



Original investigation

Feasibility of Using Ecological Momentary Assessment to Study Unaided Smoking Cessation in Couples

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Abstract

Introduction: Ecological momentary assessment (EMA) is a valuable method for studying smoking cessation, but feasibility has not been examined in committed couples. The current study examines the feasibility of conducting an EMA study of unaided smoking cessation in single-smoker couples.

Methods: Participants were 62 single-smoker couples recruited to participate in a 21-day study of unaided smoking cessation. Quitters and Partners were given instructions to complete one morning report, three signaled reports, and one evening report per day, as well as lapse reports when necessary. They also completed a series of questionnaires at baseline and follow-up. This article examines predictors of compliance with the reporting instructions.

Results: Compliance with scheduled reporting was reasonable (Quitters: 76%, Partners: 79%). Compliance with “on-time” lapse reporting (vs. make-up reporting) was poor (Quitters: 62%, Partners: 43%). Quitters’ compliance with lapse reporting was strongly associated with an orientation toward quitting. Partners’ compliance with lapse reporting was associated with relationship motivation. Quitter compliance plummeted when Partners were noncompliant. Self-regulation and emotional instability were not associated with compliance but were associated with time to complete reports. Quitters’ and Partners’ experiences completing the study provide some insight into the dynamics of completing an EMA study as part of a dyad.

Conclusions: Overall, this study suggests it is feasible and effective to collect EMA data on smoking cessation from couples. However, compliance with lapse reporting was poor, especially for Partners. Researchers could provide remuneration on a different schedule, provide shorter lapse reports, or omit Partner lapse reports altogether.

Implications: This article examined compliance with scheduled and lapse reporting in single-smoker couples during an unaided quit attempt. Compliance with scheduled reporting was acceptable, but compliance with lapse reporting was poor, especially for Partners. Quitters’ compliance with lapse reporting was heavily influenced by an orientation toward quitting, suggesting that improved screening for motivation to quit might improve compliance rates. Quitter compliance also plummeted when Partners were noncompliant. Partner demographics and relationship motivation were the best predictors of compliance. To enhance compliance, researchers might provide remuneration on a different scale, dramatically shorten lapse reports, or even omit Partner lapse reports.

Introduction

Ecological momentary assessment (EMA) is an overarching term for methods involving intensive repeated measurement in participants' natural environment. EMA includes *interval-contingent reports*, where participants initiate reports at strict intervals (eg, traditional daily diaries); *randomly signaled reports*, where participants are prompted to complete a report at randomly selected times (eg, experience sampling); and *event-contingent reports*, where participants complete a report when a target event occurs (eg, lapse reports).¹⁻³ EMA studies provide more precise estimates of cigarette use than retrospective self-report or timeline follow-back methods,⁴ enable the study of responses to smoking stimuli that participants naturally encounter,⁵ and allow tracking of precursors of cigarette use.⁶ EMA is a feasible and effective method for studying smoking in individuals,^{6,7} but it is unclear whether such methods can be used to study dyads or groups. At the time that data collection for this study began, there were no EMA studies of smoking in couples, and now only two separate daily diary studies exist.⁸⁻¹⁰ In the current article, we explore the feasibility of using EMA to study unaided smoking cessation in a community sample of married and cohabiting couples.

Intimate Partners and Smoking

Smokers who report receiving support from their partner are more likely to quit smoking,¹¹⁻¹⁶ but experimental studies that increase partner support provision have not improved smoking cessation.¹⁷ Furthermore, smokers and partners do not always agree about the amount or helpfulness of support provided.^{8,9,18,19} Studies examining *perceived* support behaviors at baseline or follow-up using only one person's report might not capture the *actual* proximal behaviors that are most influential in relapse. To identify the proximal partner behaviors of most importance to smoking cessation, EMA studies that involve both partners are needed. Such studies would assess smoking in near real-time, follow partner interactions in the natural environment, and track interaction patterns that are related to smoking lapses but are difficult to self-report.

EMA procedures are complicated by obtaining data from two partners.²⁰⁻²² First, should single-smoker or dual-smoker couples be recruited? We recruited couples with one smoker who would make an unaided quit attempt (the Quitter) and a nonsmoker (the Partner). We reasoned that nonsmoking partners would be more willing to provide support for quitting,²³ and smokers would be more likely to quit if their partner were a nonsmoker.²⁴⁻²⁶ Second, how can we minimize the coerced participation of uninterested partners? We screened and paid partners individually, and our procedures allowed people to continue participating if their partner dropped. Third, when using signaled reporting, should partners be prompted independently or simultaneously? We prompted partners simultaneously, given that the larger study focused on whether Quitters and Partners perceived the same events in the same way.^{8,9,19} Finally, how can we ensure that *both* partners complete as many reports as possible,²¹ since data missing from either partner creates a missing datapoint for the full couple? We provided extensive training on how to complete the EMA, followed a detailed payment and bonus schedule, and contacted both partners frequently during the reporting phase. In this article, we evaluate our ability to achieve adequate compliance rates, and we consider characteristics that might influence compliance.

Predictors of Compliance

We considered contextual and individual difference variables that might influence compliance. We assessed constructs related to

planning and perseverance, such as momentary fatigue, daily perceptions of self-control, and baseline self-regulation abilities.^{27,28} Similarly, we assessed variables relevant to emotional instability, like momentary mood and baseline neuroticism.^{27,29} Within a couple of study, relationship functioning should influence compliance,²¹ so we captured momentary reports of partner interactions, daily relationship satisfaction, and baseline relationship satisfaction. Finally, within a study of smoking cessation, orientation toward quitting could influence compliance with smoking protocols. Accordingly, we assessed momentary and baseline smoking-related variables. We also considered several procedural variables and demographics.

Overview

In the current article, we examined the feasibility of using EMA to study smoking cessation in single-smoker couples. We asked the following research questions: (1) What was the overall level of compliance with reporting among Quitters and Partners? (2) What momentary-, daily-, and individual-level variables predicted compliance for Quitters and Partners? (3) Was Quitter compliance influenced by Partner compliance? (4) What variables predicted time to complete the reports? (5) How did Quitters and Partners describe their experiences completing the study?

Methods

Participants

Couples were recruited to participate in a study of unaided smoking cessation, the Daily Experiences with Smoking Cessation (DESC) Study, primarily through paid Facebook advertising and mass mailing.³⁰ Eligible couples met relationship criteria (a different-sex relationship; cohabiting 6+ months or married; one smoker and one never/former smoker), demographic criteria (both partners aged 18-55; comfortable with English), Quitter smoking criteria (smoked 10+ cigarettes per day; smoked for the past 2+ years; no noncigarette forms of tobacco; motivation to quit of 50+ on a 1-100 scale; not seeing a provider or taking medication to quit smoking), logistical criteria (partners lived together; both could access smartphones during the day), and safety criteria (ie, no severe intimate partner violence).

