Nicotine & Tobacco Research, Volume 15, Number 9 (September 2013) *1528–1536*

ORIGINAL INVESTIGATION

Perceived Partner Responsiveness Predicts Decreases in Smoking During the First Nine Years of Marriage

Jaye L.Derrick PhD[1,2], **Kenneth E. Leonard** PhD[1], **Gregory G. Homish** PhD[1, 2]

[1]*Research Institute on Addictions, University at Buffalo, State University of New York, Buffalo, NY;* [2]*Department of Community Health and Health Behavior, School of Public Health and Health Professions, University at Buffalo, State University of New York, Buffalo, NY*

Corresponding Author: Jaye L. Derrick, Research Institute on Addictions, University at Buffalo, State University of New York, 1021 Main Street, Buffalo, NY 14203-1016, USA. Telephone: 716-887-2227; Fax: 716-887-2510; E-mail: jderrick@ria.buffalo.edu

Received August 7, 2012; accepted January 16, 2013

ABSTRACT

Introduction: Support for quitting is associated with smoking cessation, but few studies have examined the influence of more general social support on smoking outcomes. The current research examines perceptions of the partner's willingness and ability to provide general social support (i.e., perceived partner responsiveness) as a longitudinal predictor of smoking trajectories.

Methods: Data are from a sample of newlywed couples assessed at six timepoints over 9 years. The current analyses focus on both partners in 333 "ever-smoker" couples. Participants completed measures of partner responsiveness, smoking, and demographics through the mail at each timepoint.

Results: Both husbands and wives who initially reported greater partner responsiveness showed a decrease over the following 9 years in the likelihood of being a smoker and in cigarette quantity. This decrease was not apparent for husbands and wives who initially reported lower partner responsiveness. These effects were mediated by several time-varying characteristics.

Conclusions: Previous research has shown that support for quitting is an important predictor of smoking cessation. The current research demonstrates that more general perceived social support, unrelated to smoking behavior, also predicts decreases in smoking over time in both men and women. In fact, reports of partner responsiveness at baseline predicted smoking over 9 years, demonstrating the potency of this particular relationship perception for smoking outcomes.

INTRODUCTION

Social influence is a powerful determinant of smoking (e.g., Etcheverry & Agnew, 2008; Flay et al., 1994). Among adults, the most influential social relationship is often marriage (Kelley, 1979). The marital partner's smoking status is an important determinant of both quitting and relapsing (Homish & Leonard, 2005b), but most research has neglected other aspects of marriage that might influence smoking. Understanding marital factors that contribute to smoking cessation and relapse would provide invaluable information that could enhance people's smoking cessation efforts and improve their health, well-being, and life expectancy.

Married partners are often similar in terms of mental health, physical health, and health behaviors, such as dietary intake, lifestyle, alcohol use, and illicit drug use (Homish & Leonard, 2008; Homish, Leonard, & Cornelius, 2007; Leonard & Homish, 2008; see also Meyler, Stimpson, & Peek, 2007, for a review). Given these similarities, it is perhaps unsurprising that married partners also tend to be concordant for smoking status (Labouvie, 1996; Price & Vandenberg, 1980). In a community sample of 642 newlywed couples, Mudar, Leonard, and Soltysinski (2001) found that both partners smoked in 144 (22%) couples, neither partner smoked in 349 (54%) couples, only the husband smoked in 90 (14%) couples, and only the wife smoked in 58 (9%) couples (see also Homish & Leonard, 2005b). Thus, the majority of partners are concordant for (non) smoking status, but a substantial minority of couples are discordant. These similarities are present before marriage, suggesting that partners demonstrate assortative mating (Merline, Schulenberg, O'Malley, Bachman, & Johnston, 2008; Sutton, 1980). Given that many couples are discordant in the first year of marriage, however, there is considerable room for change over time.

Indeed, people are heavily influenced by their partner's smoking status. Smokers are more likely to quit smoking if their partner is a nonsmoker (Dollar, Homish, Kozlowski, & Leonard, 2009; Falba & Sindelar, 2008; Homish & Leonard, 2005b), and a decline in one partner's smoking is associated with a decline in the other partner's smoking over time (Merline et al., 2008). The partner's smoking status even affects people who are already highly motivated to quit—pregnant women are more likely to quit smoking if their partner is a nonsmoker (McBride et al., 1998; Severson, Andrews, Lichtenstein, Wall,

doi:10.1093/ntr/ntt011
Advance Access publication February 18, 2013

& Zoref, 1995). Conversely, quitters are more likely to relapse if their partner is a smoker (Bjornson et al., 1995; Homish & Leonard, 2005b), and women who quit during pregnancy are more likely to relapse postpartum if their partner is a smoker (Mullen, Richardson, Quinn, & Ershoff, 1997; Pollak & Mullen, 1997). The smoking status of the partner is clearly an important determinant of quitting and relapsing.

Beyond this "behavioral contagion" or "spousal influence" effect, there is reason to believe that marital quality more generally, and partner support in particular, affects smoking. Marital quality influences health, health behaviors, and addictive behaviors (for reviews, see Burman & Margolin, 1992; Derrick & Leonard, in press; Lewis et al., 2006). Many studies have demonstrated that perceptions of the partner's support for smoking cessation are associated with a greater likelihood of quitting (e.g., Coppotelli & Orleans, 1985). Yet, most of the research in this area has examined support during pregnancy (e.g., McBride et al., 1998; Pollak, Baucom, Peterson, Stanton, & McBride, 2006) or support during treatment (e.g., Lawhon, Humfleet, Hall, Reus, & Munoz, 2009; Mermelstein, Lichtenstein, & McIntyre, 1983). Given the limited nature of these samples, it is possible that the results do not generalize to all married smokers.

