Social contexts of momentary craving to smoke among Korean American emerging adults

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Abstract

Introduction—Korean American emerging adult (KAEA) smokers represent a culturally and developmentally unique population constituted of primarily light, intermittent smokers. Sociocultural contexts might play an important role in contributing to instances of acute cigarette craving and motivation to smoke in this population; yet, research testing such hypotheses is scant. The current study tests whether and how social contexts are associated with the craving among KAEA smokers.

Methods—Seventy-eight daily KAEA smokers, who smoke 4+cigs/day, participated in a 7-day ecological momentary assessment (EMA), in which participants responded to both signal-contingent (random) and event-contingent (smoking) prompts to answer surveys on their mobile phones (prompt-level n=1377; 603 random+774 smoking prompts). Nicotine dependence was measured at baseline; cigarette craving, negative affect, presence of others smoking, social contexts were measured with EMA.

Results—Modeling of within-participant variation and covariation showed that being with Korean friends (vs. alone) was associated with increased levels of momentary craving. This association between Korean friends and craving disappeared when adjusted for presence of others smoking, which was a strong predictor of momentary craving. The positive association between Korean friends and craving was amplified immediately prior to smoking (vs. non-smoking random) instances.

Conclusions—Being with Korean friends might serve as a culturally-specific salient smoking cue, which might have been learned throughout their smoking history. Our data also showed that increased craving associated with Korean friends may represent social settings that primarily involve cigarette smoking. Given our findings on cigarette use among KAEA's social network, addressing cigarette use as a group behavior might be a fruitful intervention strategy.

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1. Introduction

Emerging adulthood (18–25 years of age; Arnett, 2005) is associated with an increased risk of smoking, with the highest prevalence rate (30.6%) relative to any other age group (Substance Abuse and Mental Health Services Administration, 2014). Emerging adult smokers tend to be "light" or "intermittent" smokers (Brook et al., 2008; McDermott, Dobson, & Owen, 2007; White, Bray, Fleming, & Catalano, 2009), self-identify as "social" smokers (Schane, Glantz, & Ling, 2009; Song & Ling, 2011), are less motivated to attempt cessation (Messer, Trinidad, Al-Delaimy, & Pierce, 2008), and are also less likely to receive advice from healthcare providers regarding smoking (Tong, Ong, Vittinghoff, & Pérez-Stable, 2006), relative to more established, older adult smokers. Further, despite low levels of exposure and nicotine dependence (Shiffman, Ferguson, Dunbar, & Scholl, 2012), light smokers report craving to smoke and difficulties in cessation attempts (Rubinstein, Benowitz, Auerback, & Moscicki, 2009). In fact, a majority of low-level young adult smokers persist light smoking over extended periods or transition into heavy smoking (White et al., 2009), both of which substantially increase risk for cardiovascular disease and lung cancer (Schane et al., 2009). Hence, it is important to understand the factors implicated in light/intermittent smoking among emerging adults in order to inform the development of interventions that may promote cessation and prevent the persistence and escalation of smoking into older adulthood.

It is plausible that the immediate precursors of craving among these young, less-dependent, light smokers might be more strongly motivated by context-dependent, situational factors rather than purely pharmaco-physiological processes in chronic regular smokers. The latter group might follow a stereotypical pattern associated with regulation of blood nicotine levels and episodes of craving provoked by smoking deprivation. In contrast, low levels of nicotine dependence among younger light smokers could indicate contextual motivators for their desire to smoke, such as social and smoking-related cues. Such context-dependent factors underlying intermittent patterns of smoking lend themselves to real-time ecological momentary assessments (EMA) of instances of smoking and the contexts that surround such instances (Shiffman, Kirchner, Ferguson, & Scharf, 2009). This approach allows for assessing momentary "triggers" on craving which may vary within an individual across various contexts. The literature on real-time contextual correlates of smoking in emerging adults is sparse (Piasecki, Richardson, & Smith, 2007; Piasecki, Trela, Hedeker, & Mermelstein, 2014), as available EMA studies have often focused on older, established adult smokers (Shiffman et al., 2002, 2007, 2009) or adolescents (Weinstein, Mermelstein, Shiffman, & Flay, 2008).

