



HHS Public Access

Author manuscript

Subst Use Misuse. Author manuscript; available in PMC 2017 November 09.

Published in final edited form as:

Subst Use Misuse. 2016 November 9; 51(13): 1810–1814. doi:10.1080/10826084.2016.1197259.

Anger Expression Style Predicts the Domain of the First Smoking Relapse After a Quit Attempt

Professor Stephan Bongard, Ph. D.,

Goethe-University, Dept. of Psychology, Theodor-W.-Adorno-Platz 6 - PEG, Frankfurt am Main, 60629 Germany

Mr Leif Olson,

University of Minnesota Medical School, Duluth, 55812 United States, olso3928@d.umn.edu

Dr Motohiro Nakajima, and

University of Minnesota Medical School, Duluth, 55812 United States, mnakajim@d.umn.edu

Professor Mustafa al'Absi

University of Minnesota Medical School, Duluth, United States, malabsi@umn.edu

Abstract

Background—Risk for smoking relapse may be associated with context-dependant social and behavioral cues. However, lack of research examining the role of trait negative mood such as anger in this relationship and assessment of objective indices related to smoking status (e.g., biochemical measures) may limit existing findings. We examined the roles of trait anger, habitual anger expression behavior, and the situation in which the first incident of smoking lapse following a quit attempt occurs.

Methods—One-hundred and five smokers interested in cessation (mean age, SD: 34.7 ±11.8) set a quit day and attended multiple post-quit assessments where they were asked to provide biochemical measures including exhaled carbon monoxide (CO) and self-report measurements, including smoking status.

Results—Eighty-eight participants (40 women) returned to smoking over the 12-month study period. Self-reported smoking status was verified by exhaled CO measurements. Thirty-one percent of participants who relapsed reported the first lapse occurring at home, 15% at work, 14% at a restaurant or a bar, and 8% in a car. Multinomial logistic regression models found that high levels of anger-out were associated with smoking relapse in situations other than work or home ($p < .05$).

Conclusions—These results expand prior work suggesting habitual anger expression style may moderate associations between situational factors and risk for smoking relapse, highlighting the need to incorporate findings in treatment methods. Absence of gender differences suggests the situational factors explored here affect relapse independent of gender.

Keywords

smoking; tobacco; relapse; situational cues; anger expression

INTRODUCTION

The avoidance of negative affective states (negative reinforcement) have been proposed as a barrier to long-term abstinence after smoking cessation (Baker, Morse, & Sherman, 1986; Zinser, Baker, Sherman, & Cannon, 1992). Those negative affective states might be associated with situational or internal cues (Mowrer, 1951). Further, anxiety, depression and anger have been shown to be associated with nicotine urges, cravings, and cessation outcomes (al'Absi, Hatsukami, & Davis, 2005; Burgess et al., 2002; Leventhal, Ramsey, Brown, LaChance, & Kahler, 2008; Perez, Nicolau, Romano, & Laranjeira, 2008). In our own studies, we found trait anger - that is the individual disposition for the frequency and intensity of feeling anger - to be associated with an increased risk for early smoking relapse (al'Absi, Carr, & Bongard, 2007). Whether anger is expressed or not strongly depends on display rules (Ekman, 1999) in different domains (home, work, free time; Bongard & al'Absi, 2003; 2005). Both open anger expression and the inhibition of anger expression have been shown to be associated with stress responses (al'Absi & Bongard, 2006) and therefore such behavior might be avoided by anger regulation with the means of smoking (Jamner, Shapiro, & Jarvik, 1999).

Studies examining situational correlates of smoking relapse have found home and work, eating and drinking, and the presence of other people to be related to cessation outcomes (Cummings, Jaen, & Giovino, 1985; Myers et al., 2011; Shiffman, 1982; Shiffman, 1986; Shiffman et al., 1996). These observations suggest determinants that are not directly related to tobacco (i.e., *distal* cues) may play an important role in smoking relapse (Conklin, 2006; Conklin, Robin, Perkins, Salkeld, & McClernon, 2008). Whether anger expression is associated with where smokers lapse after a quit attempt has not been directly examined.

