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Symptom–System Fit in Couples: Emotion Regulation When One or Both Partners Smoke

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Abstract

In a laboratory smoking experiment, 25 couples in which 1 or both partners continued to smoke despite 1 of them having heart or lung disease discussed a health-related disagreement before and during a period of smoking. Immediately afterward, the partners used independent joysticks to recall their continuous emotional experience during the interaction while watching themselves on video. Participants in dual-smoker couples reported increased positive emotion contingent upon lighting up, whereas those in single-smoker couples reported the opposite. The results highlight the role of smoking in close relationships, particularly in regulating emotional closeness when both partners smoke. Attention to this fit between symptom and system may be useful in helping couples achieve stable cessation.

Keywords

health-compromised smokers; couple interaction; emotion regulation; symptom–system fit

Having a spouse or partner who smokes is a major risk factor for continued smoking and failure in future quit attempts (Ferguson, Bauld, Chesterman, & Judge, 2005; Homish & Leonard, 2005; Murray, Johnston, Dolce, Lee, & O'Hara, 1995), yet research attempting to shed light on change-resistant smoking has focused almost exclusively on cognitive and motivational factors residing in the individual smoker. Whereas some leading theories emphasize smokers' attempts to avoid and escape negative affect associated with withdrawal (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004), others propose that smoking persists due to expectations for positive effects such as mood enhancement, the ability to reduce or handle tension, or the facilitation of social interaction (Brandon, Juliano, & Copeland, 1999). Surprisingly, links between smoking and the regulation of emotions and expectancies in specific close relationships (like marriages in which both partners smoke) remain largely unexplored, even in research concerned with situational influences of positive social interaction on smoking expectations (e.g., Copeland, Brandon, & Quinn, 1995; Gwaltney, Shiffman, Balabanis, &

Paty, 2005). The present study examines the role smoking plays in single- versus dual-smoker couples, focusing on possible variations in emotional experience that could help to explain why a partner's smoking status has negative prognostic implications for successful cessation.

Although rarely invoked in the smoking literature, family systems theory provides a useful perspective on how close relationships might both maintain and be maintained by change-resistant smoking (Rohrbaugh et al, 2001). Doherty and Whitehead (1986), for example, suggested that smoking can serve important communication functions in close relationships, particularly in regulating emotional closeness. Thus, in couples where both partners smoke, shared smoking may create a context for mutually supportive interactions—for example, by providing a soothing joint experience or helping partners stay positive, even when they disagree. Seen in this light, smoking in dual-smoker couples may be a special case of “symptom-system fit” (SSF; Rohrbaugh, Shoham, & Racioppo, 2002), whereby a problematic behavior fits a relational system by supporting positive social interaction, at least in the short run.

Although applied here to smoking, the SSF idea receives indirect support from research on alcohol-involved couples, where heterogeneous links between drinking and marital patterns have included observations of drinking behavior promoting relational cohesion (Dunn, Jacob, Hummon, & Seilhamer, 1987). Some studies have even suggested that couples with two heavy-drinking partners tend to have better relationships than couples with only a single heavy drinker (Fals-Stewart, Birchler, & O'Farrell, 1999; Floyd, Cranford, Daugherty, Zucker, & Fitzgerald, 2006; Roberts & Leonard, 1998), though this may not be the case for shared nicotine addiction (Mudar, Leonard, & Soltysinski, 2001). In contrast to role incompatibility theory (Thornton & Nardi, 1975), which Fals-Stewart et al. (1999) offer as an explanation for salutary marital functioning in “drinking partnerships,” the SSF account emphasizes situational variations in cohesion-promoting functions of substance use rather than trait-like differences in relationship quality based on discrepancies between traditional versus deviant partner roles. The idea is that tobacco use plays a key role in smoking partnerships by triggering immediate positive emotion and cohesive couple interactions, which in turn reinforce the partners' shared smoking. Although this hypothesis has not been tested directly, Nyborg and Nevid (1986) found a temporary decrease in marital satisfaction concomitant with participants' quit efforts in a treatment program for dual-smoking couples—and this apparently made sustained cessation more difficult.

The current study focuses on how relationship factors contribute to the persistence of smoking despite obvious health costs. In a laboratory smoking experiment, we asked single- and dual-smoker couples in which one partner (the primary smoker) had a health problem aggravated by smoking to rate their emotional experience while discussing a disagreement in their relationship. For the first half of the discussion neither partner smoked, but then, on cue from the experimenter, smokers lit up as they continued their conversation. Rather than relying on global self-reports of emotional experience, we employed a stimulated recall procedure (Gottman & Levenson, 1992) in which the partners independently used joysticks to recall and record how positive versus negative they felt from moment to moment during the conversation while watching themselves on video. We predicted that smoking would facilitate the interactions of the dual-smoker couples, leading them to report increases in positivity after lighting up (relative to baseline), whereas the reverse might be true for the single-smoker couples in which the smoker's habit could be a source of discord.