EMA data on craving in emerging adult smokers is virtually absent from the literature, which is an important omission for several reasons. Craving and other related constructs

(e.g., urge, desire to smoke) reflect the subjective manifestation of one's immediate motivation to smoke. Tiffany's (1990) cognitive model of drug use motivation proposes that among chronic drug-dependent users, the subjective (conscious) experience of craving becomes less frequent due to well-practiced learned automatized sequences that underlie drug motivation and lead to drug use in the absence of conscious awareness. By contrast, individuals early in the drug use trajectory who have not yet developed dependence more often experience subjective craving along with drug use motivation (Tiffany, 1990), making craving particularly relevant for the emerging adult populations. Craving is included in the DSM-5 as one of the key symptom criteria for tobacco use disorder diagnosis (American Psychiatric Association, 2013) and one of the primary motivational processes involved in smoking maintenance and relapse risk (Piasecki, 2006). Hence, craving may be a prodromal indicator of later tobacco use disorder among the population of emerging adult smokers who otherwise have a fairly brief smoking history and potentially few or no other signs of dependence. Thus, understanding the correlates of craving per se (and not solely current smoking frequency and dependence) among emerging adults may provide unique and meaningful information about the factors that play a role in later tobacco use disorder early in the smoking trajectory.

Recent experimental, laboratory studies found that smoking-related cues (i.e., sights, smells, locational contexts associated with smoking that evoke learned/conditioned, drug-seeking responses; Ferguson & Shiffman, 2009) produce craving among nondependent/intermittent smokers comparable to that of dependent, heavy smokers (Shiffman et al., 2013; Wray, Gass, & Tiffany, 2014). Anecdotally, light smokers report that situational contexts (e.g., "socializing") and internal states (e.g., experiencing "negative affect") are contexts that "made them smoke" (Shiffman et al., 2009). More research is needed to parse out relative effects of such internal vs. external cues on craving among younger light smokers.

Sociocultural contexts might also contribute to momentary craving and motivation to smoke among young adults. Korean Americans emerging adults (KAEAs), for instance, are often immersed in environments where smoking is not only highly prevalent (~36% among males) but culturally-accepted and encouraged (Huh, Sami, Abramova, Spruijt-Metz, & Pentz, 2013). Smoking is closely intertwined with Korean culture (Factbook, 2013) and this cultural sentiment appears to be strongly preserved among Korean immigrants and their offspring (Huh et al., 2013) in spite of successful tobacco control efforts in the U.S. Hence, understanding immediate precursors to smoking and the real-time patterns of light, intermittent use among KAEAs is an important question of public health significance.

Recent qualitative research indicates KAEA smokers report that culturally-specific social contexts (e.g., being around Korean friends) influence craving to smoke, leading to frequent smoking in group settings (Huh, Thing, Abramova, Sami, & Unger, 2014). Further, KAEAs refer to joining their Korean friends to smoke while the friends smoke as common cultural courtesy (Huh et al., 2013). KAEAs tend to perceive smoking as a culturally-rewarding "social" behavior and severely over-estimate smoking prevalence (>70%) for Korean Americans (vs. ~40% for Caucasian Americans) (Huh, Thing, et al., 2014). Spending time with Korean smoker friends repeatedly paired with one's own smoking may become a highly salient smoking cue and thus increase motivation to smoke. Additionally, how

sociocultural contexts are related to acute craving may vary as a function whether one has initiated smoking a cigarette at a given moment. When a smoker has not used a cigarette and may experience some levels of nicotine withdrawal, for instance, interacting with others who happen to be smoking might serve as a more potent external cue for momentary craving, relative to when momentary craving has been satiated.