Of 2223 people screened, 126 couples were eligible, and 64 couples attended the initial appointment.³¹ One couple did not reschedule after a failed CO reading, and one couple dropped the first day of participation, leaving a total sample of 62 couples. The Quitter was male in 61% of couples. Quitters and Partners averaged 35.7 (standard deviation [SD] = 8.8) and 35.0 (SD = 9.1) years of age and 13.3 (SD = 1.8) and 14.5 (SD = 2.1) years of education, respectively. They were non-Hispanic White (73% Quitters; 82% Partners), non-Hispanic Black (11% Quitters; 6% Partners), multi-racial (10% Quitters; 6% Partners), and other (6% Quitters; 6% Partners). Most were employed at least part-time (63% Quitters; 74% Partners). Most were married (59%, vs. cohabiting), and had been living together for an average of 6.1 (SD = 6.8) years. Half had children. Quitters reported smoking an average of 15 cigarettes per day (SD = 7, range: 1-40) over the past 30 days.

Procedures

This research was reviewed by the Social and Behavioral Sciences Institutional Review Board of the University at Buffalo, SUNY. Participants provided informed consent at each step in the process (background, orientation, EMA, and follow-up). Participants were

told we would follow them during a quit attempt but would not provide treatment for smoking cessation. Background questionnaires were completed online. Six participants did not complete background measures; their demographic information was obtained from screening information, and mean imputation was used for other questionnaires. Quitters were required to stop smoking 12 h before their orientation session, verified with an expelled breath carbon monoxide (CO) reading of less than 10 (roughly) parts per million on a Bedfont Pico Smokerlyzer (<http://www.bedfont.com/>). Participants who failed the CO reading rescheduled. Those who passed completed additional questionnaires and laboratory tasks. Then we provided participants with Android smartphones and training for the EMA.

For the next 21 days, participants completed the EMA using a web application. Participants completed *evening reports* before bed each night (between 9 PM and 4 AM; days 1–20); *morning reports* as soon as they woke up each day (between 5 AM and 12 PM; days 2–21); and three *signaled reports* each day when prompted (in blocks from 9 AM to 12 PM, 12 PM to 3 PM, 3 PM to 6 PM, and 6 PM to 9 PM; days 2–20). The signal for the first block only occurred if the morning report had already been completed, and the signal in the fourth block only occurred if the participant had completed fewer than three reports (to accommodate early vs. late risers). Participants were asked to complete the Signaled Report within 5 min of receiving the prompt, but the report remained open up to 30 min. Both partners completed a *Lapse Report* anytime the Quitter lapsed (or the Partner assumed the Quitter lapsed; days 1–21). Participants

were limited to five lapse reports per day (to minimize participant burden) and were instructed to report further lapses in their other reports; these latter reports were treated as compliant.

After the EMA, couples attended a follow-up session. They provided a second CO reading, completed questionnaires, and returned the study smartphones. Each partner was compensated 30 USD for the background questionnaires, orientation session, and follow-up session. In addition, they received 0.50 USD per report in the EMA phase. If they completed all morning reports, all evening reports, and at least 90% of signaled reports, they also received bonuses of 2.50, 5, and 10 USD for each week of the EMA phase, plus a sliding bonus up to 50 USD. Thus, each partner could receive 150 USD.

Measures

Descriptive statistics, scoring information, and the assessment schedule for the EMA and baseline predictors are included in [Table 1](#).

Signaled Reports

Quitters and Partners completed four items assessing *fatigue* (tired, worn out, active [rs], energetic [rs]) and four items assessing *mood* (happy, sad [rs], relaxed, anxious [rs]). A variable for *partner interaction* was created based on Quitter and Partner responses to: “Since my last report, I interacted with ...” (no one, my partner, others, my partner and others). A variable for *Quitter smoked* was created based on Quitter and Partner responses to two questions: “[Have you/has your partner] smoked any cigarettes today?”; “Have you

Table 1. Descriptive Statistics, Scoring Information, and Assessment Schedule for the Predictor Variables

	Quitter			Partner			Scale	Schedule
	α	<i>M</i>	<i>SD</i>	α	<i>M</i>	<i>SD</i>		
Fatigue	.72	2.78	0.88	.78	2.77	0.92	1 = not at all, 5 = very much	Random, lapse
Mood	.76	3.85	0.74	.74	3.99	0.66	1 = not at all, 5 = very much	Random, lapse
Partner interaction	—	0.47	0.50	—	0.58	0.49	0 = no one/others, 1 = my partner/my partner and others	Random, lapse
Smoke	—	0.27	0.44	—	0.20	0.40	0 = did not smoke/ previously reported, 1 = smoked and not previously reported	Random, morning, evening, lapse (implied)
Confidence	—	3.28	1.21	—	2.90	1.19	1 = not at all confident, 5 = very confident	Random, morning, evening, lapse
Urge	—	2.85	1.32	—	—	—	1 = not at all strong, 5 = very strong	Random, morning, evening, lapse
Restraint	—	3.28	1.21	—	—	—	1 = not at all strong, 5 = very strong	Random, morning, evening, lapse
Self-control	.77	3.02	0.92	.73	3.23	0.85	1 = not at all, 5 = very much	Evening
Daily relationship satisfaction	.87	4.06	0.90	.86	3.92	0.89	1 = not at all/terrible, 5 = very much/terrific	Evening
Conscientiousness	.86	4.90	0.86	.81	4.99	0.80	1 = strongly disagree, 7 = strongly agree	Baseline
Neuroticism	.88	3.43	1.06	.81	3.19	0.83	1 = strongly disagree, 7 = strongly agree	Baseline
Baseline relationship satisfaction	.96	4.99	0.73	0.98	4.79	0.92	Varying	Baseline
Support for quitting	.94 _{positive} .85 _{negative}	1.47	0.76	.93 _{positive} .82 _{negative}	1.59	0.67	1 = almost never, 7 = very often	Baseline
Global motivation to quit	—	5.50	1.31	—	—	—	1 = not at all motivated, 7 = extremely motivated	Baseline
Nicotine dependence	.65	4.05	2.45	—	—	—	Varying	Baseline

previously reported all of the times [you/your partner] smoked?" Both Quitters and Partners rated their *confidence* the Quitter could quit ("Right now, how confident are you that [you/your partner] can quit smoking?"). Quitters also reported *urge* ("Right now, how strong is your urge to smoke?") and *restraint* ("Right now, how strong is your desire not to smoke?").