Method

Participants

Participants were 26 couples recruited from community-based medical clinics and via newspaper advertisements to receive a couple-level smoking-cessation intervention (Rohrbaugh et al., 2001; Shoham, Rohrbaugh, Trost, & Muramoto, 2006). One partner in each couple (the primary smoker) had either a diagnosed heart or lung problem aggravated by smoking or at least two other documented risk factors for coronary artery disease. In 10 (dual-smoker) couples the primary smoker's partner also smoked, yielding a total of 36 smoking participants altogether. Primary smokers included 16 men and 10 women; 5 men and 5 women were secondary-smoker partners. The couples were either married ($n = 23$) or living together in a committed relationship ($n = 3$). All but two couples—a gay couple with two smokers and a lesbian couple with one—were heterosexual.

Additional inclusion criteria required that (a) the primary smoker had smoked at least 10 cigarettes per day on average for the previous 6 months, (b) the couple was married or had lived together in a committed relationship for at least 2 years, (c) both partners were at least 30 years old, and (d) both partners were able to read and speak English. Exclusion criteria were (a) terminal illness with life expectancy less than 5 years, (b) pregnancy, and (c) history of mania or psychosis.

Demographically, the mean age of participants was 55 years (range = 35–72); 23% had graduated from college, and 54% were at least partially retired. Couples had been together an average of 21 years (range = 2–47), and 63% of the participants had been previously married. Although none had children living in their household, most (70%) had an adult child in the Tucson area. Three of the 52 participants were Mexican American, 1 was Native American, and the rest were Caucasian.

In the clinical domain, 17 (65%) of the 26 primary smokers, but none of their partners, had a diagnosed heart or lung problem aggravated by smoking. At the time of initial screening, primary and secondary smokers, respectively, reported averaging 25.1 ($SD = 9.1$) and 23.1 ($SD = 10.7$) cigarettes a day and had scores of 6.4 ($SD = 2.1$) and 5.7 ($SD = 2.1$) on the Fagerström Test for Nicotine Dependence, where scores in the 6–7 range indicate “high dependence” (Heatherton, Kozlowski, Frecher, & Fagerström, 1991). The primary smokers all reported multiple unsuccessful prior quit attempts, nearly half (45%) had a previous alcohol or drug problem, and 46% had scores in the clinical-distress range of an abbreviated Hopkins Symptom Checklist (Heshbacher, Downing, & Stephansky, 1978) compared to only 19% of their spouses. Participating couples were nevertheless fairly satisfied with their relationships, as reflected in average scores toward the high end of Hendrick's (1988) Relationship Assessment Scale (median partner score = 4.6 out of 5; range = 1.4–5 for primary smokers and 2.6–5 for their partners). Similar positive scores were recorded on Heavey, Larson, Christensen, and Zumtobel's (1996) Constructive Communication Scale, which correlated highly with the Hendrick measure for both patients ($r = .82$) and their partners ($r = .60$).

Procedure

Upon referral, but before inviting a couple to participate in the study, our research coordinator conducted individual telephone interviews with both partners to explain the project and establish both interest and eligibility. Each couple then attended a 2-hr laboratory assessment session to provide informed consent and complete a series of assessments, including the in vivo smoking experiment that is the main focus of this report. The assessments also included the measures of marital quality and addiction severity mentioned above, as well as a shortened form of the Partner Interaction Questionnaire (Cohen & Lichtenstein, 1990) tapping specific

support behaviors for smoking cessation. The entire assessment took 2–3 hr, with the smoking task occurring near the end. Although smokers were not instructed to refrain from smoking prior to coming to the lab, all smokers were typically abstinent for at least 2 hr prior to the experiment. Six couples who provided data in the assessment session ultimately did not participate in the smoking cessation intervention, in most cases because a partner was reluctant to attend the required sessions, and in one case because the couple separated before treatment began.

In preparation for the smoking experiment, the research coordinator used a modified Areas of Change Questionnaire (Weiss & Birchler, 1975) to help couples identify at least three health-related disagreements they could discuss during a videotaped marital interaction task. We instructed couples to choose topics that were important to both partners and concerned desired changes in at least one partner's behavior. Typical topics included disagreements in regard to the management of smoking, diet, and exercise; financial management of health-care costs; relationships with health-care providers; and involvement of family members in health-related issues. Disagreements also concerned divisions of labor and shared couple activities, particularly when health problems interfered with those activities.

