality of affirmative responses to the Kindness Questionnaire (Armitage et al., 2011; Ferrer et al., 2017).

Exploratory Research Questions We also explored whether the effectiveness of the self-affirmation intervention differed by subgroup. In prior research, self-affirmations have been more effective for people at higher versus lower risk based on the number of cigarettes smoked per day (Armitage et al., 2008; DiBello et al., 2015; Harris et al., 2007; Memish et al., 2017). Thus, we tested whether self-affirmations were more effective for participants who smoked more, with no predictions for the self-affirmation variations. We also explored whether education, race, and mode of study completion (phone vs. tablet/PC) moderated the effectiveness of the intervention. For example, simplifying the intervention could be beneficial only for people completing the survey on phones or for those with less education. We had no predictions about the role of race; rather, we sought to determine whether prior results based on primarily White participants generalized to people from minority racial backgrounds.

Materials and methods

Participants, eligibility criteria, and recruitment

We recruited participants from Survey Sampling International's (SSI) Internet Research Panel in January 2018. Eligibility criteria were 21–65 years of age, currently living in the U.S., and self-identifying as smoking cigarettes every day or some days in the past 30 days. People with a history of lung cancer, chronic obstructive pulmonary disease, or emphysema were excluded. We planned for a sample size of 620, which would yield 80% power to detect an effect size of $f = .125$ with $\alpha = .05$ (Cohen, 1988). Of 1193 people who accessed the survey, 284 (23.8%) were ineligible and 9 who were eligible did not consent (see Electronic Supplementary Material [ESM] Fig. 1 for CONSORT diagram). Of 900 people who consented, we excluded 178 participants who failed both attention checks ($n = 137$) and/or completed the study too quickly (< 5.4 min; $n = 69$) or too slowly (> 60 min; $n = 20$). The lower time cut-off was determined a priori by SSI to exclude those who completed the survey faster than 30% of the expected 18-min length. The upper cut-off was chosen as a reasonable time in which to have completed the study (results of ANOVAs with the primary dependent variables did not differ using an outlier cut-off of 3 *SDs* above the mean, $n = 609$). Nineteen additional participants were excluded for unrealistic or discrepant smoking patterns. Respondents ($n = 100$) who did not complete all primary and secondary dependent variables (DVs) and the covariates were also excluded. The final sample size for most analyses was 603. For the *time spent reading the health message* outcome, we removed eight outliers who spent more than 6 min reading the message. The study was approved by Kent State University's IRB and registered on clinicaltrials.gov (ID: NCT03405220).

Study design and procedures

The study was administered online with the Qualtrics hosting platform. After consenting, participants completed a pre-intervention survey and were randomly assigned by Qualtrics using an equal allocation ratio to 1 of 6 conditions in a 2 (Self-Affirmation: Self-Affirmation, No Self-Affirmation Control) × 3 (Example Type: Written, Imagined, No Examples) fully-crossed experimental design. Depending on condition, participants next completed a self-affirmation or control task. Next, all participants were presented with a 480-word written message describing health consequences of smoking and benefits of quitting (full text in Appendix A; modeled after Ferrer et al., 2012). Participants then completed a post-intervention survey assessing DVs and demographics. Lastly, participants were informed about the study purpose and provided smoking cessation resources.

Intervention and control conditions

Participants in the self-affirmation condition completed the Kindness Questionnaire and those in the control condition completed the Personal Opinion Survey (Reed & Aspinwall, 1998). The Personal Opinion Survey asks participants to indicate their agreement (yes/no) with 10 opinion statements (e.g., "I think that the color blue looks great on most people"). The Kindness Questionnaire consists of 10 yes/no questions written so all participants should be able to say "yes" and affirm a positive view of themselves (e.g., "Have you ever been considerate of another person's feelings?"). The item order was randomized for each participant.

Participants in the written and imagined examples conditions who marked "yes" to a question were instructed to "spend a few moments [writing/thinking] about a specific example of a time when you did the behavior in the question" (self-affirmation condition) or to "[write/think] about a specific reason why" (control condition). Participants in the no examples condition were not given any additional instructions after a "yes" response. Full instructions are in Appendix B.

Measures

All measures were administered in the order described. The pre-intervention survey included questions about *smoking history* (i.e., number of cigarettes smoked daily, nicotine dependence (Heatherton et al., 1991), number of days smoked, and number of lifetime quit attempts). A four-category smoking level variable to use as a covariate was created by combining nicotine dependence and amount of smoking (Table 1). We also created a dichotomous smoking level variable to use as a moderator comparing daily smokers who smoked at least 1 pack/day and within 30 min of waking (n = 191) to all other smokers (n = 412).

