


Comparisons of health-related and appearance-related smoking risk perceptions and worry on motivation to quit

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Abstract

This research examined main and interactive associations of perceived risk and worry of health and appearance smoking consequences on motivation to quit and the relative importance of each of these. Hierarchical regressions controlling for other measures found that perceived conditional risk and worry of health consequences were associated with motivation to quit; only conditional risk of appearance consequences was associated with motivation to quit. Relative weights analysis indicated that perceived conditional risk of appearance consequences and worry about health consequences were the most important variables in the model. Consideration of appearance consequences may aid in motivating smokers to try quitting.

Keywords

appearance, motivation to quit, perceived risk, smoking, worry

Introduction

Understanding factors that prevent negative health outcomes or increase motivation to change are crucial goals for behavior-change research and application. To this end, many social-cognitive theories of health behavior, such as the Health Belief Model (Janz and Becker, 1984) or Protection Motivation Theory (Rogers, 1975), propose that cognitions motivate action. One such cognition, *perceived risk*, is commonly measured as perceptions of susceptibility to illness. To reduce the perceived threat, greater risk perceptions of a health threat (e.g. heart disease) are purported to predict stronger intentions to engage in a behavior (e.g. smoking cessation) as well as the behavior itself. Meta-analyses on the association of perceived risk with intentions and behavior suggest relatively small but reliable effects supporting the theoretical suppositions (Brewer et al., 2007; Floyd et al., 2000; McCaul et al., 1996).

Social-cognitive models emphasize the deliberative and reflective processes underlying decision-making. However, dual-process models of decision-making suggest important distinctions between this type of reasoning (i.e. the

analytical system) and processes that are experiential and reflexive (i.e. the experiential system), the latter of which can be emotionally laden (Slovic et al., 2005). Thus, consideration of the feelings regarding risk are also important for health decision-making (Loewenstein et al., 2001) and may independently contribute to motivation and behavior change (Slovic et al., 2004). While distinct systems, they work together to influence decision-making (Slovic et al., 2005) suggesting cognitive and affective components of health behavior should be considered jointly.

One feeling associated with risk is worry—an anticipatory negative emotion experienced when thinking about future events (e.g. developing cancer in the future due to

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one's smoking; Loewenstein et al., 2001). In this way, it can be conceived as "thought colored by affect" (McCaul et al., 2007). Worry about health consequences has been associated with motivation to quit smoking (Koblitz et al., 2009; Magnan et al., 2009), intentions to engage in various health behaviors (Janssen et al., 2014; Klein et al., 2009; Schmiege et al., 2009), and health behaviors themselves (Dijkstra and Brosschot, 2003; Hay et al., 2006; McCaul et al., 2007). Moreover, when considered in tandem, worry often shows effects over and above effects of perceived risk on behavioral outcomes (Chapman and Coups, 2006; Ferrer et al., 2013; Magnan et al., 2009; Portnoy et al., 2014b). Additionally, perceived risk and worry are moderately related—while they share characteristics, they are distinct constructs (Janssen et al., 2011; McCaul and Mullens, 2003). It is possible to perceive an outcome as likely but not worry much about it (e.g. flu) or to perceive an outcome as unlikely but worry a great deal about it (e.g. breast cancer).

Both perceived risk and worry may have independent as well as interactive effects on motivating health behaviors. That is, they may work together in a way that results in better or worse health decisions. Some investigations have found a somewhat paradoxical effect such that among those with high worry and high risk perceptions, motivation for health-promoting behaviors is lower. Such an effect has been observed for engaging in physical exercise and consuming fruits/vegetables (Ferrer et al., 2013), intentions to quit smoking (Klein et al., 2009), and greater avoidance of practitioner visits among older adults (Persoskie et al., 2014). However, others have found no evidence for an interactive effect on the likelihood of six types of cancer screening behaviors (Moser et al., 2007). Additionally, Portnoy et al. (2014b) found the pattern of interactive effects on intentions to exercise among individuals with Type II diabetes varied by how perceived risk was measured.