Morning Reports

Quitters and Partners completed the Quitter smoked, confidence, urge, and restraint items.

Evening Reports

Quitters and Partners completed the Quitter smoked, confidence, urge, and restraint items. They also responded to three items assessing *today's self-control* (Today, I felt like ... "I had a lot of will-power"; "I had good self-control"; "it was easy to work toward my goals") and four items assessing *today's relationship satisfaction*. The first three (Today, I felt ... "in love with my partner"; "close to my partner"; "less connected to my partner than usual" [rs]) were measured on a scale from 1 (*not at all*) to 5 (*very much*). The final item ("Overall, how would you rate your relationship today?") was assessed on a scale from 1 (*terrible*) to 5 (*terrific*).

Lapse Reports

Quitters and Partners responded to the same fatigue, mood, and partner interaction items as in the signaled report. However, Quitters saw the stem: "Just before I smoked ..." and Partners saw the stem: "Just before I started my report" Quitters and Partners also completed the confidence item, and Quitters completed the urge and restraint items from the signaled report.

Baseline Individual

As assessments of self-regulation and emotional instability, Quitters and Partners completed 10 items assessing *conscientiousness* and 10 items assessing *neuroticism* from the International Personality Item Pool (IPIP).²⁷ They also completed demographic information.

Baseline Relationship

As an assessment of *relationship satisfaction*, Quitters and Partners completed the 32-item Couples Satisfaction Index.³² They also completed the 20-item Partner Interaction Questionnaire.³³ Quitters completed a version assessing the extent to which they expected the Partner to provide *support for quitting*; partners completed a version assessing the extent to which they planned to provide support. Responses to positive and negative support items were averaged separately. The final ratio scores were created by dividing positive support by negative support.

Baseline Smoking

Both Quitters and Partners completed a smoking history questionnaire from the PhenX Toolkit version June 13, 2012, Ver 5.3³⁴ to assess former and current smoking patterns. Quitters responded to a single item assessing *global motivation* to quit smoking. They also completed the 6-item Fagerström Test for Nicotine Dependence,³⁵ which was summed to create the final *nicotine dependence* score.

Follow-up: Study Experiences

Participants responded to questions regarding how long it took to complete reports, how well they followed instructions, how often

they discussed reports with their partner, and how much participation led them to perceive their relationship differently.

Analysis

First, we examined descriptive information for compliance. Second, we conducted multilevel analyses to examine predictors of compliance. To examine compliance with scheduled reporting, we calculated a variable for each morning, signaled, and evening report indicating whether the participant completed it (coded 0 = incomplete, 1 = complete); we also created a lead variable indicating whether the participant completed the following scheduled report. To examine compliance with lapse reporting, we calculated a variable indicating whether smoking was reported in a lapse report or another type of report (0 = other, 1 = lapse). Both lead variables and lagged variables were calculated by an individual (ie, across days), so compliance in evening reports could be used to predict compliance in the following morning reports. We examined Quitter and Partner compliance with both scheduled and lapse reporting in separate three-level (moment, day, individual) logistic regression models with robust standard errors in Stata 15.0.³⁶ We included a random intercept but treated the slopes as fixed effects. Third, we examined the dyadic influence on compliance using kappa and three-level logistic models. Fourth, we examined predictors of time to complete reports using three-level Gaussian models with robust standard errors. Finally, we examined experiences completing the study by comparing responses to the midpoint of the scale using one-sample *t*-tests.

Results

Compliance With EMA Protocol

Quitters and Partners completed 1098 (80%) and 1117 (82%) out of 1364 morning reports, 2759 (74%) and 2898 (78%) out of 3720 signaled reports, and 1043 (76%) and 1111 (81%) out of 1364 evening reports, for an overall compliance with scheduled reporting of 76% for Quitters and 79% for Partners. Given that compliance rates often range from about 75%–80% for interval and signaled reporting in EMA studies of substance use,⁴ these rates could be considered reasonable. Quitters and Partners completed 937 and 485 lapse reports but reported additional smoking in 584 and 643 signaled, morning, and evening reports, for overall compliance with on-time lapse reporting of 62% for Quitters but only 43% for Partners. The number of lapses reported per participant was highly variable for Quitters (range: 0–102, median: 15) and Partners (range: 0–105, median: 8). Four Quitters and eight Partners did not report any lapses. In studies that have used global self-reports as approximations for "true" reporting, compliance with event reporting (eg, lapses) in previous EMA studies has ranged from 22% to 90%.⁴ In the current study, compliance with lapse reporting might be considered poor, but both Quitter and Partner rates fall within the range of previously published compliance.

Predictors of Compliance With Scheduled Reporting

First, we examined hour of the report, partner interactions, fatigue, and mood in a given report as predictors of compliance in the *following report*. For Quitters, we also included urge, restraint, confidence they could quit, and whether they had lapsed. For Partners, we also included confidence that the Quitter could quit and whether they believed the Quitter had lapsed. Hour of the report significantly predicted compliance for the Quitter, odds ratio (OR) = 1.17, 95%

CI = 1.11% to 1.24%, $p < .001$, and for the Partner, OR = 1.21, 95% CI = 1.15% to 1.27%, $p < .001$. None of the other variables significantly predicted subsequent compliance for the Quitter, all $ps > .103$, or the Partner, all $ps > .378$. Results were comparable when separate indices of positive and negative mood were included.

Next, we examined predictors of compliance in the *current report*. Results are presented in Table 2. Both Quitters and Partners were more likely to be compliant later in the day and after having previously been compliant. Additionally, *Quitters* were more likely to be compliant on days when they reported higher self-control. They were less likely to be compliant if they reported higher baseline nicotine dependence.

Predictors of Compliance With Lapse Reporting

Three-week continuous abstinence was only 6.4%. The majority of Quitters (91.94%) smoked the first week of the study. However, participants varied in terms of whether they reported smoking in lapse reports or make-up reports. Results of analyses examining predictors of compliance with on-time lapse reporting are presented in Table 3. *Quitters* were more likely to be compliant earlier in the day when they were confident they could quit, and on days when they reported lower relationship satisfaction. They were also more likely to be compliant if they were less educated, married (vs. cohabiting), their partner was a former (vs. never) smoker, and they were lower in nicotine dependence. *Partners* were more likely