Table 1 Participant characteristics (n = 603)

Variable	Mean (*SD*)
Age	37.52 (10.19)
Number of lifetime quit attempts	3.40 (4.43)
Variable	***n* (%)**
Education: have at least some college experience	381 (63.2)
Male	170 (28.2)
White race	517 (85.7)
Non-Hispanic	553 (91.7)
Employed	354 (58.7)
Income $50,000 or higher	239 (39.6)
Completed survey on a smartphone	539 (89.4)
High health literacy[a]	422 (70.0)
Smoking level[b]	
Nondaily smoker	80 (13.3)
Daily smoker: less than 1 pack/day, does not smoke within 30 min of waking	81 (13.4)
Daily smoker: less than 1 pack/day, smokes within 30 min of waking	251 (41.6)
Daily smoker: 1 or more packs/day, smokes within 30 min of waking	191 (31.7)

Characteristics included in this table were included as pre-specified covariates in a subset of analyses

[a]High health literacy refers to participants who reported they "never" have help when reading material from one's doctor or pharmacy versus those who reported rarely/sometimes/often/always

[b]Only daily smokers were asked whether they smoked within 30 min of waking, n = 523

Primary dependent variables

All primary outcomes were measured on a scale from 1 = "strongly disagree" to 4 = "strongly agree." *Message acceptance* (adapted from Brennan et al., 2011) was a mean score of two items indicating the extent to which the information sheet was "easy to understand" and "believable" (r = .61, $p < .001$). *Perceived message effectiveness* (adapted from Brennan et al., 2014) was a mean score of six items assessing to what extent the information sheet "was relevant to me," "made me stop and think," "made a strong argument for quitting smoking," "taught me something new," "made me feel concerned about my smoking," and "made me feel motivated to try and quit smoking" (α = .87). *Reactance* (adapted from Hall et al., 2017) was a mean score of three items assessing the extent to which the "information sheet" was "manipulative," "overblown," and "annoying." (α =.76). *Intentions to quit*

was a mean score of three items: "I [intend/want/am likely] to quit smoking in the next 3 months" (α =.90).

Secondary dependent variables

Self-efficacy was a mean score of three items in which participants were asked to rate how "confident," "sure," and "certain" they were that they could quit smoking in the next 3 months (1 = "do not agree at all" to 4 = "agree strongly"; α = .97). Perceived cognitive risk was assessed as the standardized mean score of three items with different response scales (α =.79): "How likely do you think it is that you will get a smoking-related disease in the next 10 years, if you do not quit?" (1 = "not at all" to 4 = "very"), "Compared to other smokers your age and sex, how likely do you think it is that you will get a smoking-related disease in the next 10 years if you do not quit?"(1 = "much less" to 5 = "much more"), and "What do you think your chances are of getting a smoking-related disease in the next 10 years, if you do not quit?" (1 = "very small" to 5 = "very large"). *Feelings of risk* (adapted from Janssen et al. 2018 and Janssen et al., 2011) was assessed as the standardized mean score of two items (r = .70): "How easily do you feel you could get a smoking-related disease in the next 10 years, if you do not quit?" (1 = "not at all" to 4 = "very") and "What do you feel your chances are of getting a smoking-related disease in the next 10 years, if you do not quit?" (1 = "very small" to 5 = "very large"). All cognitive risk and feelings of risk items also included "do not know" as a response option, which was coded as missing data for 74 people (see Waters et al., 2013; Denman et al., 2018 for issues related to "don't know" responding). *Response efficacy* was a mean score of three items asking participants to rate their agreement that quitting smoking "will lower my chances of getting a smoking-related disease," "is a good way for me to prevent getting a smoking-related disease," and "will lower my risk of getting a smoking-related disease" (1 = "do not agree at all" to 4 = "agree strongly"; α =.91).

Anticipated regret was a mean score of three items: "I would regret it if I got a smoking-related disease because I did not quit smoking," "If I got a smoking-related disease because I smoked, I would feel regretful," and "I would be mad at myself if I got a smoking-related disease from my smoking" (1 = "do not agree at all" to 4 = "agree strongly"; α =.92). *Perceived severity* (Lipkus et al., 2003) was a mean score of three items: how "serious," "dangerous," and "life-threatening" getting a smoking-related disease would be (1 = "not at all" to 4 = "extremely"; α =.92). *Worry* was a mean score of three items indicating how "worried," "concerned," and "anxious" participants were about getting a smoking-related disease (1 = "not at all" to 4 = "very"; α = .90).

Sociodemographic and related characteristics

Health literacy shapes how people understand, interpret and use health information (Kutner et al., 2006). Health literacy was included as a covariate and was assessed with a single item, "How often do you need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy? (1 = "never" to 5 = "always"; Morris et al., 2006). It was coded as never versus rarely/sometimes/often/always due to a skewed distribution. Standard items were used to assess *age*, *sex*, *race*, *education*, *employment status*, and *income*. Mode of study completion (phone vs. tablet/PC) was also collected.

Feasibility metrics

Although examining feasibility was an a priori goal, we also conducted exploratory analyses examining feasibility based on the results testing the effectiveness of the intervention. Specifically, we assessed time to complete the intervention, time to read the health message, number of affirmative responses, and quality of responses to the Kindness Questionnaire.

Using timestamp data, we computed the *time to complete the intervention and the time spent reading the threatening health message*. We summed the *number of affirmative responses* to the Kindness Questionnaire to explore whether asking participants to write or think about each 'yes' response discouraged additional 'yes' responses. We coded the *quality of examples* in the Self-Affirmation Written Examples condition (n = 107). Higher quality was defined as more specific and/or detailed examples. Examples were coded as absent, minimal, or moderate-to-full (referred to as full). See Appendix C for the exact coding procedures and codebook.