Additionally, these studies examine *support for quitting* in particular, rather than general partner support. Very few studies have examined the effect of general support on smoking cessation. Most of these studies do not examine partner support specifically (e.g., Holahan et al., 2011). One study failed to find an effect of partner support, beyond support from other network members (Wagner, Burg, & Sirois, 2004). In another study, general support from the partner predicted lower postpartum relapse rates among women when the partner was also a nonsmoker (Pollak & Mullen, 1997). One final study demonstrated that women who received general partner support were less likely to smoke (Väänänen, Kouvonen, Kivimäki, Pentti, & Vahtera, 2008). We know of no studies that have examined the effects of partner support longitudinally or that have found an effect of general partner support on men's smoking cessation.

In the current study, we examined the effect of newlyweds' initial perceptions of the partner's willingness and ability to provide support (i.e., perceived partner responsiveness) on smoking over the first 9 years of marriage. We focus on perceived partner responsiveness, rather than enacted support, because perceived support is a stronger predictor of health and well-being than received support (Lakey & Orehek, 2011; Stroebe & Stroebe, 1996). We examine partner responsiveness and smoking in both husbands and wives, using techniques appropriate for analyzing dyadic data. We expected greater partner responsiveness at the time of marriage to predict decreases in smoking over time.

METHODS

Participants

Participants were part of the Adult Development Study, a large community study that followed couples through six timepoints over the first 9 years of marriage. This report is based on 333 couples who were categorized as "ever smokers": they reported that one or both partners were smokers at one or more of the six assessments. At baseline, husbands in this ever-smoker sample averaged 29.47 (*SD* = 7.28) and wives averaged 27.37 (*SD* = 6.60) years of age. Over half of the ever-smoker sample was White (54.7% husbands, 59.2% wives); the rest was predominantly Black. About half had at least some college education (48.6% husbands, 53.8% wives) and most were employed at least part time (85.6% husbands, 70.0% wives). The median personal income of both husbands and wives was between 10,000 and 19,999 USD. Most couples were living together prior to marriage (78%, median = 12 months) and most (62%) had at least one child at the time of marriage. This sample of ever-smoker couples differed from the nonsmoking couples in the full sample (data not presented). A table describing these demographic differences is available from the first author on request.

Procedure

Additional details of the recruitment process and participation rates are available elsewhere (e.g., Derrick, Leonard, & Homish, in press; Mudar et al., 2001), but briefly, participants were recruited from the local city hall at the time they applied for their marriage license. Couples who agreed to participate in the longitudinal study were given questionnaires to complete and return through the mail. These questionnaires asked about participants' personality, relationship, and health behaviors at six timepoints: at the time of marriage and at the first, second, fourth, seventh, and ninth anniversaries. The measures in the current analyses were taken from all six waves of data.

Measures

Tobacco Use

Participants reported whether they were current smokers in each assessment (0 = *no*, 1 = *yes*). If participants responded yes, they were asked to indicate how many cigarettes they smoked per day by selecting one of the following options: *a few cigarettes or less*; *more than a few, but less than ½ a pack*; *about ½ a pack*; *½ to 1 pack*; *about 1 pack*; *1 to 1½ packs*; *1½ to 2 packs*; *2 packs or more per day*. We assigned each option a number value from 1 to 8. If participants reported that they did not smoke, we assigned them a score of 0. At baseline, husbands reported a median cigarette quantity of 2.00 (*about ½ a pack*) and wives reported a median of 1.00 (*more than a few, but less than ½ a pack*).

Perceived Partner Responsiveness

At each assessment, participants completed the Personal Assessment of Intimacy in Relationships (PAIR; Schaefer & Olson, 1981). We used the six-item subscale, Emotional Intimacy, to assess partner responsiveness (α = .80 [husbands] and .84 [wives]). We used this measure because we were focused on perceived, rather than enacted, support in the current study. The items in this subscale capture perceptions of the partner's emotional availability (e.g., "I often feel distant from my partner" [reversed]), understanding (e.g., "My partner can really understand my hurts and joys"), and responsiveness (e.g., "My partner listens to me when I need someone to talk to"). Participants answered on a scale from 0 (*strongly disagree*) to 4 (*strongly agree*). Responses were averaged to create a final score ranging from 0 to 4, with higher scores indicating greater partner responsiveness. As is typical for relationship functioning in newlywed couples (Karney & Bradbury, 1995),

the average for the sample at baseline was above the midpoint on the scale (M = 2.92, SD = 0.67). A score at the midpoint of 2.00 fell at the 20th percentile, 3.00 fell at the 60th percentile, and 4.00 fell at the 92nd percentile.

Demographics

At the initial screening, participants completed a measure of demographics (age, race/ethnicity, education, employment, income, length of time cohabiting, children). At each assessment wave, participants provided additional data regarding education, employment, income, and the birth of a child in the previous year.

Analysis

We conducted growth curve analyses using multilevel modeling in the program MLwiN 2.24 (Rasbash, Browne, Healy, Cameron, & Charlton, 2011). We chose to conduct analyses using multilevel modeling, rather than other procedures for handling repeated measures data (e.g., repeated measures analysis of variance) for several reasons (for a full discussion, see Hox, 2010; Snijders & Bosker, 1999). The most important reason in the current study concerns the ability to analyze unbalanced and missing data. Unlike analysis of variance, which requires listwise deletion when a case has missing data, multilevel modeling programs such as MLwiN use full information maximum likelihood (FIML) estimation by default. Analyses conducted using FIML are not biased by attrition as long as data are missing at random (i.e., the missingness is not due to status on the outcome variable). This assumption is likely tenable in the present analyses given that the focus of the larger study was on marital processes (rather than, e.g., smoking cessation).