The operationalization of perceived risk may help to explain the lack of consensus on the interactive effects of perceived risk and worry on health decisions. Most measures of perceived risk are "absolute" in that they ask an individual to assess their personal risk. Personal risk can be further delineated as unconditional or conditional. *Unconditional* measures evaluate the probability of an event without specifying one's future behavior ("How likely are you to get lung cancer?"). *Conditional* measures evaluate the probability of an event depending on one's behavior ("How likely are you to get lung cancer if you continue to smoke?"). Risk measures may also be *comparative*, evaluating the probability of an event relative to similar others ("Compared to other smokers your age, how likely are you to get lung cancer?"). These different measures may influence the apparent strength of the relationship between perceived risk and motivation for health behavior (Dillard et al., 2012). For example, conditional risk

estimates may be stronger predictors of behavior than unconditional measures (Brewer et al., 2007; Janssen et al., 2011; Ronis, 1992; Van der Velde et al., 1996). Additionally, comparative risk perceptions may be more strongly associated with worry than absolute risk (Lipkus et al., 2005; Zajac et al., 2006). This variation in outcomes has led some to recommend the inclusion of both absolute and comparative assessments when measuring risk perceptions due to their distinct influence on intentions and behavior (Zajac et al., 2006).

Another consideration of measurement of risk is that the focus is typically on long-term health outcomes. However, a small but growing body of the literature suggests that focusing on other risks such as social (Halpern-Felsher et al., 2004) or appearance consequences (Flett et al., 2013) could also discourage smoking, particularly among youth and young adults. For example, Grogan et al. (2011) found that female smokers exposed to a personalized visual aging trial reported greater intentions to quit in comparison to those in a standard care condition. Moreover, certain appearance consequences of smoking may even promote continued smoking (e.g. concerns about weight gain; Perkins et al., 1997). In contrast to long-term health consequences, appearance consequences have a relatively shorter time to onset—they typically develop faster and thus may be more salient. The argument that many smokers use to rationalize continued use (i.e. I'll quit before my smoking makes me sick) may not hold when confronted with more immediate appearance consequences of their behavior (Grogan et al., 2010). A small number of studies focus on the potential for enhancing appearance-related smoking consequences to motivate behavior change (see Flett et al., 2013 for review), but none of this work to date has assessed how perceptions of appearance risks "measure up" to health-related measures of risk and the extent to which they are associated with motivation to quit smoking. From an applied perspective, understanding the conditions under which perceived risk and worry are associated with motivation to quit could aid the development of more effective risk communications, provide an alternative to reduce habituation to well-known health messages, or identify variables for developing interventions.

This study addresses the connections of perceived risk and worry with motivation to quit among smokers. This study is unique in that the relationship of perceived risk and worry on motivation to quit will be tested for both health and appearance consequences of smoking. The first aim is to test the independent and interactive effects of perceived risk and worry on motivation to quit. In keeping with theoretical perspectives (e.g. Loewenstein et al., 2001; Slovic et al., 2005) and previous work (e.g. Dillard et al., 2012; Magnan et al., 2009), I predicted similar patterns for health consequence and appearance consequence measures such that (1) all perceived risk and worry items will be positively associated with

motivation to quit and (2) worry will be associated with motivation after controlling for the effects of perceived risk. Furthermore, (3) there will be perceived risk \times worry interactive effects on motivation to quit although the specific pattern of the interaction is not identified given the variation in outcomes of previous work (e.g. Klein et al., 2009; Portnoy et al., 2014b). A second aim addresses the relative importance of perceived risk and worry of health versus appearance consequences in explaining motivation to quit smoking using a relative weights analysis (RWA). I further expected that worry and, to a lesser extent, conditional perceived risk would be the most important contributors of motivation to quit. No a priori expectations regarding the relative importance of health or appearance consequences were made.

Method

Participants

The current investigation utilized data from a study regarding reactions to different types of smoking-consequence messages, but the data reported here were collected prior to randomization to condition. Participants were 121 smokers who reported smoking at least four cigarettes per day. They were recruited from the local metro via Craigslist advertisements and flyers posted around the area. Four individuals were dropped from analysis because they reported smoking fewer than four cigarettes a day at the baseline session resulting in a final sample of 117 smokers. Participants were paid US\$80 for completing the 2-week study. All participants gave written informed consent before beginning, and this protocol was designated as exempt by the Washington State University Office of Research Assurances.

Measures

Background information and smoking behavior. Demographic information included age, gender, race/ethnicity, and education. To assess smoking behavior, participants indicated how many cigarettes they typically smoke each day and the age they began smoking. *Nicotine dependence* was assessed using the Fagerström Test of Nicotine Dependence-Revised (FTND-R; Heatherton et al., 1991), $\alpha = .66$. *Trait worry* was assessed with the Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990), $\alpha = .94$.