The aim of this study was to characterize relapsed smokers by individual differences in their anger related behavior and domain factors.

METHODS

Participants

The current study was part of a larger project investigating psychological and biological determinants of stress and smoking relapse (al'Absi, Nakajima, Allen, Lemieux, & Hatsukami, 2015). Smokers were recruited from the local public community via flyer postings. Smokers were included in the study if they: 1) had smoked 10 or more cigarettes on average per day for the past two years or more, 2) indicated a strong desire to quit, 3) weighed within BMI +/- 30% Metropolitan Life Insurance norms, and 4) had no current or past history of major medical conditions.

A total of 105 smokers enrolled in the study and quit smoking. Of those, 8 participants remained abstinent during the entire 12-month study period, 6 individuals withdrew from the

study, and data on situational factors were missing from 3 smokers who relapsed during the study. As a result, 88 participants (40 women) returned to smoking during the 12-month study period, each completing a relapse form. Data from these 88 individuals was included in the final analysis.

Measures

Lapse was defined as smoking one or more cigarettes after cessation (Hughes et al., 2003). This was assessed by a self-report measure which asked the date and time of initial slip, where the participant was (i.e., at work, at home, dining or at a bar, or other places), and whom they were with (i.e., alone or with others). The State-Trait Anger Expression Inventory (STAXI; Spielberger, 1996) includes 10 items for the assessment of trait anger and 24 items to assess anger expression styles, which consist of three factors: anger-in (AI), anger-out (AO), and anger-control (AC), each represented by 8 items. Scale scores result from summing up the values for each item. Thus the higher the scores on AI the stronger the behavioral tendency to not show angry feelings to others, the higher the scores on AO the more a person expresses or shows his or her angry feelings and finally, higher scores in AC describe a reflexive behavior that prevents the occurrence of anger at an early stage and a tendency to dampen the intensity after its elicitation. For the purpose of this study the direction of the original anger expression measure was altered so that participants were asked either to rate their anger expression behavior when they get angry or furious “at home”, “at work” or “during free time”. Internal consistencies could not be determined for the current sample since data on item responses have not been saved after scale value were calculated. However, previously we have shown that the domain-specific anger assessment strategy is a well validated strategy resulting in very sufficient internal consistencies with alpha-coefficients $\geq .76$ (Bongard, Martin, Seip, & al'Absi, 2011).

MicroCO™ monitors (Micro Direct Inc., Auburn, Maine) were used to measure exhaled CO levels to verify self-reported smoking status at the beginning of each session.

Procedure

Firstly, participants read and signed a consent form approved by the Institutional Review Board of the University of Minnesota. Participants were then asked to complete questionnaires including demographic information and the State-Trait Anger Expression Inventory (STAXI; Spielberger, 1996). They were asked to provide an exhaled carbon monoxide (CO) measurement. Next, each participant had a session with a licensed psychologist regarding benefits and potential difficulties in quitting smoking and set a quit day. Participants were required to be abstinent for at least 48 hours to make a quit attempt. This was confirmed by self-report and CO-measures. The participants attended follow-up assessments that took place at one, two, three, and four weeks, and three, six, nine, and twelve months after the quit day.

Data analysis

One-way analysis of variance and chi-square tests were conducted to examine gender differences on demographic information, smoking history, and situational variables. Multinomial logistic regression analyses were conducted to examine associations of anger

variables with the situation of smoking relapse. Before conducting logistic regression models, all situations different from work and home were pooled into one category and labeled as “other location” to save power of statistical analysis. “Work” and “home” were retained as situational categories because they are common domains in related research (e.g. Bongard & al'Absi, 2005; Cummings et al., 1985; Shiffman et al., 1996) and “others” was considered as residual-category for all other situations. This resulted in inclusion of 55 % of the sample in the other-category. Then multinomial logistic regressions for trait anger and for all anger expression styles combined (AI, AO, and AC) were conducted. The scores for the various STAXI scales were used as continuous variables and gender served as categorical variable in order to test the predictive value of the anger-expression styles for the domain where people lapsed. Then, we conducted another multinomial logistic regression analyses for those anger expression scales alone. Data were analyzed using SPSS software.