We accounted for the interdependence of husbands' and wives' responses using the multivariate feature of MLwiN. We treated husband and wife responses to the outcome variables as multivariate outcomes, within-couple assessments across time as time-varying covariates at Level 1, and between-couple variables as time-invariant covariates at Level 2. We have used this approach in prior research (Derrick et al., in press; Homish & Leonard, 2005a), and it is statistically equivalent to the actor–partner interdependence approach for analyzing dyadic data (Kenny, Kashy, & Cook, 2006; Laurenceau & Bolger, 2005). This method allows for straightforward testing of gender differences using a one degree of freedom χ^2 test. When there were no significant gender differences, we pooled the coefficients across husbands and wives.

Our analyses proceeded in three steps. First, we entered each partner's baseline smoking variables, time-invariant demographic characteristics, and time-varying demographic characteristics as covariates in a model examining trajectories of smoking over time (coded 0, 1, 2, 4, 7, 9). Initial analyses revealed that the quadratic effect of time was not significant in either set of analyses. Additionally, allowing the linear effect of time to vary across couples did not significantly increase the fit of the model in either set of analyses; given additional problems with model convergence, we treated the linear effect of time as a fixed effect in both sets of analyses. Second, we tested whether baseline partner responsiveness influenced smoking trajectories. We still examined baseline partner responsiveness as a moderator of the smoking trajectories, despite treating time as a fixed effect, because the deviance test for random slopes is more conservative than the test of the predicted cross-level interaction (Snijders & Bosker, 1999). Finally, we explored potential time-varying characteristics as mediators.

RESULTS

Descriptive statistics for smoking status, cigarette quantity, and partner responsiveness, broken down by gender and by year, are presented in Table 1. To examine whether the likelihood of dropping out of the study depended on participants' status on baseline variables, we created a dummy-coded attrition variable (0 = *never dropped*, 1 = *dropped at some point*). Attrition was independent of baseline husband and wife smoking status, both $\chi^2 < 1$, husband and wife cigarette quantity, both $t < 1$, husband reports of partner responsiveness, $t < 1$, and wife reports of partner responsiveness, $t(331) = 1.29$, $p = .20$.

Table 1. Smoking Status, Cigarette Quantity, and Partner Responsiveness at Each Time Point

	Year 0	Year 1	Year 2	Year 4	Year 7	Year 9
Husband, *n*	333	271	238	201	169	136
Husband smokers, *n* (% of husband *n*)	233 (70.0%)	174 (64.2%)	154 (64.7%)	126 (62.7%)	98 (58.0%)	73 (53.7%)
Husband quantity, *M* (*SD*)	2.57 (2.26)	2.24 (2.22)	2.21 (2.20)	2.16 (2.18)	2.02 (2.19)	1.82 (2.10)
Husband partner responsiveness, *M* (*SD*)	2.93 (0.73)	2.67 (0.80)	2.72 (0.86)	2.61 (0.83)	2.51 (0.88)	2.69 (0.96)
Wife, *n*	333	294	255	220	188	156
Wife smokers, *n* (% of wife *n*)	200 (60.1%)	164 (55.8%)	135 (52.9%)	115 (52.3%)	94 (50.0%)	78 (50.0%)
Wife quantity, *M* (*SD*)	2.03 (2.12)	1.83 (2.12)	1.67 (1.98)	1.68 (2.04)	1.73 (2.12)	1.62 (2.02)
Wife partner responsiveness, *M* (*SD*)	2.90 (0.82)	2.50 (0.97)	2.42 (0.98)	2.38 (1.08)	2.20 (1.11)	2.51 (1.10)
Intact couples, *n*	333	269	231	192	173	120
Neither partner smokes, *n* (% of intact *n*)	43 (12.9%)	55 (20.4%)	43 (18.6%)	42 (21.9%)	41 (25.6%)	34 (28.3%)
Husband only smokes, *n* (% of intact *n*)	90 (27.0%)	71 (26.4%)	68 (29.4%)	53 (27.6%)	41 (25.6%)	27 (22.5%)
Wife only smokes, *n* (% of intact *n*)	57 (17.1%)	42 (15.6%)	40 (17.3%)	29 (15.1%)	27 (16.9%)	21 (17.5%)
Both partners smoke, *n* (% of intact *n*)	143 (42.9%)	101 (37.5%)	80 (34.6%)	68 (35.4%)	51 (31.9%)	38 (31.7%)

Note. The sample was limited to couples in which one or both partners smoked at one or more timepoints. Although neither partner smoked among 43 couples at baseline, one or both partners in those couples initiated or relapsed to smoking in later years of the study.

Longitudinal Analyses: Smoking Status

Trajectory of Smoking Status

Smoking status is dichotomous, so we conducted analyses using a binomial distribution and a logit link (Hox, 2010). We provide odds ratios (*OR*) and 95% confidence intervals (*CI*) as results. Controlling for baseline smoking and both time-invariant and time-varying demographic characteristics, the likelihood of being a smoker decreased by 12% each year, *OR* = 0.88, *95% CI* [0.84, 0.93], $p < .001$.

Influence of Partner Responsiveness

Next, we included the main effect of baseline partner responsiveness and the Time × Baseline Partner Responsiveness interaction. We also entered the partner's main effect and interaction, as recommended for the analysis of dyadic data (Kenny et al., 2006; Laurenceau & Bolger, 2005). The predicted Time × Baseline Partner Responsiveness interaction was significant (see results in Table 2, Model 1).