Our previous EMA study in a prior sample has shown that being with friends promotes the likelihood of smoking among KAEA and enhances the effect of negative mood on likelihood of smoking (Huh, Shin, et al., 2014). The current study extends this previous work by examining factors that may contribute to experiencing momentary craving in an independent KAEA sample (N = 78). Here, we test whether and how within-person covariation between social/smoking contexts and craving to smoke operates among KAEA smokers, over and beyond internal states commonly associated with craving (i.e., negative affect). Specifically, we investigated the following hypotheses: 1) being with Korean friend and being around smokers would be associated with increased momentary craving to smoke, 2) associations between social/smoking cues and craving would be stronger in instances that immediately precede smoking (vs. instances not immediately preceding smoking, to be tested via interaction effects), and 3) associations between social/smoking cues and craving would be more robust for those who are less nicotine-dependent because more dependent smokers are suspected to have smoking patterns that are tied primarily to pharmacological nicotine regulation and less influenced by environmental cues (also to be tested via cross-level interaction effects).

2. Methods

2.1. Participants

From November 2013 through May 2014, daily KAEA smokers were recruited through social media, study advertisement materials, and word-of-mouth. Inclusion criteria were: 1) 18–25 year-old Korean/Korean American, 2) daily smokers who smoked 4 + cigs/day, without using other nicotine products, 3) had been smoking for at least 2 years, and 4) use English and/or Korean languages. Of the 126 individuals who were assessed for eligibility, 15 did not meet the inclusion criteria due to age (n = 5), ethnicity (n = 4), location (n = 2), smoking status (n = 1), and device incompatibility (n = 3). During an unexpectedly prolonged debugging/adjustment period of the EMA app, 24 eligible participants no longer wished to participate. Additionally, 8 participants dropped out in mid-study; 1 participant was excluded for failing to provide the minimum level of cigarette use (~4 cigs/day). Despite low compliance for random prompts due to technical glitches, we included data collected from two participants, as they provided sufficient cigarette use reports, yielding the analytic sample (N = 78, person-level, level-2).

We assessed whether baseline characteristics were associated with those who dropped out or excluded (n = 8), using a series of logistic regression models. Those who dropped out did not differ from those who completed the study with respect to age (p = .52), nicotine dependence scores at baseline (p = .93), gender (p = .11), employment status (p = .56), phone type (p = .65), or language preference for the EMA program (p = .17).

2.2. Device

The platform customized for this project, mEMA (ilumivu, Inc.), allowed for data collection via both the iOS and the Android. The platform was also programmed supporting both English and Korean languages so that participants could complete the EMA protocol in their preferred language. From our pilot study (Huh, Shin, et al., 2014), we had learned that distributing project phones to KAEA participants could present challenges (e.g., reluctance to carry/charge multiple phones). Therefore, only those with smartphones with compatible operating systems (iOS 5.1.1+/Android 4.1 "Jeallybean"+) were eligible.

2.3. Procedure

During the 7-day EMA period, participants responded to both signal-contingent (random) and event-contingent (smoking) prompts on their mobile phones. All prompts were time-stamped. Participants were instructed to record as they were getting ready to start smoking by clicking the "I'm about to smoke" icon on screen (event-contingent). Random prompts were alerted at a random time for each of the 5 blocks of 3-hour window each day from 08:00 AM through 10:59 PM. At each prompt, participants completed a 2-minute survey. Situational context questions were asked 100% of the time (i.e., with whom and what they were doing). Although a random 3 set of the EMA affect and craving scales was supposed to be delivered at 60%, the actual frequencies of administering each scale varied due to technical glitches. Because it is impossible to determine which EMA scales were administered for unanswered prompts, we are unable to calculate the actual frequencies at which each scale was programmed to be delivered.

Compliance rates were calculated for the random prompts, as smoking prompts were self-initiated and objective measure of smoking instances was unavailable. Research assistants monitored individual participants' data in real time via a web-based platform and encouraged them to meet the minimum compliance rates (overall 80% completion). On average, participants responded to 78.63% of the prompts (2142/2724 prompts), ranging from 42.86% to 97.14%. We assessed whether participant characteristics and study design variables were associated with compliance with generalized linear mixed model, using momentary compliance as the level-1 outcome. The compliance was not associated with age (p = .43), gender (p = .08), nicotine dependence (p = .28), language used in the EMA (p = .47), average number of cigarettes reported daily (p = .07), or daily number of cigarettes (p = .21). Participants were significantly less likely to respond to random prompts on weekend days (p < .001). All procedures were approved by the University Institutional Review Board.