Perceived risk. Measures of perceived risk were adapted from work by McCaul et al. (2007) and Magnan et al. (2009). *Perceived conditional risk of health consequences* of smoking was assessed with four items asking participants to indicate how likely they are to develop some type of cancer or non-cancerous medical condition within their lifetime if they continue to smoke (e.g. “What are the

chances that you might develop some type of cancer within your lifetime if you continue to smoke?”). Similarly, *perceived conditional risk of appearance consequences* of smoking was assessed with two items (e.g. “How likely do you think you are to develop a smoking-related deterioration of your physical appearance if you continue to smoke?”). Responses were made on a 7-point response scale (1 = *very low/not all likely*; 7 = *very high*), and items were averaged to create scores for conditional health risk ($\alpha = .92$) and conditional appearance risk ($\alpha = .94$). *Perceived comparative risk of health consequences* was assessed with four items (“What do you think your chances are of developing some type of cancer in your lifetime compared to other people your age who have smoked cigarettes?”), and *perceived comparative risk of appearance consequences* was assessed with two items (“Compared to other people your age who have smoked cigarettes, how would you rate your chances of developing smoking-related deterioration of your physical appearance?”). Responses were made on 7-point response scales (1 = *much smaller than average chances/below average*; *much bigger than average chances/above average*), and items were averaged to create scores for comparative health risk ($\alpha = .93$) and comparative appearance risk ($\alpha = .91$).

Worry. Worry about developing a smoking-related medical condition and deterioration of physical appearance were assessed with three items focusing on the amount and frequency of worry (adapted from Magnan et al., 2009): “How much do you worry about developing a smoking-related medical condition [deterioration of your physical appearance]?” and “How much does thinking about a smoking-related medical condition [deterioration of your physical appearance] bother you?” were answered on 7-point (1 = *not at all*; 7 = *extremely*) scales. “How often do you worry about developing a smoking-related medical condition [deterioration of your physical appearance]?” was answered on a 7-point (1 = *never*; 7 = *often*) scale. Items were averaged to create a single score for worry about health consequences ($\alpha = .85$) and worry about appearance consequences ($\alpha = .91$).

Motivation to quit. Assessment of motivation to quit was adapted from work by McCaul et al. (2007). Participants indicated how motivated they were to quit smoking in the next 30 days and 6 months (1 = *not at all*; 7 = *extremely*) and desire to quit smoking in the next 30 days and 6 months (1 = *no desire at all*; 7 = *strong desire*). Participants also indicated their plans to cut back on their smoking and to quit (1 = *I do not have plans to cut back/quit*; 5 = *I am currently cutting back/trying to quit*). Scores were summed to create a single motivation score, $\alpha = .92$. Similar approaches to measurement of motivation have been associated with quitting intentions (Kozlowski et al., 1999) and worry about cigarette smoking (McCaul et al., 2007).

Table 1. Sample characteristics by gender.

Variable	Female (N=59)	Male (N=57)	<i>d</i>	Total (N=117)
Background				
Age	35.97 (13.09)	35.49 (11.86)	.04	35.79 (12.42)
% White	74.6	77.2		76.1
% At least some college	75.9	71.9		73.9
Smoking behavior				
Cigarettes/day	12.90 (5.59)	13.63 (6.66)	.12	13.18 (6.15)
Age started	16.05 (4.68)	16.13 (4.03)	.02	16.07 (4.34)
Nicotine dependence	3.92 (1.99)	3.51 (2.13)	.20	3.70 (2.06)
Perceived risk				
Conditional health	5.49 (1.31)	5.14 (1.58)	.24	5.33 (1.46)
Conditional appearance	5.64 (1.40)	5.14 (1.71)	.32	5.41 (1.57)
Comparative health	4.52 (1.28)	4.06 (1.35)	.35	4.31 (1.33)
Comparative appearance	4.58 (1.23)	3.85 (1.36)	.56	4.24 (1.34)
Worry				
Health	4.10 (1.46)	3.43 (1.56)	.44	3.79 (1.56)
Appearance	4.29 (1.68)	3.35 (1.57)	.58	3.83 (1.68)
Motivation to quit	23.46 (7.98)	21.68 (10.22)	.19	22.67 (9.16)
Trait worry	54.15 (13.49)	45.33 (14.13)	.63	50.00 (14.51)

Values are means and standard deviations (SD) unless otherwise indicated. One person did not indicate their gender. Bolded values indicate significant gender differences at $p < .05$. "d" refers to Cohen's *d*.

