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Longitudinal associations between people's cessation-related experiences and their satisfaction with cessation

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Abstract

We sought to determine whether different social, psychological, emotional, and physiological experiences associated with quitting smoking related to people's satisfaction with cessation systematically, and whether the strength of the relations changes at different points during the cessation process and for different people (e.g., optimists). Using data from smokers enrolled in a cessation program, we used mixed models to assess the average longitudinal relation between people's experiences and satisfaction measured at seven time points and whether the relations were moderated by key variables. Eight of nine experiences were related to people's satisfaction ($ps < 0.05$) and the models accounted for 39–44% of the within-person variance in satisfaction. Current smoking behavior was more strongly related to people's satisfaction during their early efforts to quit, whereas some experiences (e.g., feedback from others) had a stronger relation with satisfaction during people's later efforts to quit or maintain abstinence ($ps < 0.05$). Individual differences in optimism and prior cessation experience moderated some of the relations ($ps < 0.05$). The findings mark the first evidence of factors that might influence how people determine their satisfaction with smoking cessation. The implications for tailoring interventions and potentially increasing the likelihood that people maintain abstinence are discussed.

Keywords

satisfaction; smoking cessation; cessation experiences; behavior change maintenance

Introduction

When people make healthy changes in their behavior, like quitting smoking or eating a healthier diet, a variety of health- and healthcare-related benefits can result (US Department of Health and Human Services, 2001). However, benefits such as increased life expectancies

and reductions in disease morbidity and health care costs are contingent on people's ability to maintain the healthy changes over a long period of time. This suggests a need for a clear understanding of the factors that influence behavior change maintenance (Jeffery et al., 2000; Ockene et al., 2000; Rothman, 2000; Rothman, Baldwin, & Hertel, 2004).

Rothman and his colleagues (Rothman, 2000; Rothman et al., 2004) have argued that people's decisions to maintain a successfully enacted change (e.g., quitting smoking) are guided primarily by their satisfaction with the outcomes afforded by the change, making people's decisions to maintain a change distinct from their decisions to initiate the change. Previous research among people attempting to quit smoking has provided support for this thesis by demonstrating that people's satisfaction with smoking cessation is a critical determinant of whether those who have been successful at quitting smoking maintain their abstinence over time (Baldwin et al., 2006; see Finch et al., 2005, for similar evidence in the weight loss domain). However, our understanding of what factors might influence people's satisfaction with the behavior changes they make is quite limited and a more thorough understanding would be informative for the development of theory and behavior change interventions. In light of prior work delineating the impact of satisfaction on the maintenance of smoking cessation (Baldwin et al., 2006), we have chosen this domain to examine the factors that influence people's satisfaction with behavior change.

Satisfaction with smoking cessation

There is little doubt that when people are attempting to quit smoking, whether they are currently successful at quitting should be an important determinant of their satisfaction. However, it is less clear what other factors might be associated with people's satisfaction with cessation over time. Previous work has demonstrated that specific treatments, such as pharmacological aides (Cousins, Stamat, & de Wit, 2001; Gonzales et al., 2006; Houtsmuller, Thornton, & Stitzer, 2002), nicotine replacement therapy (NRT; Foulds, Stapeton, Feyerabend, Vesey, Jarvis, & Russell, 1992; Shiffman, Ferguson, & Gwaltney, 2006), or a combination of the two (Rose et al., 1994; Rose, Behm, & Westman, 1998) can decrease people's satisfaction with smoking. To the extent that people's satisfaction with cessation is inversely related to their satisfaction with smoking, these studies suggest that one component of people's satisfaction with cessation may be influenced by their physiological responses to quitting.

What other factors might influence people's satisfaction with cessation? People report a variety of reasons for why they smoke and why they decide to quit smoking (e.g., Berlin et al., 2003; Nichter, Nichter et al., 2006; Worth, Sullivan, Hertel, Rothman, & Jeffery, 2005). For example, people report that their smoking and their decisions to quit smoking are influenced by others (e.g., family, friends) or that they smoke for psychological and emotional reasons. In considering what factors might influence people's satisfaction, it seems reasonable that the experiences people have during the cessation process that are related to these classes of reasons might influence their satisfaction with cessation. For example, people might monitor how their relationships with others are affected by their attempts to quit smoking and whether the feedback they receive from others about their cessation attempts is positive and encouraging. In addition, if people's aversive emotional and psychological experiences (e.g., stress, anxiety, cravings) increase, while they are engaged in smoking cessation, those experiences might negatively influence their satisfaction with cessation. However, to date the relation between people's experiences, satisfaction, and cessation has not been examined.