During their interaction, partners sat at a 90° angle partially facing each other as well as the camera. When the research assistant left the room, the couple began discussing the first disagreement on their list. After 5 min a light came on signaling smokers to light up, while the conversation continued for another 5 min. Participants did not know in advance how long they would talk before the signal. Subsequent coding of video recordings revealed that couples devoted 51.7% of their discussions to smoking-related topics.

Immediately following the smoking experiment we rearranged the room so that the partners could recall their emotional experience while watching their entire interaction on videotape. Each partner did this with an electronic joystick that moved from left to right, with clearly marked anchors of *very negative* (–) and *very positive* (+) on its left and right sides, respectively. A research assistant demonstrated how to move the joystick from side to side, normalized using the full range of the scale, and explained our interest in how each partner felt during the interaction on a continuous, second-to-second basis, regardless of whether he or she was talking at the moment. A barrier between the partners prevented them from seeing each other's hands or facial expressions as they made their ratings.

The joysticks were calibrated to record scores of –100 at the far-left position, +100 at the far-right position, and 0 at the neutral (resting) position, with continuous gradations in between. A computer in an adjacent room recorded the second-to-second position of each joystick. To balance the baseline and smoking phases, we included emotional-experience ratings from the 5 min before and after the first smoker lit up, yielding up to 600 second-to-second data points for each partner. Because technical difficulties with the equipment resulted in missing joystick data for one (dual-smoker) couple, the primary statistical analyses are based on 25 couples.

Data Analysis

To account for statistical nonindependence inherent in repeated measurement of interacting partners' emotional experience, we estimated a multilevel model with SAS PROC MIXED (Version 9.1), incorporating random intercepts for both persons and dyads (Campbell & Kashy, 2002; Kenny, 1996). This approach treats the experimental manipulation (baseline vs. smoking) as a two-level repeated measure; further nesting of repeated (1 s) joystick recordings within persons, and persons within dyads, allows for correlated error structures both within persons and within dyads (Singer & Willett, 2003). It is important to note that the continuous joystick ratings of positive–negative emotions permitted us to base estimates of emotion during both the baseline and the smoking phases on up to 300 one-s observations, affording much

greater statistical power than would be the case if the dependent measure had been observed only twice (once during baseline and once while smoking) for each person. The independent variables in the main model were dummy-coded fixed factors representing the experimental manipulation (baseline vs. smoking), couple type (single vs. dual smoker), and whether or not each person in the dyad was a health-compromised smoker (primary smoker vs. partner). Finally, to rule out third-variable explanations of observed differences between single- and dual-smoker couples, we conducted supplementary analyses examining group differences in marital quality, addiction severity, and psychological distress, as well as in discussion topics and linear trends in emotional valence over time during the baseline (presmoking) phase.

Results

Preliminary examination of the joystick data revealed considerable variation across individual participants in overall ratings of emotional experience during the smoking experiment. Although the average (mean) joystick position during the entire smoking experiment was in the low positive range for both primary smokers ($M = 6.1$, $SD = 19.2$) and their partners ($M = 8.4$, $SD = 26.3$), between-person dispersion on this measure was substantial, with individual means ranging from -55 to $+97$. Mean joystick position was unrelated to participant demographic characteristics and did not correlate with either marital quality or Hopkins Symptom Checklist distress scores. For single-smoker couples the mean joystick ratings of primary smokers and their partners were essentially uncorrelated in both the baseline phase ($r = .09$) and smoking phase ($r = .18$), but parallel correlations of $.50$ and $.51$ suggested closer emotional links between partners in the nine dual-smoker couples.

Other preliminary analyses examined possible differences between participants in single- and dual-smoker couples that might, in turn, explain group differences in response to laboratory smoking. Comparisons of these two subgroups revealed no demographic differences for either primary smokers or their spouses, no differences in mean-level marital quality or Hopkins Symptom Checklist distress, and no differences between primary smokers on the Fagerström Test for Nicotine Dependence or smoking history variables (all $ts < 1.0$).

The central study hypothesis was that smoking would increase positive experience for couples in which both partners smoked but that the reverse would be true in couples where only one partner smoked. To test this, we estimated a 2 (baseline vs. smoking) $\times 2$ (single- vs. dual-smoker couple) $\times 2$ (primary smoker vs. partner) mixed model including three main effects, three 2-way interactions, and a three-way interaction. The three-way interaction was not significant, so we dropped it from the model and repeated the analysis without this interaction term.