Table 2. Predictors of Compliance With Scheduled Reporting

	Quitter		Partner	
	OR	95% CI	OR	95% CI
Intercept	9.06***	[4.73 to 17.36]	13.79***	[5.64 to 33.71]
Level 1 (momentary) predictors				
Hour (GMC)	1.10***	[1.08 to 1.12]	1.10***	[1.08 to 1.12]
Compliant at $t-1$ (0 = no, 1 = yes)	1.81***	[1.34 to 2.45]	2.19***	[1.61 to 2.99]
Level 2 (daily) predictors				
Day of the study (GMC)	1.00	[0.98 to 1.03]	0.99	[0.97 to 1.02]
Weekend (GMC)	1.10	[0.82 to 1.48]	1.24	[0.91 to 1.70]
Today's self-control (PMC)	1.35**	[1.12 to 1.64]	0.86	[0.69 to 1.07]
Today's relationship satisfaction (PMC)	0.99	[0.86 to 1.14]	0.89	[0.75 to 1.05]
Level 3 (person) predictors				
Sex (0 = men, 1 = women)	0.98	[0.51 to 1.87]	1.15	[0.60 to 2.17]
Age (GMC)	1.00	[0.97 to 1.04]	0.99	[0.95 to 1.03]
Race (0 = White, 1 = non-White)	0.96	[0.46 to 2.01]	0.77	[0.34 to 1.77]
Education (GMC)	0.90	[0.75 to 1.08]	1.12	[0.96 to 1.31]
Unemployed (0 = no, 1 = yes)	1.46	[0.74 to 2.90]	1.76	[0.74 to 4.09]
Marital status (0 = married, 1 = cohabiting)	0.75	[0.41 to 1.37]	0.72	[0.38 to 1.36]
Relationship length (GMC)	0.97	[0.93 to 1.02]	1.01	[0.97 to 1.06]
Children (0 = no, 1 = yes)	1.08	[0.55 to 2.13]	0.98	[0.51 to 1.88]
Conscientiousness (GMC) ^a	1.04	[0.69 to 1.58]	1.01	[0.72 to 1.39]
Neuroticism (GMC) ^b	1.08	[0.77 to 1.52]	0.95	[0.65 to 1.38]
Relationship satisfaction (GMC)	1.48*	[0.94 to 2.34]	0.80	[0.58 to 1.11]
Support for quitting (GMC) ^c	0.97	[0.71 to 1.34]	1.00	[0.67 to 1.49]
Motivation to quit (GMC)	1.11	[0.85 to 1.46]	—	—
Nicotine dependence (GMC)	0.90*	[0.80 to 0.99]	—	—
Partner smoking status (0 = never, 1 = former)	1.32	[0.71 to 2.42]	0.86	[0.45 to 1.62]

ORs less than one reflect negative associations and greater than one reflect positive associations between the predictor and the likelihood of being compliant. Uncentered hour ranged from 5 (5 AM that day, opening of the morning report) to 28 (4 AM the next day, close of the evening report). Compliant at $t-1$ refers to compliance at the previous time point (including the lag from evening to the following morning). Day of the study ranged from 1 (first evening of the study) to 22 (last morning of the study). Uncentered weekend was coded 0 (Monday to Friday) or 1 (Saturday/Sunday). Today's self-control and relationship satisfaction were reported in the evening report. The intercept represents the likelihood of being compliant after previously being noncompliant, at a "typical" time of day, on a "typical" day of the study, on a "typical" day of the week, at each person's average level of daily predictors, for married, White, employed men with no children and a never-smoker partner at sample average levels of all other predictors. OR = odds ratio; 95% CI = 95% confidence interval of the odds ratio; GMC = grand mean centered; PMC = person mean centered.

^aResults were similar when measures of impulsivity (Lynam DR, Smith GT, Whiteside SP, Cyders MA. The UPPS-P: assessing five personality pathways to impulsive behavior (Technical Report). 2006, West Lafayette: Purdue University.) or self-control (Tangney JP, Baumeister RF, Boone AL. High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *J Pers.* 2004; 72: 271–324.) were substituted for conscientiousness.

^bResults were similar when measures of emotion regulation (Gratz KL, Roemer L. Multidimensional assessment of emotion regulation and dysregulation: development, factor structure, and initial validation of the difficulties in emotion regulation scale. *J Psychopathol Behav.* 2004; 26: 41–54.) or emotional reactivity (Nock MK, Wedig MM, Holmberg EB, Hooley JM. The emotion reactivity scale: development, evaluation, and relation to self-injurious thoughts and behaviors. *Behav Ther.* 2008; 39: 107–116.) were substituted for neuroticism.

^cQuitters reported the extent to which they expected their partner to provide support for quitting during the study. Partners reported the extent to which they planned to provide support for quitting.

* $p < .10$, ** $p < .05$, *** $p < .001$.

Table 3. Predictors of Compliance With Lapse Reporting

	Quitter		Partner	
	OR	95% CI	OR	95% CI
Intercept	34.05***	[6.12 to 189.44]	484.85***	[39.44 to 5960.54]
Level 1 (momentary) predictors				
Hour (GMC)	0.95*	[0.90 to 1.00]	0.91*	[0.84 to 0.98]
Compliant at <i>t</i> -1 (0 = no, 1 = yes)	1.77	[0.76 to 4.15]	3.09***	[1.64 to 5.85]
Fatigue (PMC)	0.98	[0.67 to 1.42]	0.97	[0.59 to 1.62]
Mood (PMC) ^a	0.84	[0.56 to 1.25]	0.81	[0.46 to 1.42]
Partner interaction (0 = no, 1 = yes)	0.71	[0.46 to 1.10]	0.28**	[0.11 to 0.72]
Quitter smoked at <i>t</i> -1 (0 = no, 1 = yes) ^b	1.21	[0.65 to 2.22]	0.73	[0.37 to 1.46]
Confidence (PMC) ^c	1.57***	[1.20 to 2.06]	1.17	[0.69 to 1.99]
Urge (PMC)	0.98	[0.79 to 1.21]	—	—
Restraint (PMC)	1.24	[0.95 to 1.63]	—	—
Level 2 (daily) predictors				
Day of the study (GMC)	0.96*	[0.91 to 1.00]	0.97	[0.91 to 1.03]
Weekend (GMC)	1.22	[0.81 to 1.83]	1.21	[0.73 to 2.01]
Today's self-control (PMC)	1.20	[0.79 to 1.84]	1.18	[0.77 to 1.82]
Today's relationship satisfaction (PMC)	0.72*	[0.52 to 0.99]	0.90	[0.66 to 1.23]
Level 3 (person) predictors				
Sex (0 = men, 1 = women)	0.87	[0.23 to 3.38]	0.60	[0.14 to 2.66]
Age (GMC)	0.94*	[0.88 to 1.00]	0.87**	[0.78 to 0.96]
Race (0 = White, 1 = non-White)	2.75	[0.52 to 14.48]	12.48*	[1.29 to 120.29]
Education (GMC)	0.67*	[0.46 to 0.97]	1.20	[0.77 to 1.86]
Unemployed (0 = no, 1 = yes)	1.08	[0.31 to 3.78]	5.15	[0.59 to 45.12]
Marital status (0 = married, 1 = cohabiting)	0.25*	[0.07 to 0.81]	0.09*	[0.01 to 0.58]
Relationship length (GMC)	0.99	[0.91 to 1.08]	1.09	[0.98 to 1.21]
Children (0 = no, 1 = yes)	0.47	[0.16 to 1.38]	0.20*	[0.04 to 1.13]
Conscientiousness (GMC) ^d	1.34	[0.55 to 3.26]	1.21	[0.48 to 3.09]
Neuroticism (GMC) ^e	0.67	[0.36 to 1.26]	0.97	[0.44 to 2.17]
Relationship satisfaction (GMC)	0.61	[0.27 to 1.42]	0.77	[0.38 to 1.54]
Support for quitting (GMC) ^f	1.18	[0.49 to 2.82]	3.25*	[1.10 to 9.66]
Motivation to quit (GMC)	1.35	[0.84 to 2.16]	—	—
Nicotine dependence (GMC)	0.65**	[0.49 to 0.86]	—	—
Partner smoking status (0 = never, 1 = former)	4.33**	[1.55 to 12.08]	0.68	[0.16 to 2.79]