It is also important to note that the influence of people's experiences on their satisfaction might matter more (a) at different points during the cessation process, (b) for different people, and (c) at different points for different people. Given the arguments and evidence

that behavior change maintenance is guided by people's satisfaction with what the change has afforded them (Baldwin et al., 2006; Rothman, 2000; Rothman et al., 2004), it is possible that people's cessation-related experiences (e.g., receiving positive and encouraging feedback from others about one's attempts to quit smoking) are more strongly related to their satisfaction once they reach points later in their quitting efforts and are in a position to assess what the change in behavior has afforded. Alternatively, it might be that different experiences are seen as more relevant to people's satisfaction at different times. For example, during people's initial efforts to quit smoking, they may pay limited attention to any effect their efforts have on their long-term health, but pay considerable attention to changes in the smell of their belongings or the frequency of their cravings. These possibilities suggest that the strength of the relations between people's experiences and their satisfaction might change between their early efforts to quit and their later efforts to quit or maintain abstinence.

The association between people's cessation-related experiences and their satisfaction might also differ for different types of people. First, men and women can differ in their reasons for smoking (e.g., Berlin et al., 2003; Nichter et al., 2006), thus they might focus their attention on different cessation-related experiences when determining their satisfaction with cessation. Second, prior experience with quitting smoking might afford people with a better sense for which cessation-related experiences to focus on and/or when certain experiences should occur. Finally, because optimists are more likely to maintain their positive expectations about future outcomes, even in the face of failure and negative experiences (Geers & Lassiter, 2002; Gibson & Sanbonmatsu, 2004), they might be less responsive to the negative experiences (e.g., frequency of cravings) that predominate early in the cessation process. However, even optimists may not be able to remain satisfied without evidence that at some point during their efforts to quit, their negative experiences have dissipated and their positive experiences have remained. How these various individual differences affect the associations between people's experiences and their satisfaction and how they might affect the associations at different points during the cessation process have yet to be examined.

The current research addresses the gaps in the literature regarding the factors that influence people's satisfaction with smoking cessation. Data were collected from people enrolled in a smoking cessation program on different social, psychological, emotional, and physiological experiences that people have when they attempt to quit smoking, their satisfaction with cessation, and their smoking behavior at seven different time points over a 15-month period that began 1 month after the program quit date. Because satisfaction with cessation is relevant only to those who experience some success at quitting smoking, the analyses presented here are limited to people ($N = 242$) who reported at least one 7-day period of successful abstinence at some point over the 15-month period. Using longitudinal mixed models, we tested whether changes in people's cessation-related experiences were systematically related to changes in their satisfaction across the seven time points. We also tested whether the strength of the associations between any of the cessation-related experiences and satisfaction changed depending on whether it was early or later in people's efforts to quit smoking. Finally, we tested whether gender, prior cessation experience, or dispositional optimism moderated the strength of the experience-satisfaction associations and whether the moderating effects changed depending on the point in the cessation process.

Method

Participants

Participants ($N = 242$) included in these analyses were drawn from a larger sample of regular smokers ($N = 591$) who were recruited through public advertisements to participate in a smoking cessation program. To be eligible for the program, participants had to be 18

years or older, smoke 10 or more cigarettes per day for at least 2 years, and not be pregnant. To be included in these analyses, participants had to report at least one 7-day period of successful abstinence at some point during the 16-month period following the program quit date.

Procedure

At an orientation meeting prior to the first session of the cessation program, the program was described in detail. People who chose to participate completed consent forms and a questionnaire packet that included measures of baseline smoking behavior, prior cessation experience, dispositional optimism, and demographic questions. Participants were subsequently assigned to one of two treatment conditions, which were designed to shape the participants' outcome expectations regarding smoking cessation. However, because the treatment manipulation was not the focus of these analyses, we statistically controlled for treatment condition in all the analyses reported here. A trained facilitator led groups of 10–15 smokers in a series of eight weekly 1-hour sessions. Participants completed measures during the weekly sessions and were also sent follow-up questionnaires each month for 15 months after the end of the program (see Hertel et al., in press) for more information about the intervention).

Measures

Assessed at baseline

Prior cessation experience—Participants' longest period of previous abstinence (less than 1 day, 1–6 days, 1–4 weeks, 1–2 months, 3–6 months, 7–12 months, more than 1 year) was used as a measure of prior cessation experience.