A significant interaction between the smoking manipulation and couple type, $F(1, 23) = 113.51$, $p < .001$, supports the main hypothesis. As shown in Figure 1, and confirmed by pairwise contrasts with Bonferroni corrections, the partners in dual-smoker couples reported *increased* positive emotion when smoking together compared to at baseline, $t(23) = 6.78$, $p < .001$, Cohen's $d = 0.22$, whereas partners in couples where only one person smoked reported *decreased* positive emotion during the smoking phase relative to baseline, $t(23) = -8.74$, $p < .001$, Cohen's $d = -0.28$. In dual-smoker couples, as estimated in the full multilevel model, the mean positive emotion rating for primary smokers and their smoking partners increased from $M = 8.4$ ($SE = 0.7$) to $M = 16.4$ ($SE = 0.8$) and from $M = 4.2$ ($SE = 0.8$) to $M = 9.4$ ($SE = 0.9$), respectively. In single-smoker couples, on the other hand, both partners became less positive after smoking began, with smokers moving from $M = 4.5$ ($SE = 0.7$) to $M = -0.1$ ($SE = 0.8$), and partners moving from $M = 12.1$ ($SE = 0.9$) to $M = 5.3$ ($SE = 1.1$). Note that even the 16 (primary) smokers in single-smoker couples showed a significant reduction in positive emotion

after lighting up, $t(23) = 4.29$, $p < .01$, in direct contrast to both smokers in the dual-smoker couples.

The main multilevel analysis also revealed a significant two-way interaction between role (primary smoker vs. partner) and the manipulation (baseline vs. smoking), $F(1, 23) = 11.32$, $p < .01$, reflecting a relatively greater difference between primary smokers and their partners during baseline compared to the smoking phase. Finally, to evaluate possible effects of a smoker's gender, we substituted biological sex for role while retaining couple type and the smoking manipulation in a similar multilevel model. Although this analysis again yielded a strong interaction between smoking phase and couple type, there were no main effects or interactions involving gender.

Because the design was quasiexperimental, we conducted additional analyses to examine rival hypotheses about why dual- and single-smoker couples responded differentially to the smoking manipulation. One possibility is that group differences on demographic variables, nicotine dependence, psychological distress, or relationship variables *other* than partner smoking status might explain the observed results. As noted above, however, we found no evidence for such differences in preliminary analyses, and controlling these variables in analyses of the joystick data did not affect the Smoking Phase $\times$ Couple Type interaction.

Another potential threat to internal validity is that emotional valence may have changed differentially over time, becoming more positive for dual-smoker couples and/or less positive for single-smoker couples even before (or regardless of) the initiation of smoking. Examination of linear trends in joystick position over the course of the baseline phase suggests this was not the case: In fact, estimated standardized betas of .08 and .09 for dual- and single-smoker couples (regressing positive emotion on elapsed time during the baseline phase) indicate that neither group showed much systematic change before smoking began.

A final set of analyses examined whether, in comparison to dual-smoker couples, the increased negative emotion reported by single-smoker couples was related to discussion content or to single smokers not typically smoking in their partner's presence. The concern here is that joystick ratings could reflect a situation in which a single smoker's lighting up in the laboratory (a) prompted more smoking-related discussion, leading to disagreement and deterioration of emotional climate, or (b) created an unfamiliar, uncomfortable context for continuing interaction. Regarding discussion content, a Couple Type $\times$ Smoking Manipulation analysis of variance with extent of smoking-related content as the dependent variable revealed no significant main effects or interaction. Although means were in the direction of more smoking talk by single-smoker than dual-smoker couples, especially during the smoking phase (58% vs. 40%, compared to 50% vs. 45% during baseline), we found no negative correlations between how much single-smoker couples discussed smoking and partners' reported (positive) emotion during either the baseline phase ($r = .03$) or smoking phase ($r = .26$). Nor did participants in single-smoker couples show any negative association between positivity ratings during the smoking period and a Partner Interaction Questionnaire item indicating that a partner "refuses to allow smoking in the house" ($r = .23$). Although 4 of the 16 single smokers gave this item a rating of at least 5 on a 7-point scale, their joystick ratings were no more negative than the others'.