ORs less than one reflect negative associations and greater than one reflect positive associations between the predictor and the likelihood of being compliant. Uncentered hour ranged from 5 (5 AM that day, opening of the morning report) to 28 (4 AM the next day, close of the evening report). Compliant at *t*-1 refers to compliance in the previous entry. Day of the study ranged from 1 (first evening of the study) to 22 (last morning of the study). Uncentered weekend was coded 0 (Monday to Friday) or 1 (Saturday/Sunday). Today's relationship satisfaction and self-control were reported in the evening report. The intercept represents the likelihood of being compliant after previously being noncompliant, at a "typical" hour, on a "typical" day of the study, on a "typical" day of the week, at each person's average level of momentary and daily predictors, for married, White, employed men with no children, and a never-smoker partner at sample average levels of all other predictors. OR = odds ratio; 95% CI = 95% confidence interval of the odds ratio; GMC = grand mean centered; PMC = person mean centered.

^aResults were comparable when separate indices of positive and negative mood were included rather than one composite.

^bQuitters reported whether they lapsed. Partners reported whether the quitter lapsed.

^cQuitters reported confidence that they could quit. Partners reported confidence that the quitter could quit.

^dResults were similar when measures of impulsivity (Lynam DR, Smith GT, Whiteside SP, Cyders MA. The UPPS-P: Assessing five personality pathways to impulsive behavior (Technical Report). 2006, West Lafayette: Purdue University.) or self-control (Tangney JP, Baumeister RF, Boone AL. High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *J Pers.* 2004; 72: 271–324.) were substituted for conscientiousness.

^eResults were similar when measures of emotion regulation (Gratz KL, Roemer L. Multidimensional assessment of emotion regulation and dysregulation: development, factor structure, and initial validation of the difficulties in emotion regulation scale. *J Psychopathol Behav.* 2004; 26: 41–54.) or emotional reactivity (Nock MK, Wedig MM, Holmberg EB, Hooley JM. The emotion reactivity scale: development, evaluation, and relation to self-injurious thoughts and behaviors. *Behav Ther.* 2008; 39: 107–116.) were substituted for neuroticism.

^fQuitters reported the extent to which they expected their partner to provide support for quitting during the study. Partners reported the extent to which they planned to provide support for quitting.

* $p < .10$, ** $p < .05$, *** $p < .01$, **** $p < .001$.

to be compliant earlier in the day, after being compliant in the previous report, and after interacting with the Quitter. Partners were also more likely to be compliant if they were younger, non-White (vs. White), married (vs. cohabiting), and planned to provide more support for quitting.

Dyad-Level Correlates of Compliance

Quitter and Partner compliance with *scheduled reporting* were strongly associated according to Cohen's kappa, $\kappa = 0.53$, $p < .001$. The probability of Quitter compliance with scheduled reporting in a given moment was 72%. At times when the Partner completed the

Table 4. Predictors of Length of Time to Complete the Reports

	Quitter		Partner	
	<i>b</i>	95% CI	<i>b</i>	95% CI
Intercept	2.974***	[2.317 to 3.632]	3.308	[2.107 to 4.509]
Level 1 (momentary) predictors				
Hour (GMC)	-0.007	[-0.057 to 0.042]	0.003	[-0.050 to 0.056]
Time for <i>t</i> -1	-0.032	[-0.105 to 0.040]	0.028	[-0.025 to 0.081]
Fatigue (PMC)	-0.066	[-0.312 to 0.179]	0.029	[-0.213 to 0.271]
Mood (PMC) ^a	-0.231	[-0.577 to 0.115]	-0.620*	[-1.148 to -0.092]
Partner interaction (0 = no, 1 = yes)	1.02***	[0.61 to 1.43]	0.770**	[0.233 to 1.307]
Quitter smoked at <i>t</i> -1 (0 = no, 1 = yes) ^b	-0.225	[-0.599 to 0.148]	-0.154	[-0.511 to 0.203]
Confidence (PMC) ^c	0.013	[-0.282 to 0.309]	-0.103	[-0.355 to 0.149]
Urge (PMC)	0.049	[-0.123 to 0.221]	—	—
Restraint (PMC)	-0.155	[-0.466 to 0.156]	—	—
Level 2 (daily) predictors				
Day of the study (GMC)	-0.017	[-0.047 to 0.014]	0.024	[-0.017 to 0.066]
Weekend (GMC)	-0.096	[-0.490 to 0.298]	-0.025	[-0.340 to 0.291]
Today's self-control (PMC)	0.037	[-0.198 to 0.272]	0.162	[-0.268 to 0.592]
Today's relationship satisfaction (PMC)	0.080	[-0.076 to 0.236]	0.076	[-0.406 to 0.558]
Level 3 (person) predictors				
Sex (0 = men, 1 = women)	-0.185	[-0.906 to 0.536]	-0.145	[-1.206 to 0.917]
Age (GMC)	-0.032	[-0.086 to 0.021]	0.001	[-0.066 to 0.068]
Race (0 = White, 1 = non-White)	-0.092	[-1.108 to 0.923]	-0.630	[-1.748 to 0.488]
Education (GMC)	0.204 [†]	[0.005 to 0.403]	-0.054	[-0.314 to 0.205]
Unemployed (0 = no, 1 = yes)	0.208	[-0.501 to 0.917]	-0.596	[-2.612 to 1.420]
Marital status (0 = married, 1 = cohabiting)	-0.222	[-0.972 to 0.528]	-0.143	[-1.329 to 1.044]
Relationship length (GMC)	0.038	[-0.015 to 0.091]	0.010	[-0.078 to 0.098]
Children (0 = no, 1 = yes)	0.827 [†]	[0.130 to 1.524]	1.043 [†]	[0.051 to 2.034]
Conscientiousness (GMC) ^d	-0.505 [†]	[-0.997 to -0.013]	.602	[-0.173 to 1.378]
Neuroticism (GMC) ^e	-0.582 [†]	[-1.096 to -0.067]	-0.181	[-1.335 to 0.973]
Relationship satisfaction (GMC)	-0.194	[-0.709 to 0.322]	0.130	[-0.384 to 0.643]
Support for quitting (GMC) ^f	0.380 [†]	[0.034 to 0.726]	-0.093	[-0.818 to 0.631]
Motivation to quit (GMC)	-0.299	[-0.721 to 0.122]	—	—
Nicotine dependence (GMC)	0.064	[-0.065 to 0.192]	—	—
Partner smoking status (0 = never, 1 = former)	0.660 [†]	[0.000 to 1.356]	0.656	[-0.536 to 1.849]