This interaction is depicted in Figure 1. We examined the simple effect of Time on smoking status for participants who reported low (2.00), medium (3.00), and high (4.00) partner responsiveness at baseline (controlling for all other variables in the model; Aiken & West, 1991). The effect of time was not significant for participants who reported low partner responsiveness, *OR* = 0.94, *95% CI* [0.87, 1.01], $p = .112$. The likelihood of being a smoker decreased by 12% each year for those who reported medium partner responsiveness, *OR* = 0.88, *95% CI* [0.84, 0.92], $p < .001$. The likelihood of being a smoker decreased by 18% each year for those who reported high partner responsiveness, *OR* = 0.82, *95% CI* [0.76, 0.89], $p < .001$. Examined another way, the likelihood of being a smoker at the time of marriage was not affected by baseline partner responsiveness, *OR* = 1.11, *95% CI* [0.83, 1.48], $p = .485$. However, the likelihood of being a smoker at Year 9 decreased by 38% for each one-unit increase in baseline partner responsiveness, *OR* = 0.62, *95% CI* [0.39, 0.98], $p = .041$.

Mechanisms

We explored three potential mechanisms for this longitudinal effect. One possible mechanism is the partner's changing

Table 2. Longitudinal Trajectories of Smoking Status

	Model 1		Model 2	
Predictor	*OR*	95% CI	*OR*	95% CI
Intercept	0.11***	[0.07, 0.17]	0.15***	[0.09, 0.27]
Time-invariant and time-varying covariates				
Baseline smoking status (smoker)	60.04***	[41.92, 85.99]	27.41***	[18.16, 41.37]
Baseline partner smoking status (smoker)	1.02	[0.72, 1.45]	0.66	[0.38, 1.16]
Baseline age in years	0.98	[0.96, 1.01]	0.98	[0.95, 1.01]
Baseline race/ethnicity (non-White)	0.98	[0.65, 1.48]	0.96	[0.61, 1.51]
Baseline premarital cohabitation in months	1.00	[1.00, 1.01]	1.00	[1.00, 1.01]
Baseline children (yes)	1.88**	[1.23, 2.89]	1.82**	[1.15, 2.86]
Education	1.05	[0.85, 1.30]	1.08	[0.84, 1.39]
Employed (yes)	1.48	[0.86, 2.55]	1.10	[0.56, 2.14]
Income	1.01	[0.85, 1.20]	0.99	[0.82, 1.20]
Hypothesized predictors				
Time	0.88***	[0.84, 0.93]	0.89***	[0.83, 0.95]
Baseline partner responsiveness	1.11	[0.83, 1.48]	1.10	[0.76, 1.60]
Baseline partner responsiveness (partner)	0.98	[0.73, 1.31]	1.02	[0.70, 1.47]
Time × Baseline Partner Responsiveness	0.94*	[0.88, 0.99]	0.95	[0.88, 1.02]
Time × Baseline Partner Responsiveness (partner)	1.02	[0.96, 1.08]	1.02	[0.95, 1.10]
Hypothesized mediators				
Lagged partner smoking status			1.98**	[1.19, 3.30]
Lagged partner responsiveness			0.87	[0.66, 1.16]
Lagged partner responsiveness (partner)			1.01	[0.77, 1.34]
Concurrent partner responsiveness			0.73*	[0.55, 0.95]
Concurrent partner responsiveness (partner)			1.09	[0.83, 1.43]
Lagged birth of child (yes)			1.07	[0.72, 1.59]
Concurrent birth of child (yes): husband			0.94	[0.58, 1.50]
Concurrent birth of child (yes): wife			0.46**	[0.28, 0.76]

Note. *OR* = odds ratio; CI = confidence interval.

Model 1 presents final results for the growth curve analysis. Model 2 presents the results of the mediation analyses. Results with each potential mediator entered separately were consistent with those presented; we present the results with all mediators entered simultaneously to conserve space. Time was coded 0, 1, 2, 4, 7, and 9. Time-varying predictors are italicized. Baseline smoking status, baseline partner smoking status, baseline race/ethnicity, baseline children, employed, lagged birth of child, and concurrent birth of a child were all dichotomous, dummy-coded predictors. All other variables were treated as continuous. All baseline demographic covariates were grand mean centered. All time-varying demographic covariates were person-mean centered. Coefficients that did not differ significantly between husbands and wives were pooled across gender. Coefficients that differed significantly are presented on separate lines.

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

smoking status (e.g., Dollar et al., 2009; Homish & Leonard, 2005b). People who initially report greater partner responsiveness may be more affected by their partner's smoking status in later years. Another possibility is that baseline perceptions of partner responsiveness predict later perceptions of partner responsiveness, and it is these time-varying perceptions that predict smoking status. Finally, previous research has documented that expectant mothers, on average, decrease smoking while pregnant (this effect is often not apparent for expectant fathers; see, e.g., Bachman, Wadsworth, O'Malley, Johnston, & Schulenberg, 1997; Everett, Bullock, Longo, Gage, & Madsen, 2007). Those who initially report greater partner responsiveness may be more likely to have children in subsequent years.

To test these potential mechanisms, we entered the time-lagged effect of the partner's smoking status (dummy-coded, 0 = *nonsmoker*, 1 = *smoker*), the time-lagged and concurrent effects of partner responsiveness (person-mean centered, or centered around the person's own mean over time), and the time-lagged and concurrent effects of the birth of a child (dummy-coded, 0 = *no*, 1 = *yes*) into the model as additional time-varying predictors (see Table 2, Model 2). The Time × Baseline Partner Responsiveness interaction became nonsignificant. The lagged effect of the partner's smoking status and the concurrent effect of partner responsiveness were both significant for husbands and wives. The concurrent effect of the birth of a child was significant for wives. No other potential mediators were significant. We also tested interactions of these variables, but none of the interactions were significant (data not presented). When the partner was a nonsmoker at the previous timepoint, when participants perceived more partner responsiveness than at other timepoints, or when wives reported a pregnancy in the past year, the likelihood of being a smoker decreased.