Analysis

Prior to analysis, all continuous variables were checked for assumptions of normality. Associations of perceived risk, worry, motivation to quit, and behavior were tested using bivariate correlations. Then, a hierarchical linear regression was used to examine the main and interactive relationships of conditional risk, comparative risk, and worry on motivation to quit. Step 1 included sociodemographic characteristics (age, gender), trait worry, and average number of cigarettes per day; step 2 added conditional and comparative risk of smoking; step 3 added worry; and step 4 added multiplicative interaction risk \times worry terms. The set of variables in the models were first standardized prior to entry. Because of the positive bivariate correlations among these variables, two separate models were tested for health consequences and appearance consequences.

To test the relative importance of the perceived risk and worry measures of health and appearance consequences, a RWA (Johnson, 2000) was conducted with the six primary correlates of motivation (conditional risk, comparative risk, and worry for health and appearance consequences) using RWA-Web (Tonidandel and LeBreton, 2015). This analysis is recommended when variables included in a model are correlated as a supplement to regression analyses in order to break down the predicted variance in the criterion—here motivation. RWA transforms the set of variables to be orthogonal, and thus, uncorrelated with one another. Ultimately, this analysis identifies which variables explain non-trivial variance in motivation to quit by providing an estimate of the proportionate contribution of each variable

to the variance accounted for by the complete set of variables. The analysis uses 95 percent confidence intervals based on 10,000 replication bootstrapping around the estimates of the set of variables to determine if significant variance is accounted for in the criterion.

Results

The final sample included 117 smokers. On average, the sample was 35.79 years of age (standard deviation (*SD*)=12.42; range: 18–64), 50.4 percent female, and the majority had completed at least some college (71.5%). The majority were White (75.2%), followed by African American/Black (8.5%), Hispanic/Latino (6.0%), bi- or multi-racial (3.4%), Native American/Alaska Native (1.7%), Native Hawaiian/Pacific Islander (1.7%), and 2.5 percent could not be categorized. Table 1 presents characteristics of the sample by gender. Females reported greater comparative appearance risk, health worry, appearance worry, and trait worry than males.

Table 2 presents bivariate correlations between all perceived risk and worry measures with age, trait worry, average daily cigarette use, and motivation to quit. Consistent with the first hypothesis, conditional risk ($r = .34$ and $.49$), comparative risk ($r = .23$ and $.35$), and worry ($r = .42$ and $.39$) about health and appearance consequences of smoking were all significantly and positively associated with motivation to quit smoking. No risk or worry variables were associated with daily cigarette use, and only worry about health consequences ($r = .23$) and cigarettes per day ($r = .27$) were associated with age.

Table 2. Bivariate relationships.

Variable	1	2	3	4	5	6	7	8	9	10
1. Age	–									
2. Trait worry	–.04	–								
3. Cigarettes/day	.27**	.12	–							
4. Conditional health risk	–.01	.12	–.05	–						
5. Comparative health risk	.02	.17 ^a	–.02	.56***	–					
6. Conditional appearance risk	.05	.25**	–.09	.79***	.47***	–				
7. Comparative appearance risk	.08	.28**	–.03	.49***	.79***	.62***	–			
8. Health worry	.23*	.35***	–.09	.43***	.43***	.42***	.45***	–		
9. Appearance worry	.06	.48***	–.04	.33***	.39*	.59***	.61***	.63***	–	
10. Motivation to quit	.13	.14	–.22*	.34***	.23*	.49***	.34***	.42***	.39***	–

Bolded values indicate statistically significant correlations.

^a $p < .10$.

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

The second hypothesis was that worry would be significantly associated with motivation to quit over and above the effects of perceived risk. In the model including perceived risk and worry of health consequences (see top of Table 3), age, gender, trait worry, and cigarettes per day were entered in step 1. In step 2, greater conditional perceived risk of health consequences (but not comparative perceived risk) was significantly associated with more motivation to quit ($\beta = .30$). Importantly, and as predicted, greater worry about health consequences was significantly associated with motivation to quit after controlling for perceived risk ($\beta = .26$). In the model including perceived risk and worry of appearance consequences (see bottom of Table 3), after controlling for the same background variables in step 1, greater conditional perceived risk of appearance consequences (but not comparative perceived risk) was significantly associated with more motivation to quit ($\beta = .41$). However, in contrast to predictions, worry about appearance consequences did not significantly add to the model.