Discussion

The results suggest that emotional correlates and consequences of smoking have an important relational dimension, depending on whether one or both partners in a couple smoke. Although most explanations of change-resistant smoking have focused on biological or psychological characteristics of the individual, a smoker's emotional experience appears to depend also on

the social context in which his or her smoking occurs. Thus, in our laboratory smoking experiment, partners in dual-smoker couples experienced increased positive affect contingent upon lighting up, whereas both partners in single-smoker couples reported the opposite. Strikingly, changes in individuals' emotional experience from baseline to smoking depended mainly on a couple-level variable (partner smoking status), with no apparent unique contribution from individual characteristics such as a participant's gender, psychological distress, or even (in the case of single-smoker couples) whether he or she was smoking at the time of the assessment. A series of supplementary comparisons between single- and dual-smoker couples suggested further that the differential response to laboratory smoking was probably not due to (a) preexisting group differences on demographic, psychological, or marital variables; (b) differences in smoking-related discussion topics; (c) different trajectories of emotional valence during baseline; or (d) the smoking manipulation creating an atypical, uncomfortable situation for single-smoker couples. Still, as in any quasiexperimental design, other possible third-variable explanations cannot be completely ruled out.

This kind of dyad-level emotion regulation through smoking could help to explain why smokers whose spouse or partner also smokes have more trouble quitting and staying quit (Ferguson et al, 2005; Murray et al, 1995). Consistent with the notion of SSF, shared tobacco use in these couples may promote positive emotional experiences and cohesive partner interactions, which in turn feed back to reinforce the shared smoking. Although not the only plausible explanation for why partner smoking status is a risk factor (another could be that a smoking partner prevents exposure to pressures for change), SSF provides a parsimonious account of the smoking-experiment data and, in our view, deserves further exploration.

This preliminary study has a number of limitations. First, there are too few dual-smoker couples to shed much light on this understudied and possibly heterogeneous subgroup of high-risk smokers. Second, we cannot be sure that the increased positivity reported by dual-smoker couples was specific to their own (committed) relationship, as it might also have occurred in interactions involving other smoking acquaintances, or even smoking strangers. Third, the results say little about mechanism(s) of the observed changes in emotion—for example, whether they are specific to nicotine ingestion or just reflect changes in behavior (e.g., slowed speech) coincident with smoking. Fourth, despite minimal evidence of baseline trends in the joystick data, the conclusion that shared smoking increases positive emotion would be on firmer ground had the design included a within-case reversal of the smoking manipulation or a nonsmoking control group. Fifth, because the stimulated recall measure of experienced emotion was bipolar, it was not possible to distinguish possibly independent associations of smoking with positive and negative affect. For example, did shared smoking lead dual-smoker partners to experience more positive emotion, less negative emotion, or both? Finally, although the joystick measures of emotion were taken in a distinctly interpersonal situation (discussing a marital disagreement), the partners did not explicitly rate how they felt toward each other. It seems reasonable to assume, however, that ratings of one's emotional experience while talking with an intimate partner have a central relational aspect.

These ambiguities notwithstanding, experimental and clinical observations of SSF have notable implications for intervention. One is the potential utility of investigating possible functions smoking may serve, not just for individual smokers, but also for vital relationships in which smokers participate. When both partners in a couple smoke, emotional up-regulation of the kind suggested here may play a role in preserving couple cohesion. Although the specific behavioral topography of this function likely varies from couple to couple (e.g., shared smoking may dampen conflict, make difficult conversations possible, provide soothing or stimulating joint rituals, and so on), clinicians can usefully intervene by helping couples realign their relationship in ways not organized around tobacco use. For example, if partners can anticipate relational difficulties likely to accompany cessation attempts, they can practice exposing

themselves to such situations before attempting to quit and can work toward establishing substitute rituals and activities that do not involve smoking—in other words, they can begin to make nonsmoking fit the system.

Working with SSF in this way is central to a new family consultation intervention for health-compromised smokers (Rohrbaugh et al., 2001). In a recent treatment-development project with 20 of the couples who participated in the present study, the family consultation approach helped smokers who had continued to smoke in the face of heart or lung disease achieve a 50% rate of stable abstinence over at least 6 months (Shoham et al., 2006). Family consultation appeared particularly well suited to female smokers and to smokers whose partners also smoked. Our qualitative observations of the latter group suggest that couples who found satisfactory ways to protect their relationship during the quit phase were best able to achieve stable cessation.

In summary, despite several limitations, the results of this preliminary study call attention to an interpersonal process that may help to maintain change-resistant smoking when both partners in a couple smoke. The facilitation of positive emotional experience for both partners during shared smoking, in contrast to an opposite pattern when only one smokes, fits well with the idea that a “symptom” such as smoking can both reinforce and be reinforced by the close relationship patterns in which it occurs. Although additional research is necessary to rule out alternative explanations of the apparent SSF phenomena we describe here, further documentation of interpersonal contributions to the maintenance of an individual problem like nicotine addiction would add credence to alternative, more contextual avenues of intervention.

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Figure 1.

Means of recalled positive emotion during the laboratory smoking experiment by primary smokers and their partners in single- and dual-smoker couples.