RESULTS

Sample and smoking behaviors

Descriptive statistics for sample characteristics and smoking behavior are displayed in Table 1. There were no gender differences in these demographic and smoking variables ($p > .06$).

Smoking relapse

The median days until the first smoking incident was 5 days with a mean of 20.4 days (SD : 50.6). Seventy-three percent ($n=64$) of smokers who eventually returned to smoking took up a cigarette within the first week of cessation (mean CO levels: 14.6 ppm; SD : 9.7), 86 % ($n=76$) relapsed within the four weeks (mean CO levels: 16.5 ppm; SD : 11.3), and 97 % ($n=85$) relapsed by six months post-cessation (mean CO levels: 24.3 ppm; SD : 13.2). In contrast, abstinent smokers had a mean CO of 6.1 ppm (SD : 4.6) at the first week, 4.8 ppm (SD : 3.0) at the fourth week, and 6.5 ppm (SD : 0.7; $n=2$) at the six months follow-up, suggesting compliance to the protocol. The rate of smoking relapse and CO levels at each follow-up assessment did not differ by gender except that CO was greater in female relapsers (mean: 18.4; SD : 14.0) compared to male relapsers (mean: 11.9; SD : 9.3) at the second week follow-up ($F(1, 59)=4.63$, $p < .05$).

Locations of smoking relapse

Reported relapse locations included 30.7% at home, 14.8% at work, 13.6% at a restaurant or bar, 8.0% in a car, 5.7% at a friend's house, and 5.7% at party. One-fifth of participants indicated relapse occurred at an “other” location (e.g., casino, golfing, and wedding reception). Median time of relapse at home was 6:30pm, at work 3:00pm, at dining or a bar 10:00pm, in a car 4:00pm, at friend's house 4:00pm, and at a party 9:30pm .

In most situations (i.e., home 63%, work 62%, dining/bar 100%, friend's house 80%, party 100%) most lapses occurred in the presence of other people; however, everyone who reported having lapsed in a car mentioned that they were alone ($\chi^2=23.0$, $p=.001$). Chi-square analysis showed that gender was not associated with relapse location, time of relapse, or presence of others ($p > .18$).

Trait anger, anger expression and the domain of relapse

The multinomial logistic regression analysis including trait anger and gender indicated that the model was not statistically significant ($\chi^2(4)=4.42; p=.35$). The model simultaneously including AI, AO, and AC and gender as predictors revealed statistical significance ($\chi^2(8)=20.89; p=.007$). As can be seen from the Exp(B) in Table 2, with every increase in AO by one point the risk of relapse “at work” decreased by 47% (1 - .53) relative to the risk to relapse “at other situations”, and it decreased by 22% (1 - .78) for relapse “at home” relative to “at other situations”. Figure 1 illustrates descriptive statistics of AO across different situations.

AC showed a trend to predict a higher chance for a relapse “at work” compared to a relapse “at other situations”. An increase in anger-control by one point on the scale was associated with an increase for the likelihood to relapse “at work” by 23% relative to a relapse “at other situations” (see Table 2). People who were lower in anger-control tended to be more likely to relapse in situations other than work or home.

AI and Gender were unrelated to the situations in which participants relapsed ($Walds(1) < 2; p > .16$).

DISCUSSION

Habitual anger expression styles were associated with situations where smokers lapsed. Higher levels of anger-out and, to a lesser extent, lower levels of anger-control increased the risk of relapse in situations other than work and home. This finding may be associated with anger regulation by smoking.