The third hypothesis was that there would be significant worry \times perceived risk interactions on motivation to quit, although the precise form of these interactions was not identified. Unexpectedly, none of the interaction terms specified in step 4 added significantly to the models using perceived risk and worry for health consequence or perceived risk and worry for appearance consequence.

To address the secondary aim, I conducted an RWA analysis to determine the relative importance of perceived risk and worry framed as health or appearance consequences. A weighted combination of the six primary risk and worry variables accounted for 30.81 percent of the variance in motivation to quit. The relative weights (RW) indicated that conditional appearance risk (RW = .11), health worry (RW = .08), appearance worry (RW = .04), and conditional health risk (RW = .04) each accounted for a significant amount of variance in motivation to quit, whereas the comparative risk variables did not. Table 4 presents the RW of each variable in the model. Perceived risk of appearance

consequences and worry about health consequences were the most important variables in the model, accounting for 35.17 and 27.98 percent of the predicted variance in motivation to quit, respectively.

Discussion

The purpose of this study was to test the main and interactive effects of perceived risk and worry about health and appearance consequences on motivation to quit smoking and to address their relative importance on motivation to quit. In keeping with prior work on perceived risk and worry of health consequences, all perceived risk (conditional and comparative) and worry measures were independently associated with motivation to quit such that higher perceived risk and worry were associated with more motivation to quit smoking. Moreover, these associations held when framed for health consequences of smoking, as well as appearance consequences of smoking. These results suggest that non-health-related perceived risk and worry could be unique contributors to motivating health behavior change.

Somewhat consistent with expectations, worry about health consequences was associated with motivation to quit over and above effects of perceived risk; however, worry about appearance consequences was not. These findings related to the health outcomes of smoking are in keeping with previous work and theoretical perspectives (e.g. Dillard et al., 2012; Janssen et al., 2014; Loewenstein et al., 2001) suggesting that feelings of health risk may be more important than cognitions of risk for some behaviors. However, this work has largely focused on cognitions and feelings of health threats. The current outcomes suggest that the relative importance of cognitions versus feelings for motivation may depend on the “threat” one is considering. Specifically, perceived risk of appearance consequences made the largest contribution to motivation to quit, while worry of health consequences made the second

Table 3. Standardized regression coefficients.

Health risk model	Step 1		Step 2		Step 3		Step 4	
	$R^2 = .113$		$R^2 = .211$		$R^2 = .253$		$R^2 = .274$	
Variable	β	p	β	p	β	p	β	p
Gender	-.02	.80	.01	.92	.02	.82	.03	.77
Age	.22	.02	.22	.02	.14	.12	.19	.05
Trait worry	.17	.09	.14	.14	.02	.82	.05	.61
Typical cigarettes per day	-.29	.003	-.28	.003	-.23	.01	-.25	.007
Health conditional risk			.30	.005	.23	.03	.15	.18
Health comparative risk			.04	.74	-.02	.84	-.01	.89
Health worry					.26	.02	.28	.01
Health conditional risk \times worry							-.14	.25
Health comparative risk \times worry							-.04	.72

Appearance risk model	Step 1		Step 2		Step 3		Step 4	
	$R^2 = .113$		$R^2 = .293$		$R^2 = .259$		$R^2 = .255$	
Variable	β	p	β	p	β	p	β	p
Gender	-.02	.80	.01	.84	.03	.78	.03	.75
Age	.22	.02	.02	.04	.17	.05	.18	.04
Trait worry	.17	.09	.06	.54	.004	.97	.02	.87
Typical cigarettes per day	-.29	.003	-.24	.008	-.23	.01	-.24	.008
Appearance conditional risk			.41	<.001	.37	.001	.32	.008
Appearance comparative risk			.05	.63	-.001	.99	-.02	.86
Appearance worry					.16	.20	.18	.15
Appearance conditions risk \times worry							-.14	.22
Appearance comparative risk \times worry							.07	.53

Bolded effects are statistically significant at $p < .05$.

Table 4. Relative importance of perceived risk and worry variables on motivation to quit.

Variable	Relative weight	Rescaled relative weight (%)	CI lower	CI upper
Conditional health risk	.0369	11.96	.0026	.0906
Comparative health risk	.0104	3.37	-.0230	.0368
Conditional appearance risk	.1084	35.17	.0497	.1883
Comparative appearance risk	.0287	9.30	-.0042	.0872
Health worry	.0834	27.08	.0131	.1950
Appearance worry	.0404	13.12	.0041	.1060

CI: confidence interval. Bolded values indicate statistically significant values at $p < .05$.