Overview of analysis

Effectiveness analyses

To determine whether the intervention affected the four primary DVs (intentions, reactance, and message effectiveness and acceptance), we ran four 2 (Self-Affirmation: Self-Affirmation, No Self-Affirmation Control) × 3 (Example Type: Written Examples, Imagined Examples, No Examples) ANOVAs and then four parallel ANCOVAs adjusting for 11 pre-specified covariates (sex, age, education, race, ethnicity, survey completion mode, number of

Table 2 Descriptives of and zero-order correlations among dependent variables

	1	2	3	4	5	6	7	8	9	10	11
1. Message acceptance	1	.53**	− .35**	.16**	.07	.23**	.26**	.26**	.27**	.31**	.25**
2. Message effectiveness		1	− .30**	.43**	.26**	.31**	.35**	.35**	.45**	.44**	.57**
3. Reactance			1	− .19**	− .03	− .27**	− .29**	− .33**	− .30**	− .35**	− .26**
4. Intentions to quit smoking				1	.73**	.30**	.33**	.29**	.42**	.34**	.42**
5. Self-efficacy					1	.06	.13**	.17**	.25**	.16**	.23**
6. Perceived cognitive risk						1	.80**	.30**	.37**	.44**	.53**
7. Feelings of risk							1	.32**	.38**	.44**	.52**
8. Response efficacy								1	.55**	.45**	.37**
9. Anticipated regret									1	.59**	.53**
10. Severity										1	.67**
11. Worry											1
M	3.57	3.12	1.70	2.37	2.01	0.06[a]	0.07[a]	3.41	3.36	3.39	2.99
SD	0.57	0.73	0.67	0.97	1.01	0.89	0.88	0.71	0.79	0.65	0.86
Range	1 to 4	1 to 4	1 to 4	1 to 4	1 to 4	− 2.5 to 1.2	− 2.2 to 1.2	1 to 4	1 to 4	1 to 4	1 to 4

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

[a] Means are from standardized scores

quit attempts, health literacy, employment status, income, and smoking level). We also used ANOVAs to test whether education, race, survey completion mode, or smoking level moderated the effect of the intervention on the primary DVs. Finally, we repeated the ANOVAs for only those in the self-affirmation conditions. Next, we ran seven 2 × 3 ANOVAs to test whether the intervention affected the secondary DVs (i.e., self-efficacy, perceived cognitive risk, feelings of risk, response efficacy, anticipated regret, perceived severity, and worry).

Feasibility analyses

We examined descriptives for the five feasibility metrics. Correlations and t-tests planned a priori were used to test whether these metrics differed by participant characteristics and ANOVAs were used to test whether they varied across conditions. We used correlations to examine the relationships of the five feasibility metrics with DVs. We also explored post hoc whether results differed after restricting the sample to participants in the Self-Affirmation conditions only and to those in the Self-Affirmation Written Examples condition only.

Intent-to-treat analysis

We used correlations, t-tests, and ANOVAs to test whether the 297 participants who were excluded from the analyses were different from the 603 who were included, and whether including them in the analyses meaningfully changed the results and conclusions.

Results

Participant characteristics

Participant characteristics (n = 603) are shown in Table 1. The sample was mostly female (72%), White (86%), and non-Hispanic (92%) with a mean age of 38 years (SD = 10.19). Most (89%) completed the survey on a phone. Nearly 90% of the sample smoked daily; daily smokers smoked an average of 15.43 cigarettes per day (SD = 8.04). Nondaily smokers smoked an average of 15.33 days in the past 30 days (SD = 7.62) with an average of 4.70 cigarettes smoked each day they smoked (SD = 3.80). The median number of previous quit attempts was two. Descriptives for DVs are shown in Table 2. Mean study completion time was 13.72 min (SD = 8.66).

Effectiveness analyses

Primary dependent variables

There was a significant main effect of self-affirmation on intentions, but in the opposite direction as hypothesized: people who self-affirmed displayed *lower* intentions to quit smoking (M = 2.27, SD = 0.94) than people who did not self-affirm (M = 2.48, SD = 0.99; $F(1, 597) = 6.91$, $p = .009$, $\eta_p^2 = .010$). There were no other significant main effects or interactions on the primary DVs. Adjusting for pre-specified covariates revealed the same pattern of results: a main effect of self-affirmation on intentions (Self-affirm: M = 2.28, SE = 0.05; Control: M = 2.46, SE = 0.05; $F(1, 586) = 4.93$, $p = .015$, $\eta_p^2 = .01$). Four ANOVAs

restricted to participants in the self-affirmation conditions (n = 307) showed no effect of Example Type (Written, Imagined, No examples) on the four primary DVs.

Only 3 of 16 potential interactions specified a priori reached statistical significance. As small cell sizes limited our confidence in these findings, we report results in Appendix D. In short, 2 two-way interactions suggested that self-affirmation was associated with lower intentions only for people (a) with a college education and (b) who completed the study on a tablet or PC. A three-way interaction suggested that completing the survey on a Tablet or PC was associated with lower perceived effectiveness for participants who were not asked to provide examples, but higher perceived effectiveness if they wrote or imagined examples.