2.4. Baseline measures

Before participants began the EMA protocol, basic demographic information and smoking history were obtained. Nicotine dependence was measured using the Fagerström Test for Nicotine Dependence scale (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991), higher summed scores indicating greater nicotine dependence.

2.5. Momentary EMA measures

2.5.1. Negative affect (NA)—Average scores of 7 items for negative affect adapted from the Positive Affect Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) were used (α = .87): "In the past 15 min, I have felt…: scared, upset, distressed, tense or anxious, sad or depressed, irritable or easily angered, and hopeless or discouraged." Responses ranged from "Not at all (= 1)" to "Extremely (= 6)." Items for positive affect adapted from the PANAS were also assessed in a similar fashion but are not reported in this paper.

2.5.2. Cigarette craving—Average scores of 3 items adapted from Wisconsin Smoking Withdrawal Scale (WSWS; Welsch et al., 1999) were used (α = .86): In the past 15 min…: "I had trouble getting cigarettes off my mind, I was bothered by the desire to smoke," and "I had frequent urges to smoke." Responses ranged from "Not at all (= 1)" to "Extremely (= 6)".

2.5.3. Social contexts—Participants reported with whom they had been in the 15 min prior to the prompt. They were allowed to select all that apply from the response options: "No one, I was alone," "Korean Friend (KF)," "Non-Korean Friend (NKF)," "Family (FM)," and "Other persons (OTH)." Each category was dummy coded. When participants selected more than one categories (e.g., KF + OTH), the instances that included KF selection were re-coded as being with KF (except for the "Alone" response), as our main interest was the association between culturally-congruent friends and craving.

2.5.4. Contexts involving others smoking—Participants indicated whether others were smoking around them at each prompt.

2.6. Statistical analysis

A series of general linear mixed models were conducted (limited to level-1 n = 1377, where the predictors were not missing).

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\begin{aligned}
\text{Level-1:} \quad & y_{ti} = \beta_{0i} + \beta_{1i}KF\ WS_{ti} + \beta_{2i}NA\ WS_{ti} + \cdots + \beta_{ki}X_{kti} + e_{ti} \\
\text{Level-2:} \quad & \beta_{0i} = \gamma_{00} + \gamma_{01}KF\ BS_i + \gamma_{02}NA\ BS_i + \gamma_{03}FTND_i \\
& \qquad + \cdots + \gamma_{0j}Z_i + u_{0i} \\
& \dots \\
& \beta_{ki} = \gamma_{k0}
\end{aligned}
\tag{1}
$$

where y_{ti} is the level of momentary craving given a set of predictors, t counts the repeated measures; i counts the individual. X represents the level-1 predictors; k counts the level-1 predictors. e_{ti} is level-1 residual. Z represents level-2 predictors; j counts the level-2 predictors. u_{0i} represents random effects for intercepts. The model was adjusted for relevant covariates such as weekend vs. weekday, gender and language used in the EMA platform.

We used SAS V9.3 software to conduct PROC MIXED. All level-1 predictors were partitioned into between-subject (BS, Level-2; centered at grand mean) and within-subject (WS, Level-1; centered at person mean) (Curran & Bauer, 2011). This approach helps clarify how different sources of variance in predictor variables influence the outcome. For instance,

the coefficient for KF-BS would represent the differences in levels of craving between those who, on average, spend higher percent of time with Korean friends (vs. lower percent). The coefficient for KF-WS (a dummy variable), in contrast, would represent the differences in levels of craving when one reports being with his/her Korean friends (vs. alone, the reference category). In Model 1, we assessed the association between KF-WS and momentary craving, controlling for NA. Subsequently, we added the presence of others smoking (Model 2). In Models 3 and 4, we examined whether these associations vary as a function of when one was about to smoke (vs. not smoking, level-1) and of nicotine dependence level (level-2).