Longitudinal Analyses: Cigarette Quantity

Trajectory of Cigarette Quantity

Responses on the scale assessing cigarette quantity provide a noncontinuous or count outcome variable, so analyses were conducted using a Poisson distribution and a log link (Hox, 2010). We provide rate ratios (*RR*) as results. Controlling for baseline cigarette quantity and both time-invariant and time-varying demographic characteristics, cigarette quantity decreased each year by 4% for husbands, *RR* = 0.96, *95% CI* [0.95, 0.98], $p < .001$ but did not decrease significantly for wives, *RR* = 0.99, *95% CI* [0.98, 1.01], $p = .412$.

Influence of Partner Responsiveness

Next, we included the main effect of baseline partner responsiveness and the Time × Baseline Partner Responsiveness interaction. We also entered the partner's main effect and interaction, as before. The predicted Time × Baseline Partner Responsiveness interaction was significant (see Table 3, Model 1).

This interaction is depicted in Figure 2. We examined the simple effect of Time on cigarettes per day for participants who reported low (2.00), medium (3.00), and high (4.00) partner responsiveness at baseline. Among participants who reported low partner responsiveness, husbands' cigarette quantity decreased by 2% each year, *RR* = 0.98, *95% CI* [0.96, 0.99],

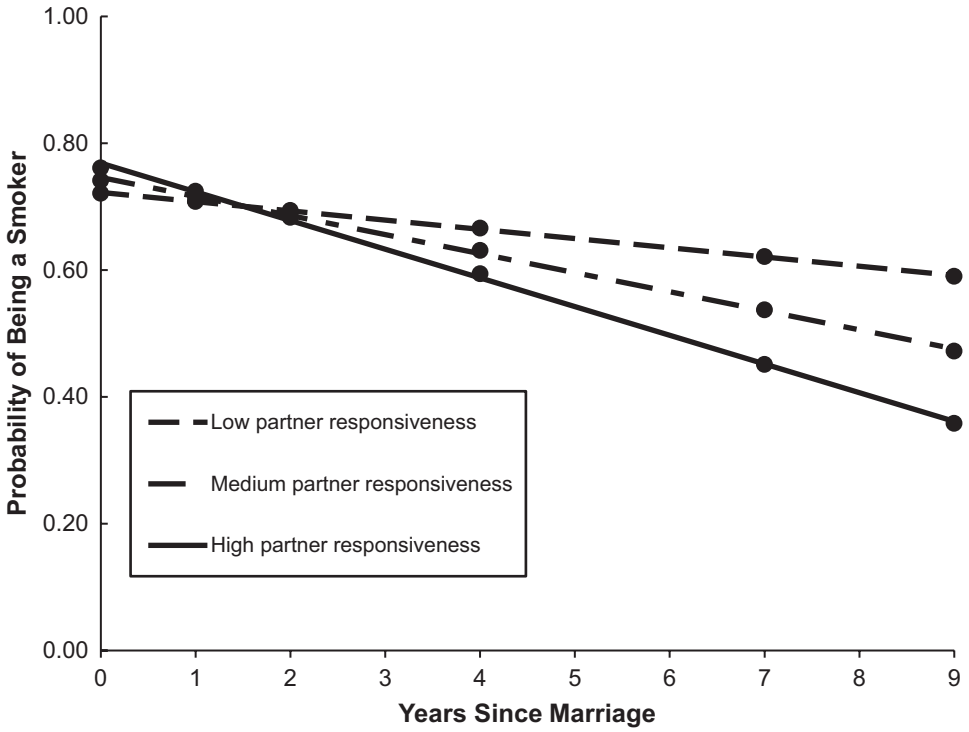

Figure 1. The probability of being a smoker over the first 9 years of marriage as a function of the linear effect of time and baseline partner responsiveness. Baseline partner responsiveness is graphed at low (2.00), medium (3.00), and high (4.00) values.

Table 3. Longitudinal Trajectories of Cigarette Quantity

	Model 1		Model 2	
Predictor	*RR*	95% CI	*RR*	95% CI
Intercept: husband	1.59***	[1.43, 1.77]	1.62***	[1.36, 1.92]
Intercept: wife	1.10	[0.96, 1.25]	1.13	[0.92, 1.37]
Time-invariant and time-varying covariates				
Baseline cigarette quantity: husband	1.54***	[1.49, 1.59]	1.51***	[1.44, 1.57]
Baseline cigarette quantity: wife	1.65***	[1.59, 1.72]	1.63***	[1.54, 1.72]
Baseline partner cigarette quantity	0.99	[0.97, 1.02]	1.00	[0.97, 1.04]
Baseline age in years	0.99**	[0.98, 0.99]	0.98**	[0.97, 0.99]
Baseline race/ethnicity (non-White)	1.19**	[1.05, 1.34]	1.17+	[0.98, 1.40]
Baseline premarital cohabitation in months	1.00	[1.00, 1.00]	1.01*	[1.00, 1.00]
Baseline children (yes)	1.11	[0.98, 1.25]	1.12	[0.94, 1.34]
Education: husband	1.06+	[1.00, 1.13]	1.10*	[1.01, 1.20]
Education: wife	0.94+	[0.88, 1.00]	0.96	[0.85, 1.07]
Employed (yes)	1.10+	[1.00, 1.23]	1.06	[0.92, 1.33]
Income	1.01	[0.97, 1.05]	1.01	[0.96, 1.07]
Hypothesized predictors				
Time: husband	0.96***	[0.95, 0.98]	0.96***	[0.94, 0.98]
Time: wife	0.99	[0.98, 1.01]	0.98	[0.96, 1.01]
Baseline partner responsiveness	1.01	[0.93, 1.10]	0.99	[0.87, 1.12]
Baseline partner responsiveness (partner)	1.01	[0.93, 1.09]	1.03	[0.91, 1.16]
Time × Baseline Partner Responsiveness	0.98*	[0.97, 0.99]	0.99	[0.97, 1.02]
Time × Baseline Partner Responsiveness (partner)	1.01	[1.00, 1.03]	1.01	[0.99, 1.04]
Hypothesized mediators				
Lagged partner cigarette quantity			1.02	[0.98, 1.07]
Lagged partner responsiveness			0.98	[0.90, 1.06]
Lagged partner responsiveness (partner)			1.02	[0.95, 1.10]
Concurrent partner responsiveness			0.94+	[0.87, 1.01]
Concurrent partner responsiveness (partner)			0.99	[0.92, 1.07]
Lagged birth of child (yes)			1.01	[0.91, 1.13]
Concurrent birth of child (yes): husband			0.95	[0.83, 1.08]
Concurrent birth of child (yes): wife			0.71***	[0.59, 0.86]