Uncentered hour ranged from 5 (5 AM that day, opening of the morning report) to 28 (4 AM the next day, close of the evening report). Time for *t*-1 refers to time taken to complete the previous entry. Day of the study ranged from 1 (first evening of the study) to 22 (last morning of the study). Uncentered weekend was coded 0 (Monday to Friday) or 1 (Saturday/Sunday). Today's relationship satisfaction and self-control were reported in the evening report. The intercept represents the length of time spent completing the report, at a "typical" hour, on a "typical" day of the study, on a "typical" day of the week, at each person's average level of momentary and daily predictors, for married, White, employed men with no children, and a never-smoker partner at sample average levels of all other predictors. *b* = unstandardized regression coefficient; 95% CI = 95% confidence interval of the unstandardized regression coefficient; GMC = grand mean centered; PMC = person mean centered.

^aResults were comparable when separate indices of positive and negative mood were included rather than one composite. When predicting partner time to complete the reports, neither positive mood nor negative mood were significant predictors when entered separately.

^bQuitters reported whether they smoked. Partners reported whether the quitter smoked.

^cQuitters reported confidence that they could quit. Partners reported confidence that the quitter could quit.

^dResults were similar when measures of impulsivity (Lynam DR, Smith GT, Whiteside SP, Cyders MA. The UPPS-P: assessing five personality pathways to impulsive behavior (Technical Report). 2006, West Lafayette: Purdue University.) or self-control (Tangney JP, Baumeister RE, Boone AL. High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *J Pers.* 2004; 72: 271-324.) were substituted for conscientiousness.

^eResults were similar when measures of emotion regulation (Gratz KL, Roemer L. Multidimensional assessment of emotion regulation and dysregulation: development, factor structure, and initial validation of the difficulties in emotion regulation scale. *J Psychopathol Behav.* 2004; 26: 41-54.) or emotional reactivity (Nock MK, Wedig MM, Holmberg EB, Hooley JM. The emotion reactivity scale: Development, evaluation, and relation to self-injurious thoughts and behaviors. *Behav Ther.* 2008; 39: 107-116.) were substituted for neuroticism.

^fQuitters reported the extent to which they expected their partner to provide support for quitting during the study. Partners reported the extent to which they planned to provide support for quitting.

[†]*p* < .10, ****p* < .001.

report, Quitter compliance rose to 86%. However, when the Partner did not complete the report, Quitter compliance fell to only 30%.

Quitter and Partner compliance with *lapse reporting* was more weakly associated, though still significant, $\kappa = 0.30$, $p < .001$. The probability of Quitter compliance with lapse reporting at a given time was 90%. If the partner completed an on-time lapse report,

Quitter compliance rose to 92%. However, when the Partner did not complete a lapse report, Quitter compliance fell to only 64%.

Time to Complete EMA Reports

On average, Quitters and Partners completed morning reports in 2.54 (SD = 2.96, range: 0.67-37.17) and 1.90 min (SD = 0.58, range:

0.58–31.10), signaled reports in 4.11 (SD = 3.72, range: 0.68–52.33) and 4.21 min (SD = 4.84, range: 0.57–54.35), evening reports in 7.50 (SD = 5.15, range: 2.12–55.15) and 6.97 min (SD = 3.99, range: 1.87–38.12), and lapse reports in 4.51 (SD = 4.68, range: 1.32–66.58) and 4.06 min (SD = 4.68, range: 1.32–66.58). Length of time taken to complete reports by Quitters and Partners was significantly correlated, $r = .24, p < .001$.

Results of analyses examining predictors of time to complete reports are presented in Table 4. *Quitter* reports were longer after interacting with the Partner. They were also longer if Quitters were more educated, had children (vs. not), were less conscientious, were less neurotic, and expected more support for quitting, and if their partner was a former (vs. never) smoker. *Partner* reports were longer when Partners were in a worse mood, after interacting with the Quitter, and if Partners had children (vs. not).

Experiences Completing the Study

Quitters and Partners reported in the follow-up questionnaire that they completed morning reports in 4.20 (SD = 2.88, range: 1–15) and 4.00 min (SD = 2.75, range: 1–15), signaled reports in 4.27 (SD = 2.36, range: 1–10) and 5.26 min (SD = 4.34, range: 2–25), evening reports in 6.51 (SD = 3.47, range: 2–15) and 7.05 min (SD = 3.72, range: 1–15), and lapse reports in 3.80 (SD = 2.22, range: 1–10) and 3.34 min (SD = 2.53, range: 1–15). Thus, Quitters and Partners overestimated the length of morning reports, $t(59) = 4.84, p < .001$ and $t(57) = 5.99, p < .001$, and Partners overestimated the length of signaled reports, $t(57) = 2.40, p = .020$. However, Quitters underestimated the length of evening reports, $t(59) = -2.13, p = .038$. Bivariate correlations between *estimated* time to complete the report and average *compliance* for that report were not significant, all $ps > .066$.

Table 5 contains descriptive information regarding participants' experiences completing the study. Participants reported typically

completing the morning report immediately after waking up and the evening report immediately before bed. However, they did not always complete the signaled report within 5 min of receiving the alert or lapse reports immediately after the Quitter smoked. Participants reported that they completed the reports carefully and did not rush. They did not generally discuss answers or participation with their partner.

Discussion

We examined predictors of compliance in an EMA study of unaided smoking cessation in couples. Compliance with scheduled reporting was reasonable (Quitters: 76%, Partners: 79%), and signaled reporting, in particular, was comparable to previous EMA studies of smoking (Quitters: 74%, Partners: 78%).^{37,38} Compliance rates were somewhat lower than in two daily diary studies of smoking cessation in couples (83%–90%),^{8–10} but couples in those studies were asked to complete only one report per day. The only consistent predictors of compliance with scheduled reporting in the individual analyses were procedural.