Dispositional optimism—Dispositional optimism was assessed using a modified version of the Life Orientation Test-Revised (LOT-R; Scheier, Carver, & Bridges, 1994) that is comprised of six self-report items of global optimism. An example item is, "In uncertain times, I usually expect the best". Responses to the items were measured on a 1 (*strongly disagree*) to 7 (*strongly agree*) scale that included a midpoint label (*neither agree nor disagree*). Three of the items were reverse scored and a composite score was created by computing the mean across the six items with higher scores representing higher levels of optimism ($\alpha = 0.86$).

Assessed during the cessation process

Participants' cessation-related experiences were assessed at 1-, 2-, 5-, 8-, 11-, 14-, and 16-months after the program quit date. Although participants' satisfaction and smoking experience variables were considered in these analyses.

Satisfaction—Satisfaction was assessed at 1 month post-quit date with one item that asked participants, "Given the effort you have put into being smoke-free, how satisfied are you with your progress?" At the remaining six time points, satisfaction was measured with a different item that asked participants, "As of today, how satisfied are you with what you have experienced as a result of quitting smoking?" Responses to both items were measured on a –4 (*very dissatisfied*) to +4 (*very satisfied*) scale that included a midpoint label (*neither satisfied nor dissatisfied*). For the item measured at the last six time points, participants could indicate that the item did not apply to them (e.g., someone who had yet to have a 7-day period of abstinence). In that case, satisfaction was considered missing at the respective time point for those participants.

Cessation-related experiences—Participants' completed nine different items that asked about a variety of cessation-related experiences. The items were selected because they represented a range of experiences (i.e., social, psychological, emotional, and physiological) that people have when they attempt to quit smoking. The items assessed the following experiences: (1) frequency of cravings, (2) ability to cope with stress, (3) amount of anxiety, (4) amount of irritability, frustration, and/or anger, (5) ability to detect different tastes and smells, (6) extent to which belongings smell like smoke, (7) supportiveness of feedback from family, friends, and co-workers, (8) positivity of the impact of their smoking status on relationships with smokers, and (9) positivity of the impact of their smoking status on relationships with non-smokers. Responses to the items were measured on 9-point scales with anchors labeled to indicate low or high levels of the experience. For example, one item asked, "How often did you have cravings for cigarettes over the past week?" with responses measured on a 0 (*I never experienced cravings*) to 8 (*I constantly experienced cravings*) scale with a midpoint label (*I occasionally experienced cravings*).

Smoking status—Current smoking status was assessed using participants' self-report of the number of days during which they had smoked even a puff over the last 7 days. At each time point, participants were considered to be smoking if they reported having smoked during each of the previous 7 days. This group included people who had not yet quit and those who had previously quit but relapsed. Participants were considered as not smoking if they reported (a) not smoking at all, or (b) smoking on fewer than 7 days in the previous week (i.e., not yet relapsed). If participants' smoking status self-reports were missing, they were considered to be smoking at that time point. The current smoking status variable was dummy coded such that smoking = 0 and not smoking (or not yet relapsed) = 1.

Analysis strategy

To address the question of whether people's cessation-related experiences are associated with their satisfaction throughout the cessation process, we ran longitudinal mixed models and tested whether the average relation between each experience variable and satisfaction across the seven time points was significant. In addition, we estimated the amount of variation in satisfaction that is explained by each of the cessation-related experiences. The following unconditional means model served as a baseline model from which to compare the amount of variance explained by the addition of cessation-related experiences in subsequent models:

$$Y_{ij} = \gamma_{00} + (\zeta_{0i} + \varepsilon_{ij}) \quad (1)$$

where Y_{ij} = satisfaction for the i th participant at j th time point, γ_{00} = the grand mean of satisfaction across all participants and time points, ζ_{0i} = between-person variance in satisfaction for the i th participant, and ε_{ij} = within-person variance in satisfaction for the i th participant at j th time point. Given that all of the cessation-related experience variables are time-varying predictors, the focus of these analyses was on the amount of within-person variance that is accounted for by each experience variable (see Singer, 2002).