3. Results

As shown in Table 1, about a third of our participants were female. The majority of the participants was U.S.-born and completed the EMA surveys in English. Almost two thirds of our participants had smoked a whole cigarette before the age of 17. The FTND score indicated that the mean nicotine dependence level of our participants ($\alpha = .56$) would be considered "low" (Fagerstrom, Heatherton, & Kozlowski, 1990). Similar findings showing moderate reliability for FTND have been reported in other studies involving college-aged smokers (e.g., Otsuki, 2009). Only 18% of our participants reported smoking more than 10 cigarettes a day during the past 30 days, which is a cutoff for light smokers among Asian Americans (Tong et al., 2006).

Both craving and average NA were generally low across all prompts (Table 2). There were slightly more smoking prompts than random prompts. Alone was the modal category, followed by social contexts involving Korean friends. Social contexts involving non-Korean friends comprised the smallest category. For about 20% of all prompts, participants reported that other people around them were smoking.

Table 3 shows that our participants with higher mean NA (BS-NA) levels, averaged across the study period, and higher nicotine dependence, reported higher craving (Model 1, p = .03, p = .02, respectively). When reporting higher NA than her/his average level (WS-NA), participants reported greater craving (p < .001). Also, when they were with their Korean friend (vs. alone), participants reported greater momentary craving (p = .03). Being with non-Korean friend or family (vs. alone) was not associated with craving (ps > .64).

In Model 2, we added presence of others smoking as an additional predictor. The effect of WS-NA on craving also remained unchanged (p < .001). In presence of others smoking (vs. when not present), momentary craving was significantly greater (p = .02) and the association between being with Korean friend and craving was reduced below significance (p = .46). Therefore, when averaged across both occasions, the association between being with Korean friend and craving appeared to be confounded with presence of others smoking. Adding presence of others smoking yielded 0.3% reduction in level-1 residual variance estimate relative to that of Model 1 (Peugh, 2010).

In Model 3, we tested whether the associations between contextual variables and craving differ when they were about to smoke (vs. random prompts). The positive WS-NA relation

with craving were significantly amplified for smoking prompts (interaction Est. = .22, p = .004), compared to that of random prompts (p < .001). Notably, during random prompts, Korean friend (vs. alone) had no association with craving (Est = −.03, p = .67), while presence of OS was associated with greater craving (Est = .27, p = .003). In contrast, when about to smoke, being with Korean friend (vs. alone) was associated with higher craving (interaction Est. = .18, p = .049), controlling for presence of others smoking (see Fig. 1). Also, the positive effects of OS on craving were significantly dampened when about to smoke (interaction Est. = −.34, p = .002) relative to random prompts. Being with non-Korean friend (vs. alone) was associated with lower craving when about to smoke (interaction Est. = −.29, p = .07), although not significantly; it was not associated with craving when not smoking (Est = .13, p = .24), either. The effects of other social contexts, relative to when alone, did not differ by smoking vs. random prompt type (ps > .21). Inclusion of these interaction terms between within-subject predictors yielded 4.1% reduction in the level-1 residual variance estimate relative to that of Model 2 (Peugh, 2010).

Nicotine dependence did not moderate the association between any contextual correlate and craving (Model 4).

3.1. Supplemental analyses

To explicitly test whether the ethnicity of friends (rather than presence of friends vs. alone) was associated with craving, we also report results with non-Korean friend as the reference (parallel to Model 3). During smoking prompts, craving was greater when participants were with Korean friend (vs. non-Korean friend) (Est = .25, p = .01); during random prompts, evidence of a marginally-inverse association was observed (Est = − .15, p = .06). We also collapsed the peer-interaction categories (being with Korean friend/non-Korean friend vs. alone/with family/with other people), the positive social effect on craving was not significant (Est = .05, p = .41).