Those who habitually express angry feelings openly and control them less might lack an effective strategy for anger regulation. They might use smoking as means to reduce or avoid their anger (Jamner, Shapiro, & Jarvik, 1999) and its expression and more so in casual situations. Why such an effect is stronger in more casual situations like restaurant/bar, friend's house, and party compared to work or home condition is not clear yet. It is possible that a more restrictive environment such as work place helps high anger-out expressors more than low anger out expressors to maintain abstinence, especially early in the quit attempt. Conversely, situational conditions with less behavior boundaries might present a risk factor for anger expressors to start smoking again.

To our knowledge the current study is the first to show the link of habitual anger expression style with the domain of the first smoking lapse. The findings expand previous work showing potential usefulness of anger expression behavior in predicting smoking relapse (al'Absi et al., 2007; Patterson et al., 2008). More research is warranted to elucidate the extent to which negative mood expression and situational cues contribute to smoking behavior.

The findings of the current study are limited primarily by the use of retrospective interviews. Relapse event memory recall inaccuracies may have confounded results (Shiffman, Hufford, Hickcox, Paty, Gnys, & Kassel, 1997).

In conclusion, the current study found that habitual anger expression behavior and social and situational antecedents are associated with smoking lapse after a quit attempt in men and women. These findings may help identify links to target in smoking cessation treatment.

Acknowledgements

We thank Angie Forsberg, Elizabeth Ford, and Barbara Gay for assistance with data collection and Jie Gooder for data management.

REFERENCES

- al'Absi M, Bongard S. Neuroendocrine and behavioral mechanisms mediating the relationship between anger expression and cardiovascular risk: Assessment consideration and improvements. *Journal of Behavioral Medicine*. 2006; 29:573–591. [PubMed: 17096059]
- al'Absi M, Carr S, Bongard S. Trait anger and psychobiological changes during smoking abstinence and in response to acute stress: prediction of smoking relapse. *International Journal of Psychophysiology*. 2007; 66:109–115. doi: 10.1016/j.ijpsycho.2007.03.016. [PubMed: 17544533]
- al'Absi M, Nakajima M, Allen S, Lemieux A, Hatsukami D. Sex Differences in Hormonal Responses to Stress and Smoking Relapse: A Prospective Examination. *Nicotine & Tobacco Research*. 2015
- al'Absi M, Hatsukami D, Davis GL. Attenuated adrenocorticotrophic responses to psychological stress are associated with early smoking relapse. *Psychopharmacology (Berl)*. 2005; 181(1):107–117. doi: 10.1007/s00213-005-2225-3. [PubMed: 15834539]
- Baker; Morse; Sherman. The motivation to use drugs: a psychobiological analysis of urges.. In: Rivers, C., editor. *Nebraska symposium on motivation: Vol 3, alcohol and addictive behavior*. University of Nebraska Press; Lincoln: 1986. p. 257-323.
- Bongard S, al'Absi M. Domain-specific anger expression assessment and blood pressure during rest and acute stress. *Personality and Individual Differences*. 2003; 34:1381–1402.
- Bongard S, al'Absi M. Domain specific anger expression and blood pressure in an occupational setting. *Journal of Psychosomatic Research*. 2005; 58:43–49. [PubMed: 15771869]
- Bongard S, Martin NM, Seip M, al'Absi M. Validation of a domain specific anger expression assessment. *Journal of Personality Assessment*. 2011; 93:56–61. [PubMed: 21184331]
- Burgess ES, Brown RA, Kahler CW, Niaura R, Abrams DB, Goldstein MG, Miller IW. Patterns of change in depressive symptoms during smoking cessation: who's at risk for relapse? *Journal of Consulting and Clinical Psychology*. 2002; 70(2):356–361. [PubMed: 11952193]
- Conklin CA. Environments as cues to smoke: implications for human extinction-based research and treatment. *Experimental and Clinical Psychopharmacology*. 2006; 14:12–19. doi: 10.1037/1064-1297.14.1.12. [PubMed: 16503701]
- Conklin CA, Robin N, Perkins KA, Salkeld RP, McClernon FJ. Proximal versus distal cues to smoke: the effects of environments on smokers' cue-reactivity. *Experimental and Clinical Psychopharmacology*. 2008; 16:207–214. doi: 10.1037/1064-1297.16.3.207. [PubMed: 18540780]
- Cummings KM, Jaen CR, Giovino G. Circumstances surrounding relapse in a group of recent exsmokers. *Preventive Medicine*. 1985; 14:195–202. doi: 10.1016/0091-7435(85)90035-0. [PubMed: 4048082]
- Ekman P. Facial expressions. *Handbook of cognition and emotion*. 1999; 16:301–320.
- Hughes JR, Keely JP, Niaura RS, Ossip-Klein DJ, Richmond RL, Swan GE. Measures of abstinence in clinical trials: issues and recommendations. *Nicotine & Tobacco Research*. 2003; 5:13–25. doi: 10.1093/ntr/5.1.13. [PubMed: 12745503]
- Jamner LD, Shapiro D, Jarvik ME. Nicotine reduces the frequency of anger reports in smokers and nonsmokers with high but not low hostility: An ambulatory study. *Experimental and Clinical Psychopharmacology*. 1999; 7:454–463. doi:10.1037//1064-1297.7.4.454. [PubMed: 10609980]
- Leventhal AM, Ramsey SE, Brown RA, LaChance HR, Kahler CW. Dimensions of depressive symptoms and smoking cessation. *Nicotine & Tobacco Research*. 2008; 10:507–517. [PubMed: 18324570]