Because satisfaction with cessation is likely to be related to people's current smoking status, the relation between current smoking status and satisfaction was assessed before the relations with any of the cessation-related experience variables were assessed. The current smoking status variable was added to the unconditional means model (Equation 1) resulting in the following model:

$$Y_{ij} = \gamma_{00} + \gamma_{10} \text{Status}_{ij} + (\zeta_{0i} + \zeta_{1i} \text{Status}_{ij} + \varepsilon_{ij}) \quad (2)$$

where $Status_{ij}$ equals 0 if individual i was smoking at time j and equals 1 if individual i was not smoking at time j , and γ_{10} = the average strength of the relation between current smoking status and satisfaction over j time points. In addition, the model allows for the relation between current smoking status and satisfaction to randomly vary among individuals (ζ_{1j}).

Then to assess the unique relation between each of the cessation-related experiences and satisfaction, each experience was added separately to the current smoking status model (Equation 2) resulting in the following model:

$$Y_{ij} = \gamma_{00} + \gamma_{10}Status_{ij} + \gamma_{20}X_{2ij} + (\zeta_{0i} + \zeta_{1i}Status_{ij} + \zeta_{2i}X_{2ij} + \varepsilon_{ij}) \quad (3)$$

where X_{2ij} is the value of each cessation-related experience for individual i at time j , and γ_{20} = the average strength of the relation between the cessation-related experience and satisfaction over j time points while controlling for current smoking status. In addition, the relations between satisfaction and current smoking status (ζ_{1j}) and each cessation-related experience (ζ_{2j}) were allowed to randomly vary.

To determine whether the strength of the relations between people's experiences and their satisfaction change between their early efforts to quit and their later efforts to quit or maintain abstinence, the time points after the program quit date were dummy coded and dichotomized to reflect points early (1 and 2 months after the program quit date: dummy code = 0) and points later (5 Months and beyond: dummy code = 1) in the cessation process. This dichotomization was chosen because the vast majority of participants had experienced some success at quitting smoking during the first 2 months after the program quit date (i.e., only 12% were still smoking during both of the first 2 months). The interactions between the dummy coded time variable and current smoking status (added to Equation 2) and between the time variable and each of the cessation-related experiences (added to Equation 3) were tested to determine whether the strength of the relations between the variables and satisfaction changed depending on whether it was early or later in the cessation process. In these models, the relations with current smoking status, each experience variable, cessation phase, and each experience $\times$ cessation phase interaction were allowed to randomly vary.¹

To determine whether the strength of the relations is moderated by gender, prior cessation experience, or optimism, their interactions with current smoking status (added to Equation 2) and with the cessation-related experiences (added to Equation 3) were tested. In addition, three-way interactions were tested for each experience variable and the potential moderating variables (e.g., optimism $\times$ cessation-related experience $\times$ cessation phase) to determine whether the moderating effects might change at different points of the cessation process. To facilitate interpretation of the interaction terms, the continuous time-invariant variables (prior cessation experience and optimism) were centered by subtracting the respective sample mean from each participant's value on the variable.

Results

Descriptive statistics

Most participants included in the analyses were Caucasian (95%) and well-educated (88% with some college or higher education completed). Their mean age was 46.8 years (range 21–79 years) and slightly more than half (54.6%) were women. They reported having smoked for an average of 27.0 years (range 3–61 years), smoked a mean rate of 20.6

¹The variance estimates for some of these random effects were zero and thus were removed from the model as random effects, but not as fixed effects.

cigarettes per day, with 63% reporting a previous period of abstinence lasting at least 3 months. Also, participants' mean level of optimism was 4.97 (SD = 1.19).

To provide a description of people's experiences throughout the cessation process, descriptive statistics across the seven time points for satisfaction, the nine cessation-related experience variables, and smoking status are reported in Table 1. As can be seen in Table 1, the mean levels of all the cessation-related experiences and the smoking rates changed over time, and there was variability in all of the experiences. For example, mean levels of satisfaction decreased through 8 months after the program quit date and then began to steadily increase through the end of follow-up. The analyses reported below test whether these changes observed in satisfaction are systematically related with the changes observed in current smoking status and the changes observed in each of the cessation-related experience variables.

Current smoking status and satisfaction

To determine the strength of the relation between people's current smoking status and their satisfaction over time, the current smoking status model was fit. There was a significant, positive relation between people's satisfaction and their current smoking status, indicating that being smoke free or having not yet relapsed was associated with greater satisfaction (Table 2). Moreover, current smoking status explained approximately 33% of the within-person variation in satisfaction.