Note. *RR* = risk ratio; CI = confidence interval.
Model 1 presents final results for the growth curve analysis. Model 2 presents the results of the mediation analyses. Results with each potential mediator entered separately were consistent with those presented; we present the results with all mediators entered simultaneously to conserve space. Time was coded 0, 1, 2, 4, 7, and 9. Time-varying predictors are italicized. Baseline race/ethnicity, baseline children, employed, lagged birth of child, and concurrent birth of child were all dichotomous, dummy-coded predictors. All other variables were treated as continuous. All baseline demographic covariates were grand mean centered. All time-varying demographic covariates were person-mean centered. Coefficients that did not differ significantly between husbands and wives were pooled across gender. Coefficients that differed significantly are presented on separate lines.
$^{+}p < .10$, $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

$p = .044$, but the effect was not significant for wives, $RR = 1.01$, *95% CI* [0.99, 1.03], $p = .313$. Among participants who reported medium partner responsiveness, husbands' cigarette quantity decreased by 4% each year, $RR = 0.96$, *95% CI* [0.94, 0.97], $p < .001$, but the effect was not significant for wives, $RR = 0.99$, *95% CI* [0.98, 1.01], $p = .412$. Among participants who reported high partner responsiveness, husbands' cigarette quantity decreased by 6% each year, $RR = 0.94$, *95% CI* [0.92, 0.96], $p < .001$, and wives' cigarette quantity decreased by 3% each year, $RR = 0.97$, *95% CI* [0.95, 0.99], $p = .036$. Examined another way, cigarette quantity at the time of marriage was not affected by baseline partner responsiveness, $RR = 1.01$, *95% CI* [0.93, 1.10], $p = .795$, for husbands and wives. However, cigarette quantity at Year 9 (on the 0–8 scale) decreased by 15% for each one-unit increase in baseline partner responsiveness, $RR = 0.85$, *95% CI* [0.75, 0.97], $p = .016$, for husbands and wives.

Mechanisms

We explored the same three potential mechanisms for this decrease in cigarette quantity: the time-lagged effect of the partner's cigarette quantity, the time-lagged and concurrent effects of partner responsiveness, and the time-lagged and concurrent effects of birth of a child (see Table 3, Model 2). The Time × Baseline Partner Responsiveness interaction became nonsignificant. Surprisingly, the lagged effect of the partner's cigarette quantity was not significant. The concurrent effect of partner responsiveness was marginally significant for both husbands and wives. The concurrent effect of the birth of a child was significant for wives. No other potential mediators were significant. We also tested interactions of these variables, but none were significant (data not presented). When participants perceived more partner responsiveness than at other timepoints or when wives reported experiencing a pregnancy in the past year, cigarette quantity decreased.

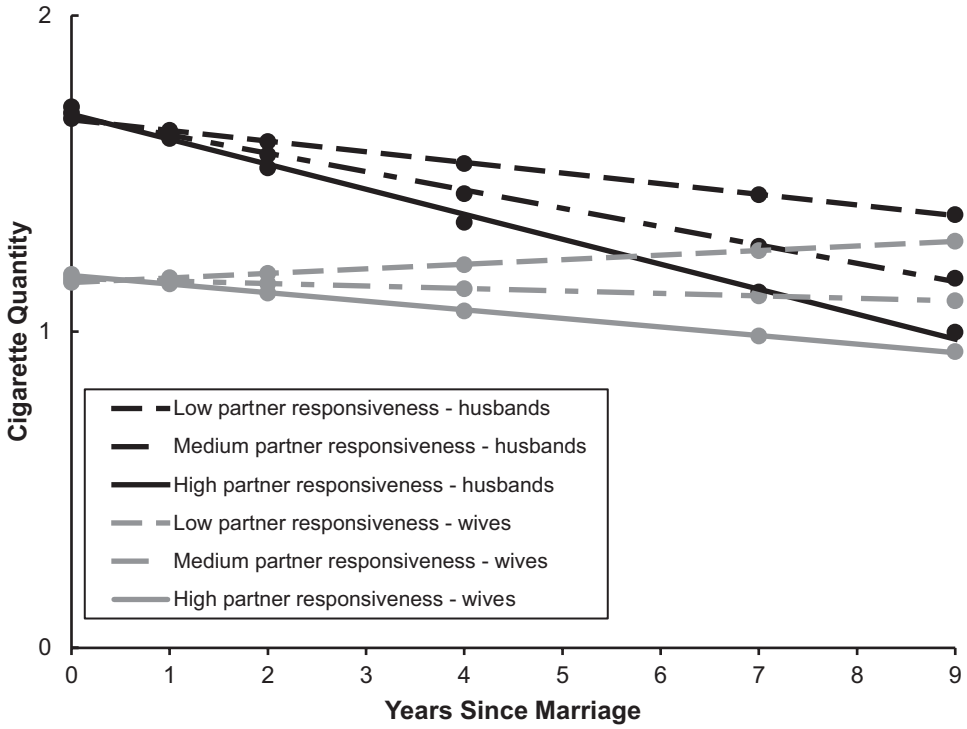

Figure 2. Cigarette quantity over the first 9 years of marriage as a function of the linear effect of time and baseline partner responsiveness. Baseline partner responsiveness is graphed at low (2.00), medium (3.00), and high (4.00) values. Husbands are graphed in black and wives are graphed in gray. Quantity was assessed on a scale that ranged from 0 (none) to 8 (2 packs or more per day). The graph depicts values at 0 (none), 1 (a few cigarettes or less per day), and 2 (more than a few, but less than ½ a pack per day).