Secondary dependent variables

There were only two significant effects out of 21 possible effects. Self-affirmation resulted in *lower* perceived cognitive risk (Self-affirm: M = 0.03, SD = 0.87; Control: M = 0.15, SD = 0.90; $F(1, 597) = 6.32$, $p = .012$, $\eta_p^2 = .010$) and feelings of risk than the control conditions (Self-affirm: M = -0.02, SD = 0.88; Control: M = 0.17, SD = 0.87; $F(1, 597) = 6.77$, $p = .010$, $\eta_p^2 = .011$).

Feasibility analyses

Time to complete intervention

Participants spent an average of 2.25 min (SD = 3.20) responding to the Kindness Questionnaire or the Personal Opinion Survey intervention (Table 3), with significant differences across conditions (Self-Affirmation by Example Type interaction: $F(2, 597) = 16.13$, $p < .001$, $\eta_p^2 = .051$). Participants spent more time on the self-affirmation (M = 2.76, SD = 4.04) than the control intervention (M = 1.73, SD = 1.83; $F(2, 597) = 18.84$, $p < .001$, $\eta_p^2 = .031$), but this difference was significant only for those in the written examples conditions. Specifically, participants asked to write self-affirming examples spent more time on the intervention than participants asked to write examples unrelated to self-affirmation ($p < .001$; Table 3). There were no differences among the no examples and imagined examples conditions.

Time completing the intervention was not significantly correlated with any of the primary or secondary DVs in the full sample (Table 4), or in the self-affirmation conditions only (n = 307). Within the Self-Affirmation Written Examples condition (n = 107), only one correlation was significant: more time on the intervention was associated with lower reactance ($r = -.21$, $p = .028$).

Time spent reading the threatening health message

Time spent reading the health message differed across conditions (Self-Affirmation by Example Type interaction: $F(2, 589) = 3.57$, $p = .029$, $\eta_p^2 = .012$) such that participants asked to write examples spent longer when in the control condition than when in the self-affirmation condition ($p = .002$; Table 3). Longer time spent on the intervention was related to more time reading the health message ($r = .17$, $p < .001$).

More time spent reading the threatening health message was associated with greater message acceptance and less reactance, but was not significantly associated with intentions or perceived message effectiveness (Table 4). Longer reading time was also associated with greater response efficacy, perceived cognitive risk, feelings of risk, anticipated regret, and severity, but lower self-efficacy.

Number of affirmative responses to the intervention questions

Participants in the self-affirmation conditions endorsed significantly more of the 10 items (M = 9.21, SD = 1.71)

Table 3 Feasibility metrics as a function of intervention condition, M (SD)

	Self-affirmation				Control			
	No examples (n = 105)	Imagined examples (n = 95)	Written examples (n = 107)	Total (n = 307)	No examples (n = 103)	Imagined examples (n = 99)	Written examples (n = 94)	Total (n = 296)
Time to complete intervention, in minutes (n = 603)	0.83 (0.42)	1.46 (2.13)	5.81 (5.33)	2.76 (4.04)	0.90 (0.76)	1.24 (0.77)	3.16 (2.50)	1.73 (1.83)
Time to read health message, in seconds (n = 595)	50.45 (48.46)	54.70 (56.07)	40.38 (46.32)	48.25 (50.42)	52.76 (55.99)	51.18 (47.78)	64.04 (63.25)	55.84 (56.02)
Number of 'yes' responses out of 10 possible (n = 603)	9.77 (0.59)	9.63 (0.84)	8.28 (2.48)	9.21 (1.71)	6.14 (1.51)	5.28 (1.78)	4.36 (2.01)	5.29 (1.91)

Table 4 Bivariate correlations of feasibility metrics with primary and secondary dependent variables

	Time to complete intervention All participants (n = 603)	Time to read health message All participants < 10 min (n = 595)	Number of 'yes' responses Self-affirmation conditions only (n = 307)	Number of moderate-to-full (full) written examples Self-affirmation written condition only (n = 107)	Number of absent written examples Self-affirmation written condition only (n = 107)
Message acceptance	.03	.17**	.06	.06	− .02
Message effectiveness	− .01	.08	.02	.03	− .10
Reactance	− .04	− .17**	− .22**	− .27**	.32**
Intentions to quit smoking	− .07	− .03	− .04	− .01	− .09
Self-efficacy	− .04	− .10*	− .08	− .15	− .02
Perceived cognitive risk	.00	.09*	− .01	.04	.01
Feelings of risk	.02	.12**	.03	.14	− .13
Response efficacy	.03	.13**	.06	.12	− .05
Anticipated regret	− .02	.09*	.10	.18	− .14
Severity	− .01	.09*	.06	.12	− .06
Worry	− .03	.06	− .01	− .05	-.08

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

than participants in the control conditions (M = 5.28, SD = 1.91; $F(1597) = 845.28$, $p < .001$, $\eta_p^2 = .586$; Table 3), consistent with how the Kindness Questionnaire was designed to promote 'yes' responses. Further, participants who were asked to write examples endorsed significantly fewer of the 10 items (M = 6.45, SD = 3.00) than participants who imagined examples (M = 7.41, SD = 2.59) or were not asked to provide examples (M = 7.97, SD = 2.15; $F(2, 597) = 50.7$, $p < .001$, $\eta_p^2 = .145$). The Self-Affirmation by Example Type interaction on the number of 'yes' responses was not significant. Among self-affirmation conditions only, participants who endorsed more items reported less reactance ($r = -.22$, $p < .001$), but endorsement was not significantly associated with any other DVs (Table 4).