Cessation-related experiences and satisfaction

The results of the models testing the relation between people's satisfaction with cessation and each of the cessation-related experiences are also reported in Table 2. Except for people's relationships with friends and family that smoke, all of the cessation-related experiences were significantly related to people's satisfaction with cessation while controlling for their current smoking status. For example, the positive relation between the feedback people receive from others and their satisfaction indicates that the more positive the feedback they received, the more they were satisfied. In contrast, the negative relation between the frequency of people's cravings and their satisfaction indicates that the more frequent their cravings, the less they were satisfied. In addition, the amount of within-person variation in satisfaction explained by the cessation-related experience models ranged from 44% (feedback from others) to 39% (irritability, frustration, and/or anger; anxiety).

Does the strength of the relation with satisfaction change at different points of the cessation process?

To determine whether the strength of the relations depended on whether it was early or later in people's efforts to quit, we tested the two-way interactions between the dummy coded time variable and each of the cessation-related variables and current smoking status.² The results of the models are reported in Table 3. The significant interaction terms for current smoking status and for five of the cessation-related experience variables (feedback from others, extent to which belongings smell like smoke, relationship with friends and family who do not smoke, ability to detect different tastes and smells, and relationship with friends and family who do smoke) indicate that the strength of the relations between those variables and satisfaction differs between points early and points later in people's efforts to quit. To interpret the significant interactions, the following equation was solved for each interaction:

²The dichotomization we used to represent early efforts to quit and later efforts to quit or maintain abstinence was not relevant for 12% of the sample ($n = 29$) who was still smoking during both of the first 2 months after the program quit date. Thus we re-ran all of the models that included the dichotomized time variable excluding those 29 participants. There was no change in the significance of any of the relations.

(coefficient estimate of each variable) + (interaction term coefficient $\times$ dummy coded time variable [0 or 1]). As can be seen in Table 3, the strength of the relation between current smoking status and satisfaction is stronger at points early in the cessation process. In contrast, the strength of the relations between the five cessation-related experiences and satisfaction are stronger later in cessation process. These findings suggest that when people assess their satisfaction early in their efforts to quit smoking, they focus on their smoking status. But once people have moved past their initial efforts to quit, they give more weight to specific cessation-related experiences when assessing their satisfaction.

The moderating effect of gender, prior cessation experience, and dispositional optimism

To determine whether gender moderated the strength of the relations between people's satisfaction and their cessation-related experiences, gender and its interactions with current smoking status and each of the cessation-related variables, as well as the three-way interactions, were added to the models. There was a significant relation with gender such that women reported higher levels of satisfaction than men (estimate = 0.399, $SE = 0.176$, $p < 0.05$).³ In addition, there were two significant two-way interactions suggesting that feedback from others and people's relationship with their friends and family who smoke were more strongly related to satisfaction for men than they were for women ($ps < 0.05$). There was also a similar three-way interaction with feedback from others suggesting that the relation between feedback from others and satisfaction is stronger for men, but only at points later in the cessation process ($p < 0.05$; estimates early in the process: women = 0.278, men = 0.247; estimates later in the process: women = 0.308, men = 0.542).

To test whether prior experience with smoking cessation moderated the strength of the relations, the longest period of previous abstinence, its interactions with current smoking status and each of the cessation-related experiences, and the three-way interactions were added to the models. The only significant effects were two three-way interactions with frequency of cravings and the ability to detect different tastes and smells ($ps < 0.05$). To interpret the three-way interactions, the strength of the relation between satisfaction and the experience variables was estimated at one SD above and below the longest previous period of abstinence mean at points early and at points later in the cessation process. As can be seen in Table 4, the three-way interactions suggest that early in the cessation process, the relation between these two experience variables and satisfaction are stronger for people with shorter periods of previous abstinence. However, at later points of the cessation process, the relations between these two cessation-related experiences and satisfaction were stronger for those with longer periods of previous abstinence.

Finally, to determine whether individual differences in dispositional optimism moderated the strength of the relations, optimism, its interaction with current smoking status and each of the cessation-related experiences, and the three-way interactions were added to the models. Although higher levels of optimism were associated with greater satisfaction (estimate = 0.216, $SE = 0.075$, $p < 0.01$),⁴ none of the two-way interactions were significant (all $ps > 0.30$). There were, however, significant three-way interactions with four of the cessation-related experience variables (feedback from others, relationship with friends and family who do not smoke, ability to cope with stress, and anxiety over the past week; all $ps < 0.05$). To interpret these interactions, the strength of the relation between satisfaction and each experience variable was estimated at one SD above and below the optimism mean at points

³Because women reported higher levels of satisfaction over time than men did, we re-ran all of the models reported in the article controlling for gender. There was no change in the significance of any of the relations.