- Mowrer OH. Two-factor learning theory: summary and comment. *Psychological Review*. 1951; 58:350–354. <http://dx.doi.org/10.1037/h0058956>. [PubMed: 14883248]
- Myers MG, Gwaltney CJ, Strong DR, Ramsey SE, Brown RA, Monti PM, et al. Adolescent first lapse following smoking cessation: situation characteristics, precipitants and proximal influences. *Addictive Behaviors*. 2011; 36:1253–1260. doi: 10.1016/j.addbeh.2011.07.040. [PubMed: 21903332]
- Patterson F, Kerrin K, Wileyto EP, Lerman C, et al. Increase in anger symptoms after smoking cessation predicts relapse. *Drug and Alcohol Dependence*. 2008; 95(1–2):173–176. [PubMed: 18328642]
- Perez GH, Nicolau JC, Romano BW, Laranjeira R. Depression: a predictor of smoking relapse in a 6-month follow-up after hospitalization for acute coronary syndrome. *European Journal of Cardiovascular Prevention & Rehabilitation*. 2008; 15:89–94. [PubMed: 18277192]
- Shiffman S. Relapse following smoking cessation: a situational analysis. *Journal of Consulting and Clinical Psychology*. 1982; 50:71–86. doi: 10.1037//0022-006X.50.1.71. [PubMed: 7056922]
- Shiffman S. A cluster-analytic classification of smoking relapse episodes. *Addictive Behaviors*. 1986; 11:295–307. doi: 10.1016/0306-4603(86)90057-2. [PubMed: 3739816]
- Shiffman S, Hickcox M, Paty JA, Gnys M, Kassel JD, Richards TJ. Progression from a smoking lapse to relapse: prediction from abstinence violation effects, nicotine dependence, and lapse characteristics. *Journal of Consulting and Clinical Psychology*. 1996; 64:993–1002. doi: 10.1037/0022-006X.64.5.993. [PubMed: 8916628]
- Shiffman S, Hufford M, Hickcox M, Paty JA, Gnys M, Kassel JD. Remember that? A comparison of real-time versus retrospective recall of smoking lapses. *Journal of Consulting and Clinical Psychology*. 1997; 65:292–300. [PubMed: 9086693]
- Spielberger, CD. State-trait anger expression inventory: STAXI professional manual. Psychological Assessment Resources; Odessa, FL: 1996.
- Zinser MC, Baker TB, Sherman JE, Cannon DS. Relation between self-reported affect and drug urges and cravings in continuing and withdrawing smokers. *Journal of Abnormal Psychology*. 1992; 101:617–629. [PubMed: 1430600]