Given that relations of Korean friend to craving were diminished when adding other smoking as a simultaneous predictor (e.g., Model 2), we explored whether prompts in which being Korean friend were more likely to concurrently involve the presence for other smoking with each social contexts as the predictor and others smoking as an outcome. As noted in Fig. 2, relative to being with Korean friend, all social contexts were less likely to involve others smoking (.02 < ORs < .69; all ps < .001, except for non-Korean friend n.s.).

4. Discussion

Our findings supported our hypothesis in that being around Korean friends is associated with increased momentary craving, over and beyond the robust effects of within-person negative affect. We also show that the effects of Korean friends were explained largely by presence of others smoking. In this sample, social contexts involving Korean friends and presence of others smoking (shown in Fig. 1) serve as empirical evidence that might explain why KAEA perceive being with Korean friends as a potent trigger for craving.

The current results are consistent with data from previous studies indicating that social factors – such as having close social ties to other smokers – substantially increase the risk

for smoking initiation and maintenance of use (Brook, Zhang, & Brook, 2014; Hitchman et al., 2014; Hoffman, Sussman, Unger, & Valente, 2006; Vink, Willemsen, Engels, & Boomsma, 2003). One possible mechanistic explanation for the current findings is that the specific social context of being in the presence of Korean friends may act as a particularly salient smoking cue (i.e., sights, smells or environmental contexts associated with smoking that evoke learned, or conditioned, drug-seeking responses such as craving; Ferguson & Shiffman, 2009). It is possible that throughout their smoking history, participants may have had more smoking occasions with their Korean friends compared to other non-Korean friends. Indeed, our post hoc analyses showed a greater likelihood of smoking (vs. non-smoking random prompts) in the presence of Korean friends (OR = 1.90, p < .001) compared to other social contexts. Thus, the repeated pairings of smoking with their Korean friends may have created a conditioned response, such that this specific social context directly elicits craving and subsequent smoking. Of course this is speculative as we did not directly measure cue reactivity to the various social contexts. In order to further examine this possible explanation, future controlled laboratory research may investigate craving in KAEA in response to different sets of standardized social/cultural visual cues.

Limitations of our study must be noted. Although the FTND score had a significantly positive effect on momentary craving, we did not find that nicotine addiction, assessed by the FTND, moderated the effects of social contexts on craving. Consistent with previous research on light and intermittent smokers (Otsuki, 2009; Shiffman et al., 2009), 24.36% of our sample (n = 19) showed an FTND score of 0 (i.e., no nicotine dependence), which may be one of the reasons for not detecting significant moderation by nicotine addiction levels. Nicotine dependence among light and intermittent smokers might require more sensitive measures that focus more on behavioral components (e.g., frequency of purchasing one's own pack of cigarettes). Also, the ethnicity of others who were smoking at EMA was not assessed to minimize burden as complex branching within EMA tend to burn out participants. Therefore, we are unable to directly assess whether greater acute craving was associated with the ethnicity of one's friends or simple presence of others smoking, even though our supplemental analyses show a robust association between presence of others smoking and being with Korean friends at a given moment.

Nonetheless, our study has several strengths. To the best of the authors' knowledge, there is currently no real-time, intensive measurement study that focused on smoking behavior and related contexts among KAEAs who are considered more vulnerable for current and future smoking-related health risk relative to other ethnic and developmental groups. Therefore, our approach is complementary to the available qualitative and cross-sectional survey research in demonstrating how cultural dynamic processes and contexts of smoking unfold in real-time, as KAEA smokers make a momentary decision to light up a cigarette. Given that our momentary data show that members of our participants' social network were simultaneously smoking, addressing cigarette use as a group behavior might be fruitful.

The current study shows that, for these young, light smokers, their Korean/Korean American friends may serve as context-cued stimuli. Our findings have implications for interventions that can leverage KAEA smokers' social contexts. Future investigation is needed to address

ways to effectively manage craving in social contexts involving cultural/in-group cues for these young smokers.

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HIGHLIGHTS

- We examine how sociocultural contexts influence craving among Korean American young light smokers.

- We model within-subject covariation between social contexts and craving.

- Being with Korean friends (vs. alone) increased craving, especially immediately prior to smoking (vs. non-smoking).