Compliance with on-time lapse reporting was unexpectedly low, particularly for Partners (Quitters: 62%, Partners: 43%), and was lower than in some previous studies.^{4,37,39} Quitters' compliance was primarily affected by partner and smoking variables. Results for the smoking variables should be interpreted with caution, given that these associations were not observed in prior research.³⁷ However, the partner variables, and particularly the association with Partner smoking status, suggest that Quitters with Partners who were former smokers (and therefore successful quitters) might have been particularly motivated to participate in the study.

Partners were more likely to complete on-time lapse reports after interacting with Quitters, but they reported at follow-up that they

Table 5. Participants' Experiences Completing the Study

Item	Scale	Quitter		Partner	
		M (SD)	Diff. from midpoint (t) ^a	M (SD)	Diff. from midpoint (t) ^b
Were you able to complete the morning reports immediately after awakening each day?	1 (<i>never</i>) to 7 (<i>always</i>)	5.15 (1.34)	6.62***	5.00 (1.65)	4.58***
Were you able to complete the evening reports immediately before going to bed each day?	1 (<i>never</i>) to 7 (<i>always</i>)	5.58 (1.48)	8.20***	5.46 (1.60)	6.85***
Were you able to respond to the random prompts within five minutes of receiving them?	1 (<i>never</i>) to 7 (<i>always</i>)	3.75 (1.42)	-1.37	4.00 (1.36)	0.00
Were you able to complete the slip reports immediately after you/your partner smoked?	1 (<i>never</i>) to 7 (<i>always</i>)	4.33 (1.99)	1.27	3.38 (1.91)	-2.40*
Overall, how careful were you to read the questions before you responded?	1 (<i>not at all</i>) to 7 (<i>extremely</i>)	5.49 (1.25)	9.16***	5.28 (1.08)	8.94***
Overall, how often did you find yourself rushing through the reports?	1 (<i>never</i>) to 7 (<i>always</i>)	3.02 (1.22)	-6.17***	3.16 (1.28)	-4.97***
How often did you discuss your responses with your partner?	1 (<i>never</i>) to 7 (<i>always</i>)	2.83 (1.28)	-7.04***	2.63 (1.33)	-7.76***
How much did completing the reports enter into your daily conversations with your partner?	1 (<i>not at all</i>) to 7 (<i>all the time</i>)	3.69 (1.29)	-1.82*	3.18 (1.18)	-5.27***

The columns for Diff. from midpoint contain the t -scores for a one-sample t -test comparing the mean to the midpoint of the scale. M = mean; SD = standard deviation; Diff. = difference.

^a $df = 58$.

^b $df = 56$.

* $p < .10$, ** $p < .05$, *** $p < .001$.

were not able to complete lapse reports immediately after Quitters smoked. Together, these results suggest that Partners gained most of their knowledge about lapses from the Quitter, perhaps through conversation or observation (eg, smelling smoke). Partners were more likely to report smoking “on time” (ie, in lapse reports rather than morning, random, or evening reports) if they were married (vs. cohabiting) and at higher levels of support for quitting, indicating that Partners’ relationship motivation was crucial for Partners’ compliance with on-time lapse reporting.

It is important to understand why Partners are compliant because their compliance influences Quitters’ compliance.²¹ When Partners did not complete on-time lapse reports, Quitter compliance fell from 92% to 64%. When Partners did not complete scheduled reporting, Quitter compliance fell from 86% to a mere 30%. These results are only correlational; couples might be less likely to complete a scheduled report when out together in public, for example. However, it does indicate that, even if partners do not discuss their reports with each other (Table 5), compliance with scheduled reporting is not independent. We signaled Quitters and Partners to complete their reports simultaneously. Future studies should consider whether Quitter compliance would be less dependent on the Partner if couples are signaled independently.

Limitations and Strengths

We examined compliance during unaided smoking cessation in different-sex, single-smoker couples. Compliance might be different in a treatment study, in dual-smoker couples, or in same-sex couples. Furthermore, only 51% of couples who were initially eligible to participate actually attended an orientation session. Therefore, some selection bias may have been operating, as the high no-show rate is likely partly attributable to our requirement that Quitters stop smoking at least 12 h before their initial appointment.

Despite these limitations, the results of the current study are impressive for at least three reasons. First, this is the first study to examine how partners influence compliance in an EMA study of smoking cessation. We were able to demonstrate that Partner compliance is a crucial correlate of Quitter compliance with scheduled reporting. Second, although compliance with lapse reporting was unexpectedly low, we discovered that Quitters with stronger smoking motivation and more compliant Partners were more likely to be compliant, an important clue for future research. Within single-smoker couples, collecting lapse reports from Partners may not be feasible without modifications to the design of the study. We did not pay for lapse reports as we did not want to influence smoking. Participants might have been willing to complete more lapse reports if they were paid on a different schedule or the lapse reports were shorter. Finally, we obtained participants’ subjective experiences completing the study. This information provides some insight into participants’ experiences that might be useful for future studies. For example, participants appear to have little patience for completing morning reports, even though morning compliance was reasonable.

Conclusions

Compliance with scheduled reporting was acceptable in the current study. Partners, in particular, were not compliant with lapse reporting, however, suggesting that researchers might provide remuneration on a different scale, dramatically shorten lapse reports, or omit Partner lapse reports. Quitters’ overall attitude toward quitting smoking strongly predicted compliance with on-time lapse

reporting, suggesting that improved screening for motivation to quit might improve compliance rates. Overall, the current article found that an EMA study of single-smoker couples is a feasible method for studying unaided smoking cessation.

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Declaration of Interests

None declared.