DISCUSSION

Previous research demonstrates that marriage has a protective effect on substance use in general and on smoking in particular (see Derrick & Leonard, in press, for a review). Among those who do smoke, the partner's smoking status influences both quitting and relapsing (Dollar et al., 2009; Homish & Leonard, 2005b). The current research extends this work to demonstrate that perceptions of general partner support impact smoking. We found that perceptions of the partner's willingness and ability to provide general support (i.e., partner responsiveness), reported at the time of marriage, predicted decreases over the following 9 years in the likelihood of being a smoker and in cigarette quantity. It is important to note that these effects were obtained for perceived partner responsiveness in general and not for support for smoking cessation in particular. It may be the case that general perceptions of the partner's availability and willingness to provide support are more important for decreasing smoking than specific behaviors intended to produce change. This possibility is in line with previous theory suggesting that perceived support is more important for health and well-being than received support (e.g., Lakey & Orehek, 2011; Stroebe & Stroebe, 1996; Wethington & Kessler, 1986).

We examined several potential time-varying mechanisms for the impact of baseline partner responsiveness on smoking: time-lagged partner smoking (i.e., partner influence), time-lagged and concurrent partner responsiveness, and time-lagged and concurrent reports of experiencing a pregnancy in the previous year (i.e., quitting during pregnancy and postpartum relapse). The partner's smoking status mediated the effect of baseline partner responsiveness on own smoking status, consistent with prior research on partner influence (Dollar et al., 2009; Homish & Leonard, 2005b). The partner's cigarette quantity did not predict own cigarette quantity, however. Quantity smoked may be influenced by many factors outside the marriage, including affect regulation (Shiffman & Waters, 2004), smoking by other members of the social network (Eiden et al., 2011), and smoke-free policies (Hopkins et al., 2010).

We replicated prior research in demonstrating that women, but not men, quit or decrease smoking during pregnancy (Bachman et al., 1997). However, we failed to observe the postpartum relapse effect (e.g., Lelong, Kaminski, Saurel-Cubizolles, & Bouvier-Colle, 2001; Mullen et al., 1997). This null effect may be due, in part, to the varying length of time between assessments. Postpartum relapse might only be expected in the year immediately following childbirth. Thus, we may have failed to observe this effect because the lagged assessments in the current analyses treat the length of time between assessments (i.e., 1, 2, and 3 years) as equivalent. This is most likely an untenable assumption for relapse specific to the birth of a child.

In examining time-varying partner responsiveness as a mechanism, we were essentially making within-person comparisons (because the variables were person-mean centered). We used changes in one's own reports of partner responsiveness over time as a predictor (rather than differences among couples, as in the growth curve analyses). We found that concurrent partner responsiveness mediated the effect of baseline

partner responsiveness on both smoking status and (marginally) cigarette quantity. In years when people reported more partner responsiveness than usual, they were less likely to smoke and smoked less (and vice versa).

As with the birth of a child, however, we failed to find evidence for a lagged effect of time-varying partner responsiveness. In previous research, we found that perceptions of the partner's responsiveness tend to fluctuate around a person's mean over time (Derrick et al., in press). Given this fluctuation and the length of time between assessments, increases in partner responsiveness at a given timepoint likely cannot predict smoking at a later timepoint (i.e., when partner responsiveness would again be lower). Future research should examine the effects of partner responsiveness on smoking at shorter assessment intervals.

Despite limitations regarding the spacing of assessments, this study has several strengths. First, we used a community sample rather than a sample of people in smoking cessation treatment or a sample selected for pregnancy. Second, we obtained reports from both partners in each couple, rather than reports from only the smoker. Third, we used a longitudinal research design. Together, these strengths allowed us to examine the effects of general partner support, rather than support specific to smoking cessation, on smoking outcomes prospectively in both men and women, controlling for partner variables. Our analyses provide evidence that initial levels of partner responsiveness contribute to decreases in smoking and smoking cessation in both men and women over time. Future research could examine whether initial reports of partner responsiveness could be used as a screening tool for determining which people are most likely to need interventions to decrease or quit smoking. It may be the case that people who report low partner responsiveness are less likely to quit on their own and thus could benefit more from an external intervention.

FUNDING

National Institute on Alcohol Abuse and Alcoholism (R37 AA09922 to K.E.L.); National Institute on Drug Abuse (R21 DA034068 to J.L.D.).

DECLARATION OF INTERESTS

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Preliminary results of this research were presented at the Health, Emotions, and Relationships miniconference of the International Association for Relationship Research, October 22, 2011, in Tucson, AZ.

REFERENCES

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. New York: Sage.

Bachman, J. G., Wadsworth, K. N., O'Malley, P. M., Johnston, L. D., & Schulenberg, J. E. (1997). *Smoking, drinking, and drug use in young adulthood: The impacts of new freedoms and new responsibilities*. Mahwah, NJ: Lawrence Erlbaum Associates.

Bjornson, W., Rand, C., Connett, J. E., Lindgren, P., Nides, M., Pope, F. . . . O'Hara, P. (1995). Gender differences in smoking cessation after 3 years in the lung health study. *American Journal of Public Health*, *85*, 223–230. doi:10.2105/ajph.85.2.223

Burman, B., & Margolin, G. (1992). Analysis of the association between marital relationships and health-problems: An interactional perspective. *Psychological Bulletin*, *112*, 39–63. doi:10.1037/0033-2909.112.1.39

Coppotelli, H. C., & Orleans, C. T. (1985). Partner support and other determinants of smoking cessation maintenance among women. *Journal of Consulting and Clinical Psychology*, *53*, 455–460. doi:10.1037/0022-006x.53.4.455

Derrick, J. L., & Leonard, K. E. (in press). Substance use in committed couples. In K. J. Sher (Ed.), *Oxford handbook of substance use disorders*. New York, NY: Oxford University Press.