Quality of written examples

Participants in the Self-Affirmation Written Examples condition (n = 107) provided, on average, 4.27 full responses (SD = 3.13), 3.22 minimal responses (SD = 2.75), and 2.51 (SD = 2.77) absent responses. Participants who provided more full responses reported less reactance ($r = -.27$, $p = .005$). Participants who provided more absent responses reported greater reactance ($r = .32$, $p = .001$). No other relationships were significant (Table 4).

Association of feasibility measures with smoking and sociodemographic factors

When examining the 11 covariates included in Table 1, older adults ($r = .11$, $p = .006$) and those who completed the survey on a tablet or PC ($t(66) = 2.23$, $p = .029$) spent more time on the intervention. Participants who were unemployed ($t(367) = 2.86$, $p = .004$) spent more time reading the message. Women endorsed more self-affirmation questions ($t(149) = 2.15$, $p = .049$). Hispanic participants provided fewer full examples ($t(105) = 2.08$, $p = .040$). Those with lower health literacy provided fewer minimal ($t(105) = 2.75$, $p = .007$) and full examples ($t(105) = -2.73$, $p = .007$). No other associations among smoking/sociodemographic factors (including quit attempts, gender, education race, income, and smoking level) and feasibility measures were significant.

Intent-to-treat analyses

Compared to participants excluded from analyses, those who were included were older, had higher health literacy, and were more likely to be female, White, and to have

completed the survey on a phone (Electronic Supplementary Material Table 1). Those retained for analysis reported lower reactance, intentions to quit, and self-efficacy. They had greater message acceptance, perceived cognitive risk, feelings of risk, response efficacy, worry, anticipated regret, and perceived severity. Participants retained for analysis also provided more full written examples and fewer absent written examples. In addition, they were equally likely to be in either Self-Affirmation condition or in any of the three Example Type conditions.

Given these differences, we conducted ANOVAs among the full sample of 900 eligible respondents (see Appendix D for statistics). Consistent with primary analyses, those who self-affirmed reported somewhat lower intentions ($p = .072$) and lower cognitive risk ($p = .008$) and feelings of risk ($p = .001$) than those in the control conditions. There were two new significant effects. First, there was a Self-Affirmation by Example Type interaction for reactance ($p = .007$): participants who imagined self-affirmation examples reported greater reactance than those who imagined control examples, with no differences among self-affirmation conditions for those who wrote examples or did not provide examples. There was also a main effect of affirmation such that perceived severity was lower in the self-affirmation than the control condition ($p = .038$).

Discussion

We tested multiple versions of a self-affirmation intervention for community-based smokers translated for use on mobile devices. Contrary to our expectation that the self-affirmation variations would be equivalent to each other and outperform control conditions, none of the variations were effective or feasible. The intervention had no effect on key message processing outcomes. Worse, and contrary to our hypotheses, self-affirmation backfired by reducing intentions to quit smoking and risk perceptions. Both the null and backfiring effects should be interpreted with caution given the unexpectedness of these effects.

Despite attempts to limit the amount of writing required, participants asked to provide written self-affirmation responses endorsed fewer affirmation questions than participants not asked to provide written examples; that this was also the case in the control conditions suggests that the writing was onerous for both the self-affirmation and control conditions. Thus, the intervention may have been unacceptably burdensome in terms of time and effort for participants to complete. For participants providing written examples, the intervention took nearly four times as long—an average of almost 6 min—than it did for those who imagined examples, and took 7 times longer than it did for participants not asked to provide examples. These short completion times in the imagined (1.5 min) and no examples (< 1 min) self-affirmation conditions suggest that participants may not have spent enough time self-affirming for the intervention to have an effect. However, there were no significant differences in outcomes across the three self-affirmation conditions, and being more adherent or spending more time on the intervention typically was not correlated with effectiveness outcomes.

A close inspection of self-affirmation interventions for smokers indicates that the effectiveness of these interventions is not universal. Some previous self-affirmation interventions with smokers have shown success increasing quit intentions and reducing smoking behavior (Armitage et al., 2008; Epton et al., 2014; Harris et al., 2007; Taber et al., 2016), whereas others showed null effects (Dillard et al., 2005; Schneider et al., 2012), and one had a backfiring effect in which self-affirmed occasional smokers viewed cigarette warning labels as less effective, with null effects for daily smokers (Zhao et al., 2014). Several self-affirmation interventions with smokers have reported effects conditional on factors such as trait reactance (Nan & Zhao, 2012), message framing (Zhao & Nan, 2010), and risk level (Armitage et al., 2008; DiBello et al., 2015; Harris et al., 2007; Memish et al., 2017). In the present study, smoking level—based on nicotine dependence and amount/frequency of smoking—did not moderate effects.

Inconsistencies across studies could arise for multiple reasons, including methodological factors such as sample size and publication bias. Another source is theoretical moderators such as the presence of threat, availability of resources for behavior change, and timing of the self-affirmation, which all moderate the effect of self-affirmation on health behavior (Ferrer & Cohen, 2018). More research is needed to identify characteristics of the participants, situation, and nature of the interventions associated with effective self-affirmation interventions for smokers.