- Increased craving associated with Korean friends may represent social settings that involve cigarette smoking.
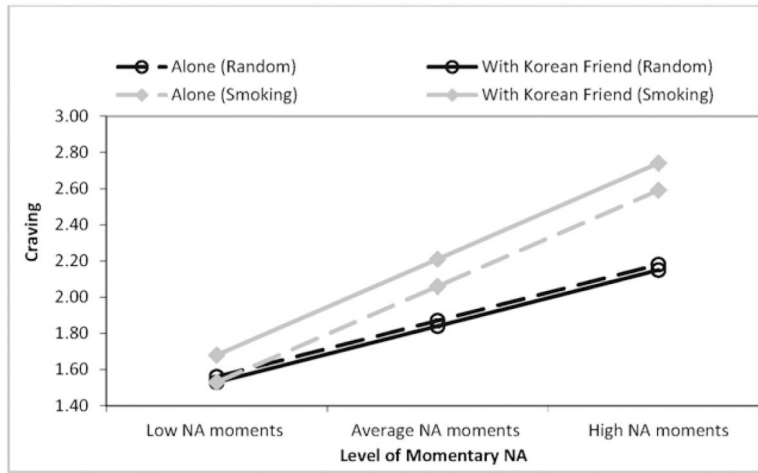
Fig. 1.
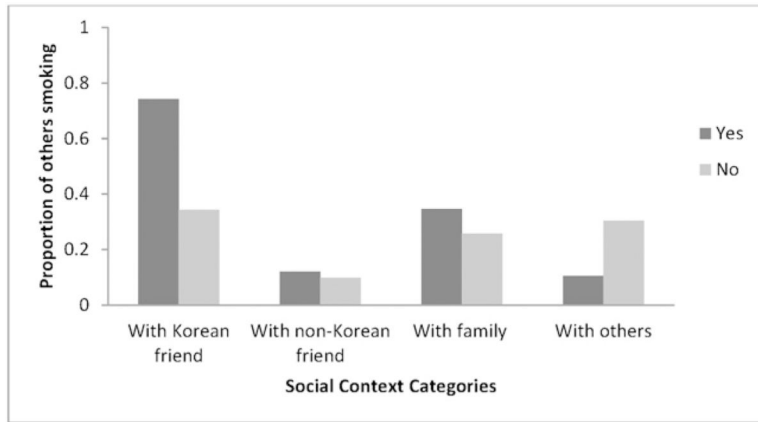Craving by prompt type and social context as a function of negative affect.

Fig. 2.
Proportion of presence of others smoking by social contexts categories.

Table 1

Sample characteristics (Level-2 N = 78).

	M (*SD*)	*N* (%)
Age	22.40 (1.77)	
Male		56 (71.8%)
Employment status		
Full-time student		17 (21.8%)
Part-time student, part-time employed		12 (15.4%)
Full-time student, full-time employed		11 (14.1%)
Employed part-time		5 (6.4%)
Employed full-time		25 (32.1%)
Not employed, looking for work		8 (10.3%)
US born		49 (62.8%)
Selected English language to be used for EMA platform		62 (79.5%)
FTND	2.10 (1.92)	
The first whole cig smoked <17 years old		52 (66.7%)
Number of cigarettes per day during the past 30 days		
2–5 cigs		27 (34.6%)
6–10 cigs		37 (47.4%)
11 to 20 cigs		13 (16.7%)
20+ cigs		1 (1.3%)

Note: FTND: Fagerström Test for Nicotine Dependence scale.

Table 2

Prompt-level sample characteristics (N = 1377).

	M (SD)	*N (%)*
Craving	1.87 (0.89)	
NA	1.31 (0.55)	
Smoking prompts		774 (56.2%)
Social contexts		
Alone		613 (44.5%)
KF		364 (26.4%)
NKF		80 (5.8%)
FM		138 (10.0%)
OTH		179 (13.0%)
Others smoking		274 (19.9%)

Note: NA = Negative Affect; KF = Korean friend; NKF = Non-Korean friend; FM = Family member; OTH = Other; scores for craving and NA ranged from 1 (Not at all) to 6 (Extremely), high values indicating greater levels of craving and NA.