⁴Because higher levels of optimism were associated with higher levels of satisfaction over time, we re-ran all of the models reported in this article controlling for optimism. Two of the relations were rendered non-significant: the gender $\times$ feedback from others interaction and the longer period of previous abstinence $\times$ ability to detect new tastes and smells $\times$ cessation phase interaction.

early and at points later in the cessation process (Table 4). During people's early efforts to quit smoking, the relations between the four experiences and satisfaction were stronger for those low in dispositional optimism. However, at points later in the cessation process, the relations between the cessation-related experiences and satisfaction became stronger for those high in optimism than those low in optimism.

Discussion

The purpose of this study was to determine whether changes in people's cessation-related experiences were related to changes in their satisfaction throughout the cessation process systematically, and whether the strength of the relations between people's experiences and their satisfaction changed at different points of the cessation process and for different people. The findings suggested that a variety of positive and negative experiences people had that are associated with smoking cessation were independently related to their satisfaction with cessation, even while controlling for their current smoking behavior. These findings mark the first known evidence of factors that might influence whether people who are trying to quit smoking are satisfied with what their efforts have afforded them.

The findings also suggested that the specific factors that are associated with people's satisfaction with cessation depend on where they are in the cessation process. Specifically, people's satisfaction with cessation was more strongly associated with their smoking behavior early in their efforts to quit than later, whereas five of the nine cessation-related experiences were more strongly associated with their satisfaction later in their efforts. In comparing the experiences for which the strength of the associations did and did not change, it is interesting to note that the experiences that did not change (e.g., frequency of cravings, amount of anxiety) appear to be psychological and/or affective in nature, whereas the experiences that did change (e.g., smoking behavior, feedback from others, smell of belongings) appear to provide people with more concrete feedback about their experiences. However, given this is the first time these associations have been examined, the implications of this distinction for understanding how the influence of cessation-related experiences might change throughout the cessation process is an issue to be fleshed out in future research.

The findings also revealed that the strength of the relations between people's satisfaction and their experiences changed over time in different ways for different people. It appeared that early in the cessation process, there were both positive and negative cessation-related experiences that were more strongly related to people's satisfaction for those with less previous cessation experience and those low in optimism than for those with more previous cessation experience and those high in optimism, respectively. These findings suggest that during people's early efforts to quit smoking, factors such as previous cessation experience and dispositional optimism influence which cessation-related experiences people react to when assessing their satisfaction. For example, optimism may serve as a buffer against the difficult challenges people initially face in behavior change and may help them to maintain their positive expectations (Geers & Lassiter, 2002; Gibson & Sanbonmatsu, 2004). Yet, for people with more previous cessation experience and those high in optimism, the same experiences with cessation became more strongly related to their satisfaction later in the cessation process suggesting that over time, even optimists and those with previous cessation experience need to see tangible benefits from their efforts (e.g., receive positive feedback from others) in order to be satisfied. It is important to note, however, that the changes in the strength of these relations were observed for a limited number of cessation-related experiences (two for previous cessation experience and four for optimism).

We also observed that the relation between people's satisfaction and the feedback they received from others was stronger for men later in the cessation process and that the relation between satisfaction and the relationships with family and friends who smoke was also stronger for men, regardless of the point in the cessation process. However, given that the pattern of the moderating effects were not consistent with those observed with optimism and previous cessation experience and they were limited in number, the reason why we might have observed these patterns is less clear.

Implications

Although causal relations cannot be determined from the analyses reported here, the findings suggest that focusing on certain cessation-related experiences may promote the maintenance of successful cessation by increasing people's satisfaction with it. For example, an intervention in which a smoker's spouse or close friend is included and directed to provide periodic encouragement and positive feedback to the smoker might increase their satisfaction with cessation. Moreover, the findings suggest that this type of intervention might be most effective for certain types of people (e.g., pessimists) and for those who have already gone through their initial efforts to quit smoking, at which point their satisfaction is more contingent on the feedback they receive from others. Further consideration of these distinctions may allow investigators to tailor interventions – much like interventions tailored to people's stage of change or to other clinical decision criteria – in ways that enhance the likelihood that people maintain cessation over time.