With respect to the present study, the effectiveness of the intervention may have been related to low feasibility, as previously described. Our study also differs from previous self-affirmation studies in which smokers have been shown attention-grabbing graphic warning labels with brief text (see Ehret & Sherman, 2014). According to the Trigger and Channel framework, sufficient psychological threat—that is, threat to one's self-integrity—is a necessary precursor to the effectiveness of self-affirmation interventions (Ferrer & Cohen, 2018). Our lengthy written risk message may not have been sufficiently threatening or novel, as smokers may be desensitized to messages about the negative health effects of smoking. In addition, our intervention may not have provided sufficient resources to promote quit intentions (Ferrer & Cohen, 2018); the health message included information targeting response efficacy but not self-efficacy. Future research should test whether self-af-

firmation interventions can be bolstered by combining them with other smoking cessation strategies such as one-on-one counseling or nicotine replacement therapy.

We used the Kindness Questionnaire, which is used less frequently than the values essay (Epton et al., 2015; McQueen & Klein, 2006), to minimize the typing required by participants using smartphones. Some meta-analytic evidence suggests that values essay affirmations are more effective than other affirmations, but in that meta-analysis the type of "other" affirmations was not specified (Epton et al., 2015; but see Sweeney & Moyer, 2015). Selecting a value with personal relevance may be an important component of effective self-affirmation interventions, which is not a part of the Kindness Questionnaire (see Schüz et al., 2017 for this argument). Thus, the values essay may be more effective despite potential increased burden. Future studies might also test whether a new "implementation intention" approach (Armitage et al., 2011) in which people plan how they will respond when feeling threatened (i.e., "If I feel threatened or anxious, then I will…") is more easily adapted to an online or smartphone setting. Future research could also test self-affirmations in which participants are asked to provide fewer than 10 written examples to identify the right balance between too much and too little writing.

Strengths and Limitations

Our study was unique in that we recruited an older community sample rather than a college student sample. To date, only about 30% of self-affirmation interventions in the health domain are conducted with samples other than college students (Epton et al., 2015; Sweeney & Moyer, 2015) (see exceptions Armitage et al., 2011; Hall et al., 2014; Jessop et al., 2009; Ogedegbe et al., 2012). Self-affirmation interventions may be more challenging to complete for general community populations, who may be less accustomed to completing tasks involving writing and self-introspection than students. Consistent with most self-affirmation studies, we did not include an explicit manipulation check to verify that participants felt self-affirmed because asking participants to rate their feelings about themselves could serve as an inadvertent affirmation for control participants (Reed & Aspinwall, 1998). However, the lack of a manipulation check makes it unclear whether the intervention was ineffective because it did not allow participants to self-affirm or because self-affirmation did not promote beneficial health-related outcomes in this context. We also do not know whether participants in the imagined examples condition were more likely to consider hypothetical versus actual instances of kindness. Although participants may need more specific instructions about the level of detail needed for examples or the time they need to spend, participants who provided more detailed examples or spent more time did not report greater intentions to quit smoking.

Another limitation is that many of the feasibility analyses are correlational and significant associations (not involving study conditions that were randomly assigned) could be explained by a third variable (e.g., conscientiousness). Furthermore, eligible participants who were excluded from analyses differed from those retained in analyses in their demographic characteristics and on the study DVs. Participants were excluded largely for failure to attend to the study, and as such this differential attrition is unsurprising. It also suggests that the self-affirmation interventions we tested were not effective even with participants more willing to engage. We also conducted a large number of analyses, which increases the likelihood of false positives. Using a statistical approach to correct for multiple analyses may have further reduced our observation of significant findings, which diminishes our confidence in the backfiring effects observed. However, the conclusion that this adapted self-affirmation intervention was neither effective nor feasible would not change.

Conclusion

We attempted to translate a self-affirmation intervention for use online or in a mobile application to promote smoking cessation intentions. Translating interventions developed and tested for efficacy in laboratory settings to "real-world" settings is necessary but challenging. Additional research is necessary to identify the parameters and adaptations necessary for self-affirmation interventions to work in non-laboratory settings.

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Compliance with ethical standards

Conflict of interest Jennifer M. Taber, Amy McQueen, Nicolle Simonovic and Erika A. Waters declare that they have no conflict of interest.

Human and animal rights statement All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study was approved by Kent State University's IRB, protocol #17-544. This article does not contain any studies with animals performed by any of the authors.

Informed consent Informed consent was obtained from all individual participants included in the study.

References

Armitage, C. J., Harris, P. R., & Arden, M. A. (2011). Evidence that self-affirmation reduces alcohol consumption: Randomized exploratory trial with a new, brief means of self-affirming. *Health Psychology, 30,* 633–641.

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.

Bowen, D. J., Kreuter, M., Spring, B., Cofta-Woerpel, L., Linnan, L., Weiner, D., et al. (2009). How we design feasibility studies. *American Journal of Preventive Medicine, 36,* 452–457.

Brennan, E., Durkin, S. J., Cotter, T., Harper, T., & Wakefield, M. A. (2011). Mass media campaigns designed to support new pictorial health warnings on cigarette packets: Evidence of a complementary relationship. *Tobacco Control, 20,* 412–418.