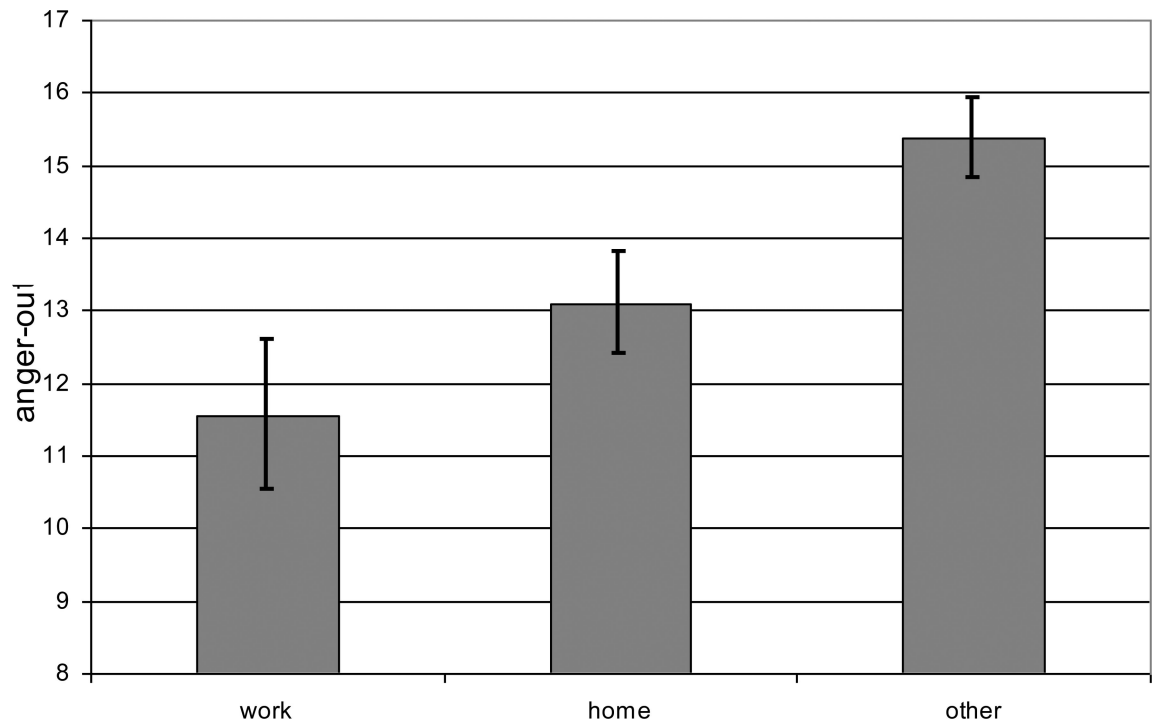


Figure 1. Mean anger-out ratings and Standard Errors of means depending on the situations in which smokers relapsed.

Table 1

Sample characteristics and smoking behavior (N = 88)

Item	Mean (SD) or ratio
Age (years)	34.7 (11.8)
Body Mass Index (kg/m ²)	26.0 (4.2)
Education (years)	14.2 (2.6)
Caucasian	86 %
Single	56%
Cigarettes per day	18.7 (6.1)
Years of Smoking	11.5 (9.7)
Age when started smoking	16.1 (3.2)
CO concentration (ppm) before quit attempt	24.5 (13.1)
CO concentration (ppm) when abstinent	4.5 (3.4)

Note: CO = carbon monoxide; ppm = parts per million

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 2

Results for the multinomial logistic regression analysis with *relapse at other situations* set as reference.

	B	Exp(B)	Wald	p
Relapse at work				
Anger-in (AI)	.122	1.13	1.94	.164
Anger-out (AO)	-.638	.53	7.97	.005
Anger-control (AC)	.210	1.23	2.86	.091
Relapse at home				
Anger-in (AI)	.064	1.07	1.03	.310
Anger-out (AO)	-.249	.78	4.13	.042
Anger-control (AC)	.036	1.04	.20	.653