In addition, although the findings were specific to the domain of smoking cessation, we believe that the implications of these findings should generalize to other behavioral domains. For example, in the domain of weight loss behavior, it seems reasonable that experiences such as the type of feedback people receive from others about their weight loss or the frequency of their cravings for food would have an effect on people's satisfaction with weight loss, independent of their actual weight loss success. However, questions regarding how people's specific experiences are associated with their satisfaction in different behavioral domains are for future research.

Limitations

One limitation of the present study is that the cessation-related experiences we included in the analyses were certainly not comprehensive. There could have been a number of other experiences people had during the cessation process that influenced their satisfaction with cessation that we did not measure (e.g., money saved by quitting, changes in perceptions of overall health). In addition, although we did find that the strength of some of the relations changed at different points of the cessation process, the amount of time between each assessment (1–3 months) did not allow for more precise observations about exactly when people start to pay attention to different experiences. Studies that include ecological momentary assessments (EMA) might be better equipped to more precisely assess when the shifts in the associations occur.

Another limitation of the study is that we did not account for the role that people's expectations might play in their satisfaction with cessation. Because people's satisfaction with change is thought to be determined, at least in part, by their expectations for the change (Rothman, 2000), it would be important to know whether people's experiences met the expectations they initially had (e.g., some people might have had high expectations for the feedback they receive from others, whereas other people might not have). Similarly, it might be important to know which cessation-related experiences each person considered to be the most important to them. It is possible that people focus their attention only on the experiences they consider to be important and other experiences might be unrelated to their

satisfaction. Additional insight along these lines would not only promote our understanding of the nature of the relations between people's cessation-related experiences and their satisfaction, but would also inform the development of interventions that are designed to enhance the likelihood that behavior changes are maintained over time.

Conclusion

The findings from this study suggest that a variety of experiences people have while they are engaged in changing their behavior can influence whether they are satisfied with the changes they have made. Moreover, the findings highlight the need to consider where people are in the behavior change process, and people's different experiences and characteristics, when deciding which factors might influence their satisfaction with the change. Given the theoretical and empirical work demonstrating the critical role satisfaction plays in determining people's ability to maintain changes over time (Baldwin et al., 2006; Rothman, 2000; Rothman et al., 2004), these findings also have important implications for designing interventions to address the issue of behavior change maintenance.

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Table 1
Means, SDs, percentages, and sample sizes of study variables across the 16-month post-quit period.

	Month post-quit date							
	1	2	5	8	11	14	16	
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	
Satisfaction (<i>ns</i> range from 215 to 83)	2.62 (2.03)	2.18 (2.26)	1.61 (2.60)	1.34 (2.70)	1.98 (2.67)	2.02 (2.45)	2.94 (1.24)	
Frequency of cravings (<i>ns</i> range from 214 to 125)	4.53 (1.89)	4.03 (1.91)	3.82 (2.25)	4.12 (2.27)	3.66 (2.37)	3.65 (2.33)	3.26 (2.49)	
Feedback from others (<i>ns</i> range from 213 to 124)	2.20 (1.60)	1.96 (1.93)	1.40 (2.04)	1.27 (2.08)	1.32 (1.99)	1.39 (2.00)	1.56 (2.09)	
Smell of personal belongings (<i>ns</i> range from 212 to 122)	2.14 (1.90)	1.71 (2.24)	1.82 (2.18)	1.93 (2.19)	1.87 (2.38)	1.67 (2.15)	1.74 (2.27)	
Relationship with non-smokers (<i>ns</i> range from 211 to 123)	1.16 (1.69)	1.26 (1.85)	0.66 (1.90)	0.44 (2.00)	0.55 (1.89)	0.76 (1.89)	0.84 (1.92)	
Cope with stress (<i>ns</i> range from 214 to 125)	5.12 (1.68)	5.35 (1.77)	5.23 (1.88)	5.14 (1.82)	5.23 (1.88)	4.98 (1.94)	5.57 (1.75)	
Detect different tastes and smells (<i>ns</i> range from 211 to 123)	4.96 (1.81)	4.52 (1.94)	4.45 (1.94)	4.41 (2.04)	4.37 (2.15)	4.60 (2.19)	4.80 (1.79)	
Anxiety (<i>ns</i> range from 214 to 124)	3.72 (1.81)	3.17 (1.92)	3.29 (2.13)	3.11 (2.03)	3.01 (1.94)	3.11 (1.94)	3.43 (2.02)	
Irritability, frustration, and/or anger (<i>ns</i> range from 214 to 125)	3.85 (1.88)	3.13 (1.81)	3.41 (2.01)	3.24 (1.95)	3.15 (2.03)	3.36 (2.01)	3.30 (1.91)	
Relationship with smokers (<i>ns</i> range from 209 to 123)	0.16 (1.28)	0.39 (1.55)	0.24 (1.39)	0.42 (1.48)	0.18 (1.34)	0.25 (1.51)	0.37 (1.51)	
Current smoking status (percentage not smoking or not yet relapsed)	86.0	65.7	52.9	50.8	50.0	47.5	50.8	