Brennan, E., Durkin, S. J., Wakefield, M. A., & Kashima, Y. (2014). Assessing the effectiveness of antismoking television advertisements: Do audience ratings of perceived effectiveness predict changes in quitting intentions and smoking behaviours? *Tobacco Control, 23,* 412–418.

Brewer, N. T., DeFrank, J. T., & Gilkey, M. B. (2016). Anticipated regret and health behavior: A meta-analysis. *Health Psychology, 35,* 1264–1275.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale: Lawrence Erlbaum Associates.

Cohen, G. L., & Sherman, D. K. (2014). The psychology of change: Self-affirmation and social psychological intervention. *Annual Review of Psychology, 65,* 333–371.

Denman, D. C., Baldwin, A. S., Betts, A. C., McQueen, A., & Tiro, J. A. (2018). Reducing "I don't know" responses and missing survey data: Implications for measurement. *Medical Decision Making, 38,* 673–682.

DiBello, A. M., Neighbors, C., & Ammar, J. (2015). Self-affirmation theory and cigarette smoking warning images. *Addictive Behaviors, 41,* 87–96.

Dillard, A. J., McCaul, K. D., & Magnan, R. E. (2005). Why is such a smart person like you smoking? Using self-affirmation to reduce defensiveness to cigarette warning labels. *Journal of Applied Biobehavioral Research, 10,* 165–182.

Ehret, P. J., & Sherman, D. K. (2014). Public policy and health: A self-affirmation perspective. *Policy Insights from the Behavioral and Brain Sciences, 1,* 222–230.

Epton, T., Harris, P. R., Kane, R., van Koningsbruggen, G. M., & Sheeran, P. (2015). The impact of self-affirmation on health-behavior change: A meta-analysis. *Health Psychology, 34,* 187–196.

Epton, T., Norman, P., Dadzie, A. S., Harris, P. R., Webb, T. L., Sheeran, P., et al. (2014). A theory-based online health behaviour intervention for new university students (U@Uni): Results from a randomised controlled trial. *BioMed Central Public Health, 14,* 563.

Erceg-Hurn, D. M., & Steed, L. G. (2011). Does exposure to cigarette health warnings elicit psychological reactance in smokers? *Journal of Applied Social Psychology, 41*, 219–237.

Ferrer, R. A., & Cohen, G. L. (2018). Reconceptualizing self-affirmation with the trigger and channel framework: Lessons from the health domain. *Personality and Social Psychology Review.* Advance Online Publication: October 7, 2018.

Ferrer, R. A., Klein, W. M., & Graff, K. A. (2017). Self-affirmation increases defensiveness toward health risk information among those experiencing negative emotions: Results from two national samples. *Health Psychology, 36,* 380–391.

Ferrer, R. A., Shmueli, D., Bergman, H. E., Harris, P. R., & Klein, W. M. (2012). Effects of self-affirmation on implementation intentions and the moderating role of affect. *Social Psychological and Personality Science, 3,* 300–307.

Hall, M. G., Sheeran, P., Noar, S. M., Ribisl, K. M., Bach, L. E., & Brewer, N. T. (2016). Reactance to health warnings scale: Development and validation. *Annals of Behavioral Medicine, 50,* 736–750.

Hall, M. G., Sheeran, P., Noar, S. M., Ribisl, K. M., Boynton, M. H., & Brewer, N. T. (2017). A brief measure of reactance to health warnings. *Journal of Behavioral Medicine, 40,* 520–529.

Hall, C. C., Zhao, J., & Shafir, E. (2014). Self-affirmation among the poor: Cognitive and behavioral implications. *Psychological Science, 25,* 619–625.

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.

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.

Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerstrom, K. O. (1991). The Fagerström test for nicotine dependence: A revision of the Fagerstrom Tolerance Questionnaire. *British Journal of Addiction, 86,* 1119–1127.

Hughes, J. R., Keely, J., & Naud, S. (2004). Shape of the relapse curve and long-term abstinence among untreated smokers. *Addiction, 99,* 29–38.

Janssen, E., Ruiter, R. A., & Waters, E. A. (2018). Combining risk communication strategies to simultaneously convey the risks of four diseases associated with physical inactivity to socio-demographically diverse populations. *Journal of Behavioral Medicine, 41*, 318–332.

Janssen, E., van Osch, L., de Vries, H., & Lechner, L. (2011). Measuring risk perceptions of skin cancer: Reliability and validity of different operationalizations. *British Journal of Health Psychology, 16,* 92–112.

Janssen, E., Waters, E. A., van Osch, L., Lechner, L., & de Vries, H. (2014). The importance of affectively-laden beliefs about health risks: The case of tobacco use and sun protection. *Journal of Behavioral Medicine, 37,* 11–21.

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 & Health, 24,* 529–544.

Kamboj, S. K., Place, H., Barton, J. A., Linke, S., Curran, H. V., & Harris, P. R. (2016). Processing of alcohol-related health threat in at-risk drinkers: An online study of gender-related self-affirmation effects. *Alcohol and Alcoholism, 51,* 756–762.