Table 3

General linear mixed models: momentary craving and contextual correlates (n = 1377).

	Model 1 b(SE)	Model 2 b(SE)	Model 3 b(SE)	Model 4 b(SE)
Intercept	1.98(.15)***	1.97(.15)***	1.87(.15)***	1.87(.15)***
Between-subject (BS)				
Male	−.35(.18)^	−.34(.18)^	−.35(.18)^	−.35(.18)^
EMA completed in Korean	.13(.19)	.13(.19)	.12(.19)	.13(.19)
Language				
% smoking occasions/all prompts[1]	−1.74(1.18)	−1.79(1.19)	−1.80(1.19)	−1.77(1.19)
Negative affect[1] (NA)	.43(.20)*	.43(.20)*	.43(.20)*	.43(.20)*
% with Korean friend[1] (KF)	−.21(.63)	−.37(.72)	−.38(.72)	−.40(.72)
% with non-Korean friend[1] (NKF)	1.40(1.00)	1.33(1.02)	1.25(1.03)	1.28(1.02)
% with family[1] (FAMILY)	.05(.67)	.02(.68)	.02(.68)	.01(.68)
% with other people[1] (OTHER)	.24(.63)	.19(.65)	.22(.65)	.24(.63)
Nicotine Dependence[1] (NicDep)	.10(.04)*	.10(.04)*	.10(.04)*	.11(.04)**
% around others smoking[1] (OS)		.34(.72)	.42(.73)	.35(.72)
Within-subject (WS)				
Weekend	.01(.04)	.02(.04)	<.01(.04)	.01(.04)
Time in study	.02(.01)**	.03(.01)**	.02(.01)**	.02(.01)**
NA-WS[2]	.43(.04)***	.43(.04)***	.31(.06)***	.43(.04)***
KF-WS[2] (vs. alone)	.09(.04)*	.04(.05)	−.03(.07)	.06(.05)
NKF-WS[2] (vs. alone)	−.04(.08)	−.08(.08)	.13(.11)	−.03(.08)
FAMILY-WS[2] (vs. alone)	−.02(.06)	−.02(.06)	−.03 (.08)	.02(.06)
OTHER-WS[2] (vs. alone)	.08(.06)	.07(.06)	.11(.08)	.11(.06)
OS-WS[2]		.12(.05)*	.27(.09)**	.03(.05)
Smoking[2] (vs. random)			.19(.05)***	.19(.03)***

	Model 1 b(SE)	Model 2 b(SE)	Model 3 b(SE)	Model 4 b(SE)
Interaction terms				
NA-WS × smoking			.22(.08) **	
KF-WS × smoking			.18(.09) *	
NKF-WS × smoking			−.29(.16) ^	
FAMILY-WS × smoking			.15(.12)	
OTHER-WS × smoking			.04(.11)	
OS-WS × smoking			−.34(.11) **	
NA-WS × NicDep				−.02(.02)
KF-WS × NicDep				−.02(.02)
NKF-WS × NicDep				−.02(.04)
FAMILY-WS × NicDep				−.02(.04)
OTHER-WS × NicDep				−.04(.03)
OS-WS × NicDep				.02(.03)

Model 1 tests the association between social contexts and momentary craving, controlling for relevant covariates; Model 2 tests the influence of presence of others; Model 3 tests whether the relationship between craving and social/smoking contexts when about to smoke differs from that of random prompts; Model 4 tests whether nicotine dependence levels moderates this relationship.

Note: NA = Negative Affect; KF = Korean friend; NKF = Non-Korean friend; FAMILY = Family member; OTHER = Other people; OS = Others smoking; NicDep = Nicotine Dependence assessed with Fagerström Test for Nicotine Dependence scale.

[1]BS variable centered at grand mean (0 = grand mean).

[2]WS variable centered at person-mean (0 = person-mean).

^
 p < .10.

*
 p < .05.

**
 p < .01.

***
 p < .001.