Notes: *ns* vary because of missing values. The values for current smoking status are percentages rather than means. The scale ranges for satisfaction and the cessation-related experiences are the following: satisfaction (−4 to +4), frequency of cravings (0–8), feedback from others (−4 to +4), smell of personal belongings (0–8), relationship with non-smokers (−4 to +4), ability to cope with stress (0–8), ability to detect different tastes and smells (0–8), anxiety (0–8), irritability, frustration, and/or anger (0–8), relationship with smokers (−4 to +4).

Table 2

Longitudinal associations between cessation-related experiences and satisfaction with cessation.

Equation	Model/experience variable	Coefficient estimate (SE)	σ_{ε}^2	R_{ε}^2
1	Unconditional means model	—	3.878	—
2	Current smoking status model	4.269 (0.258) ***	2.618	0.325
3	Cessation-related experience models			
3a	Feedback from others	0.360 (0.046) ***	2.161	0.443
3b	Frequency of cravings	−0.231 (0.035) ***	2.196	0.434
3c	Relationship with friends and family that do not smoke	0.272 (0.035) ***	2.282	0.412
3d	Extent to which belongings smell like smoke	−0.230 (0.045) ***	2.324	0.401
3e	Ability to cope with stress	0.274 (0.039) ***	2.284	0.411
3f	Ability to detect different tastes and smells	0.194 (0.040) ***	2.341	0.396
3g	Irritability, frustration, and/or anger over the past week	−0.108 (0.036) *	2.386	0.385
3h	Anxiety over the past week	−0.133 (0.036) **	2.356	0.392
3i	Relationship with friends and family that smoke	0.090 (0.049)	2.294	0.408

Notes: σ_{ε}^2 = estimate of within-person variation. R_{ε}^2 = estimate of the proportion of within-person variation explained by the model.***
p < 0.0001,**
p < 0.001,*
p < 0.01.

Table 3

Estimates of the strength of the associations at different points after the program quit date.

Cessation-related experience	Coefficient estimates (SE)		Strength of associations	
	Experience	Interaction term	First 2 months	5 months+
Current smoking status	4.949 (0.401) ****	-1.178 (-0.479) *	4.949	3.771
Frequency of cravings	-0.237 (0.045) ****	-0.049 (0.062)	–	–
Feedback from family, friends, and co-workers	0.264 (0.059) ****	0.141 (0.065) *	0.264	0.405
Extent to which belongings smell like smoke	-0.161 (0.050) **	0.174 (0.072) *	-0.161	-0.335
Relationship with friends and family who do not smoke	0.178 (0.050) ****	0.136 (0.063) *	0.178	0.314
Ability to detect different tastes and smells	0.091 (0.051)	0.168 (0.064) **	0.091	0.259
Ability to cope with stress	0.272 (0.059) ****	0.017 (0.070)	–	–
Irritability, frustration, and/or anger over the past week	-0.163 (0.050) **	0.074 (0.068)	–	–
Anxiety over the past week	-0.223 (0.051) ****	0.117 (0.062)	–	–
Relationship with friends and family who do smoke	-0.075 (0.067)	0.220 (0.080) **	-0.075	0.145

Notes:

p < 0.0001,***
p < 0.001,**
p < 0.01,*
p < 0.05.

Table 4

Estimates of the strength of the relations for the three-way interactions.

Moderating variable Cessation-related experience	<u>Early in the cessation process</u>		<u>Later in the cessation process</u>	
	High values of moderator	Low values of moderator	High values of moderator	Low values of moderator
Length of longest previous quit				
Cravings	−0.145	−0.251	−0.364	−0.206
Ability to detect tastes and smells	0.048	0.166	0.264	0.159
Optimism				
Feedback from others	0.134	0.355	0.435	0.354
Relationship with non-smokers	0.061	0.291	0.344	0.258
Ability to cope with stress	0.119	0.362	0.364	0.198
Anxiety	−0.165	−0.274	−0.186	0.005