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References

1. Stone AA, Shiffman S. Ecological momentary assessment (EMA) in behavioral medicine. *Ann Behav Med*. 1994.
2. Shiffman S, Stone AA, Hufford MR. Ecological momentary assessment. *Annu Rev Clin Psychol*. 2008;4:1–32.
3. Stone AA, Shiffman S, Atienza AA, et al. Historical roots and rationale of ecological momentary assessment (EMA). In: *The Science of Real-Time Data Capture: Self-reports in Health Research*. New York, NY: Oxford University Press; 2007:3–10.
4. Shiffman S. Ecological momentary assessment (EMA) in studies of substance use. *Psychol Assess*. 2009;21(4):486–497.
5. Warthen MW, Tiffany ST. Evaluation of cue reactivity in the natural environment of smokers using ecological momentary assessment. *Exp Clin Psychopharmacol*. 2009;17(2):70–77.
6. Shiffman S, Balabanis MH, Gwaltney CJ, et al. Prediction of lapse from associations between smoking and situational antecedents assessed by ecological momentary assessment. *Drug Alcohol Depend*. 2007;91(2–3):159–168.
7. Shiffman S, Kirchner TR, Ferguson SG, Scharf DM. Patterns of intermittent smoking: an analysis using Ecological Momentary Assessment. *Addict Behav*. 2009;34(6–7):514–519.
8. Lüscher J, Ochsner S, Berli C, et al. Invisible social control as predictor of daily negative affect and smoking after a self-set quit date. *Z Gesundheitspsychol*. 2014;22:165–174.
9. Lüscher J, Stadler G, Ochsner S, et al. Daily negative affect and smoking after a self-set quit attempt: the role of dyadic invisible social support in a daily diary study. *Br J Health Psychol*. 2015;20(4):708–723.
10. Lüscher J, Stadler G, Scholz U. A daily diary study of joint quit attempts by dual-smoker couples: the role of received and provided social support. *Nicotine Tob Res*. 2017;1–8.
11. Coppotelli HC, Orleans CT. Partner support and other determinants of smoking cessation maintenance among women. *J Consult Clin Psychol*. 1985;53(4):455–460.
12. Ginsberg D, Hall SM, Rosinski M. Partner interaction and smoking cessation: a pilot study. *Addict Behav*. 1991;16(5):195–202.
13. Mermelstein R, Lichtenstein E, McIntyre K. Partner support and relapse in smoking-cessation programs. *J Consult Clin Psychol*. 1983;51(3):465–466.
14. Derrick JL, Leonard KE, Homish GG. Perceived partner responsiveness predicts decreases in smoking during the first nine years of marriage. *Nicotine Tob Res*. 2013;15(9):1528–1536.
15. Pollak KI, Mullen PD. An exploration of the effects of partner smoking, type of social support, and stress on postpartum smoking in married

- women who stopped smoking during pregnancy. *Psychol Addict Behav.* 1997;11:182–189.
16. Väänänen A, Kouvonon A, Kivimäki M, Pentti J, Vahtera J. Social support, network heterogeneity, and smoking behavior in women: the 10-town study. *Am J Health Promot.* 2008;22(4):246–255.
 17. Park EW, Tudiver F, Schultz JK, Campbell T. Does enhancing partner support and interaction improve smoking cessation? A meta-analysis. *Ann Fam Med.* 2004;2(2):170–174.
 18. Lüscher J, Ochsner S, Knoll N, Stadler G, Hornung R, Scholz U. Examining gender differences in received, provided, and invisible social control: an application of the dual-effects model. *Anxiety Stress Coping.* 2014;27(6):678–694.
 19. Pollak KI, McBride CM, Baucom DH, et al. Women's perceived and partners' reported support for smoking cessation during pregnancy. *Ann Behav Med.* 2001;23(3):208–214.
 20. Laurenceau JP, Bolger N. Using diary methods to study marital and family processes. *J Fam Psychol.* 2005;19(1):86–97.
 21. Cranford JA, Tennen H, Zucker RA. Feasibility of using interactive voice response to monitor daily drinking, moods, and relationship processes on a daily basis in alcoholic couples. *Alcohol Clin Exp Res.* 2010;34(3):499–508.
 22. Mehl MR, Conner TS, eds. *Handbook of Research Methods for Studying Daily Life.* New York, NY: Guilford Press; 2012.
 23. McBride CM, Curry SJ, Grothaus LC, et al. Partner smoking status and pregnant smoker's perceptions of support for and likelihood of smoking cessation. *Health Psychol.* 1998;17(1):63–69.
 24. Falba TA, Sindelar JL. Spousal concordance in health behavior change. *Health Serv Res.* 2008;43(1 Pt 1):96–116.
 25. Homish GG, Leonard KE. Spousal influence on smoking behaviors in a US community sample of newly married couples. *Soc Sci Med.* 2005;61(12):2557–2567.
 26. Severson HH, Andrews JA, Lichtenstein E, et al. Reducing maternal smoking and relapse: long-term evaluation of a pediatric intervention. *Prev Med.* 1997;26(1):120–130.
 27. Goldberg LR. A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. In: Mervielde I, Deary I, Fruyt FD, Ostendorf E, eds. *Personality Psychology in Europe.* Tilburg, The Netherlands: Tilburg University Press; 1999:7–28.
 28. Muraven M, Baumeister RF. Self-regulation and depletion of limited resources: does self-control resemble a muscle? *Psychol Bull.* 2000;126(2):247–259.
 29. Gratz KL, Roemer L. Multidimensional assessment of emotion regulation and dysregulation: development, factor structure, and initial validation of the difficulties in emotion regulation scale. *J Psychopathol Behav.* 2004; 26: 41–54.
 30. Derrick JL, Eliseo-Arras RK, Hanny C, et al. Comparison of internet and mailing methods to recruit couples into research on unaided smoking cessation research. 2017.
 31. Derrick JL, Eliseo-Arras RK, Hanny C, et al. Comparison of internet and mailing methods to recruit couples into research on unaided smoking cessation. *Addict Behav.* 2017;75:12–16.
 32. Funk JL, Rogge RD. Testing the ruler with item response theory: increasing precision of measurement for relationship satisfaction with the Couples Satisfaction Index. *J Fam Psychol.* 2007;21(4):572–583.
 33. Cohen S, Lichtenstein E. Partner behaviors that support quitting smoking. *J Consult Clin Psychol.* 1990;58(3):304–309.
 34. Hamilton CM, Strader LC, Pratt JG, et al. The PhenX Toolkit: get the most from your measures. *Am J Epidemiol.* 2011;174(3):253–260.
 35. Heatherton TF, Kozlowski LT, Frecker RC, Fagerström KO. The Fagerström Test for Nicotine Dependence: a revision of the Fagerström Tolerance Questionnaire. *Br J Addict.* 1991;86(9):1119–1127.
 36. StataCorp. *Stata Statistical Software: Release 15.* College Station, TX: StataCorp LP; 2017.
 37. Schüz N, Walters JA, Frandsen M, et al. Compliance with an EMA monitoring protocol and its relationship with participant and smoking characteristics. *Nicotine Tob Res.* 2014;16 (suppl 2):S88–S92.
 38. Carter BL, Lam CY, Robinson JD, et al. Real-time craving and mood assessments before and after smoking. *Nicotine Tob Res.* 2008;10(7):1165–1169.
 39. Shiffman S. How many cigarettes did you smoke? Assessing cigarette consumption by global report, time-line follow-back, and ecological momentary assessment. *Health Psychol.* 2009;28(5):519–526.