$R^2 = .3081$. Rescaled relative weight represents each variable's percentage of the predicted criterion accounted for by the set of variables in the model (R^2). Weights did not significantly differ by age (30 years or younger vs over 30 years).

largest. In other words, these variables were the most important among the set of variables in the model. Although the outcomes of the RWA differ slightly from the regression outcomes, this is not surprising given the different approaches to the analyses. The RWA identifies which variables explain non-trivial variance in motivation to quit (i.e. uncorrelated with other variables in the model). Thus, while both conditional risk measures and worry measures account

for variance in motivation to quit (regardless of consequences for health or appearance), they may account for little unique incremental variance in the regressions (Tonidandel and LeBreton, 2015).

Dual-process theoretical perspectives suggest that whether one relies on the analytical or experiential system for decision-making may vary depending upon the context (Slovic et al., 2005). In this study, cognitions of appearance

consequences weighed more heavily on motivation than feelings of appearance consequences, while feelings of health consequences weighed more heavily than cognitions of health consequences. The relationship of risk appraisals on behavior may be moderated by the proximity of the health threat (Sheeran et al., 2014). Health consequences of smoking are often perceived as being distal—occurring in the distant future. Appearance consequences, in contrast, may be more proximal—occurring in the near future. Furthermore, appearance consequences are visible, potentially making the negative effects of behavior (i.e. one's susceptibility) more salient. Health symptoms of smoking may not be visible until the consequences become more severe. This variation by proximity suggests differences in what may influence thoughts about smoking consequences versus feelings about smoking consequences. These outcomes add to evidence that different content may differentially influence perceptions of risk and worry (Portnoy et al., 2014a).

The current findings also provide additional support for growing literature highlighting the potential importance of appearance-related consequences on health behaviors (Flett et al., 2013). The vast majority of work assessing the role of risk perceptions on health behavior, appropriately, focuses on health threats; but consequences of smoking are relevant to more than personal health—smoking has monetary, social, and appearance consequences. To this end, these data provide some support that investigators focusing exclusively on health consequences of behavior could be missing an opportunity to motivate behavior change.

In contrast to expectations, there was no evidence of a perceived risk \times worry interaction effect on motivation to quit, for either health or appearance consequences. However, this outcome is consistent with prior work on cancer screening behaviors (Moser et al., 2007). Interaction effects also did not vary as a function of the way perceived risk was measured (i.e. conditional or comparative)—a finding seen in prior work (Portnoy et al., 2014b). One possibility for these null findings is that this study focused on motivation as an outcome, whereas other work has focused on intentions (e.g. Portnoy et al., 2014b) and behavior (Ferrer et al., 2013). As mentioned previously, motivation is associated with both intentions and behavior, but the interactive effect may differ for motivation versus behavior. Additionally, each prior test of this interactive relationship used slightly different construct measurement (e.g. single item versus multi-item risk or worry measures). This speaks to a larger issue of inconsistency of risk measurement in the literature (Brewer et al., 2007); however, such a discussion is beyond the scope of this article. Given the limited focus on the interactive relationship of perceived risk and worry on health decisions and behavior, these outcomes emphasize the need for continued work establishing the conditions under which and for whom such interactions occur.

Findings of the current investigation should be considered in light of several limitations. First, this was a cross-sectional investigation and causal conclusions cannot be made. Indeed, it is possible that the relationship between perceived risk and worry and motivation is bi-directional. Those who are already motivated to quit may have more and/or stronger thoughts and concerns about smoking consequences. Second, risk measures may have stronger associations with motivation when framed for specific “threats” (Brewer et al., 2007). Although a “non-cancerous medical condition” and “smoking-related deterioration of physical appearance” were indicated, specific consequences within these domains were not provided (e.g. wrinkles, yellowing teeth). The specific consequences one thought about in these categories were left up to the responder's imagination and thus it is not possible to determine which proximal or distal threats were brought to mind. Finally, the sample is limited to a single geographic area, and the findings may not generalize to other groups.

Despite these limitations, the findings point to the importance of taking into account the appearance consequences of smoking. All perceived risk and worry items for health and appearance items were independently associated with motivation to quit. Furthermore, the most important contributor of motivation to quit (i.e. perceived risk or worry) may be dependent upon the behavioral consequence under consideration. The current outcomes suggest that in addition to health consequences, making appearance consequences more salient may be a worthwhile focus for smoking cessation interventions.

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