Kutner, M., Greenburg, E., Jin, Y., & Paulsen, C. (2006). *The Health Literacy of America's Adults: Results from the 2003 National Assessment of Adult Literacy.* (NCES 2006-483). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Lipkus, I. M., Green, L. G., & Marcus, A. (2003). Manipulating perceptions of colorectal cancer threat: Implications for screening intentions and behaviors. *Journal of Health Communication, 8,* 213–228.

Mays, D., & Zhao, X. (2016). The influence of framed messages and self-affirmation on indoor tanning behavioral intentions in 18-to 30-year-old women. *Health Psychology, 35,* 123–130.

McQueen, A., & Klein, W. M. (2006). Experimental manipulations of self-affirmation: A systematic review. *Self and Identity, 5,* 289–354.

McQueen, A., Kreuter, M. W., Boyum, S., Thompson, V. S., Caburnay, C. A., Waters, E. A., et al. (2015). Reactions to FDA-proposed graphic warning labels affixed to US smokers' cigarette packs. *Nicotine & Tobacco Research, 17,* 784–795.

McQueen, A., Vernon, S. W., & Swank, P. R. (2013). Construct definition and scale development for defensive information processing: An application to colorectal cancer screening. *Health Psychology, 32,* 190–202.

Memish, K. E., Schüz, N., Frandsen, M., Ferguson, S. G., & Schüz, B. (2017). Using self-affirmation to increase the effects of emotive health warnings on smoking: A randomized exploratory trial. *Nicotine & Tobacco Research, 19,* 1238–1242.

Morris, N. S., MacLean, C. D., Chew, L. D., & Littenberg, B. (2006). The single item literacy screener: Evaluation of a brief instrument to identify limited reading ability. *BioMed Central Family Practice, 7,* 21.

Nan, X., & Zhao, X. (2012). When does self-affirmation reduce negative responses to antismoking messages? *Communication Studies, 63,* 482–497.

Ogedegbe, G. O., Boutin-Foster, C., Wells, M. T., Allegrante, J. P., Isen, A. M., Jobe, J. B., et al. (2012). A randomized controlled trial of positive-affect intervention and medication adherence in hypertensive African Americans. *Archives of Internal Medicine, 172,* 322–326.

Pew Research Center, Internet and Technology. (2018). *Mobile fact sheet*. Retrieved from http://www.pewinternet.org/fact-sheet/mobile/.

Reed, M. B., & Aspinwall, L. G. (1998). Self-affirmation reduces biased processing of health-risk information. *Motivation and Emotion, 22,* 99–132.

Schneider, S., Gadinger, M., & Fischer, A. (2012). Does the effect go up in smoke? A randomized controlled trial of pictorial warnings on cigarette packaging. *Patient Education and Counseling, 86,* 77–83.

Schumann, K. (2014). An affirmed self and a better apology: The effect of self-affirmation on transgressors' responses to victims. *Journal of Experimental Social Psychology, 54,* 89–96.

Schüz, B., Cooke, R., Schüz, N., & van Koningsbruggen, G. M. (2017). Self-affirmation interventions to change health behaviors. In E. Sillence & A. Joinson (Eds.), *Behavior change research and theory* (pp. 87–114). San Diego: Academic.

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.

Sheeran, P., Maki, A., Montanaro, E., Avishai-Yitshak, A., Bryan, A., Klein, W. M., et al. (2016). The impact of changing attitudes, norms, and self-efficacy on health-related intentions and behavior: A meta-analysis. *Health Psychology, 35,* 1178–1188.

Steele, C. M. (1988). The psychology of self-affirmation: Sustaining the integrity of the self. In B. Leonard (Ed.), *Advances in experimental social psychology* (pp. 261–302). New York: Academic.

Sweeney, A. M., & Moyer, A. (2015). Self-affirmation and responses to health messages: A meta-analysis on intentions and behavior. *Health Psychology, 34,* 149–159.

Taber, J. M., Klein, W. M., Ferrer, R. A., Augustson, E., & Patrick, H. (2016). A pilot test of self-affirmations to promote smoking cessation in a national smoking cessation text messaging program. *Journal of Medical Internet Research Mhealth and Uhealth, 4,* e71.

U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. (2014). *The health consequences of smoking: 50 years of progress. A report of the surgeon general.* Retrieved from https://www.surgeongeneral.gov/library/reports/50-years-of-progress/full-report.pdf.

van 't Riet, J., & Ruiter, R. A. (2013). Defensive reactions to health-promoting information: An overview and implications for future research. *Health Psychology Review, 7*, S104–S136.

Van Koningsbruggen, G. M., & Das, E. (2009). Don't derogate this message! Self-affirmation promotes online type 2 diabetes risk test taking. *Psychology & Health, 24,* 635–649.

Waters, E. A., Hay, J. L., Orom, H., Kiviniemi, M. T., & Drake, B. F. (2013). "Don't know" responses to risk perception measures: Implications for underserved populations. *Medical Decision Making, 33,* 271–281.

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.

Zhao, X., & Nan, X. (2010). Influence of self-affirmation on responses to gain-versus loss-framed antismoking messages. *Human Communication Research, 36,* 493–511.

Zhao, X., Peterson, E. B., Kim, W., & Rolfe-Redding, J. (2014). Effects of self-affirmation on daily versus occasional smokers' responses to graphic warning labels. *Communication Research, 41,* 1137–1158.