Derrick, J. L., Leonard, K. E., & Homish, G. G. (2012). Dependence regulation in newlywed couples: A prospective examination. *Personal Relationships, 19,* 644–662. doi:10.1111/j.1475-6811.2011.01384.x

Dollar, K. M., Homish, G. G., Kozlowski, L. T., & Leonard, K. E. (2009). Spousal and alcohol-related predictors of smoking cessation: A longitudinal study in a community sample of married couples. *American Journal of Public Health*, *99*, 231–233. doi:10.2105/ajph.2008.140459

Eiden, R. D., Molnar, D. S., Leonard, K. E., Colder, C. R., Homish, G. G., Maiorana, N. et al. (2011). Sources and frequency of secondhand smoke exposure during pregnancy. *Nicotine & Tobacco Research*, *13*, 653–660. doi:10.1093/ntr/ntr053

Etcheverry, P. E., & Agnew, C. R. (2008). Romantic partner and friend influences on young adult cigarette smoking: Comparing close others' smoking and injunctive norms over time. *Psychology of Addictive Behaviors*, *22*, 313–325. doi:10.1037/0893-164x.22.3.313

Everett, K. D., Bullock, L., Longo, D. R., Gage, J., & Madsen, R. (2007). Men's tobacco and alcohol use during and after pregnancy. *American Journal of Mens Health*, *1*, 317–325. doi:10.1177/1557988307299477

Falba, T. A., & Sindelar, J. L. (2008). Spousal concordance in health behavior change. *Health Services Research*, *43*, 96–116. doi:10.1111/j.1475-6773.2007.00754.x

Flay, B. R., Hu, F. B., Siddiqui, O., Day, L. E., Hedeker, D., Petraitis, J. et al. (1994). Differential influence of parental smoking and friends' smoking on adolescent initiation and escalation of smoking. *Journal of Health and Social Behavior*, *35*, 248–265. doi:10.2307/2137279

Holahan, C. J., North, R. J., Holahan, C. K., Hayes, R. B., Powers, D. A., & Ockene, J. K. (2011). Social influences on smoking in middle-aged and older women. *Psychology of Addictive Behaviors*. doi:10.1037/a0025843

Homish, G. G., & Leonard, K. E. (2005a). Marital quality and congruent drinking. *Journal of Studies on Alcohol*, *66*, 488–496. Retrieved from http://pubmedcentralcanada.ca/picrender.cgi?artid=1507019&blobtype=pdf

Homish, G. G., & Leonard, K. E. (2005b). Spousal influence on smoking behaviors in a US community sample of newly married couples. *Social Science & Medicine*, *61*, 2557–2567. doi:10.1016/j.socscimed.2005.05.005

Homish, G. G., & Leonard, K. E. (2008). Spousal influence on general health behaviors in a community sample. *American Journal of Health Behavior*, *32*, 754–763. doi:10.5993/AJHB.32.6.19

Homish, G. G., Leonard, K. E., & Cornelius, J. R. (2007). Predictors of marijuana use among married couples: The influence of one's spouse. *Drug and Alcohol Dependence*, *91*, 121–128. doi:10.1016/j.drugalcdep.2007.05.014

Hopkins, D. P., Razi, S., Leeks, K. D., Kalra, G. P., Chattopadhyay, S. K., Soler, R. E. et al. (2010). Smokefree policies to reduce tobacco use: A systematic review. *American Journal of Preventive Medicine*, *38*, S275–S289. <Go to ISI>://WOS:000274419700007. doi:10.1016/j.amepre.2009.10.029

Hox, J. J. (2010). *Multilevel analysis: Techniques and applications* (2nd ed.). New York: Routledge.

Karney, B. R., & Bradbury, T. N. (1995). The longitudinal course of marital quality and stability: A review of theory, methods, and research. *Psychological Bulletin*, *118*, 3–34. doi:10.1037/0033-2909.118.1.3

Kelley, H. H. (1979). *Personal relationships: Their structures and processes*. Hillsdale, NJ: Erlbaum.

Kenny, D. A., Kashy, D. A., & Cook, W. L. (2006). *Dyadic data analysis*. NY: Guilford Press.

Labouvie, E. (1996). Maturing out of substance use: Selection and self-correction. *Journal of Drug Issues*, *26*, 457–476. http://www2.criminology.fsu.edu/~jdi/26n2.htm

Lakey, B., & Orehek, E. (2011). Relational regulation theory: A new approach to explain the link between perceived social support and mental health. *Psychological Review*, *118*, 482–495. doi:10.1037/a0023477

Laurenceau, J.-P., & Bolger, N. (2005). Using diary methods to study marital and family processes. *Journal of Family Psychology*, *19*, 86–97. doi:10.1037/0893-3200.19.1.86

Lawhon, D., Humfleet, G. L., Hall, S. A., Reus, V. I., & Munoz, R. F. (2009). Longitudinal analysis of abstinence-specific social support and smoking cessation. *Health Psychology*, *28*, 465–472. doi:10.1037/a0015206

Lelong, N., Kaminski, M., Saurel-Cubizolles, M. J., & Bouvier-Colle, M. H. (2001). Postpartum return to smoking among usual smokers who quit during pregnancy. *European Journal of Public Health*, *11*, 334–339. doi:10.1093/eurpub/11.3.334

Leonard, K. E., & Homish, G. G. (2008). Predictors of heavy drinking and drinking problems over the first 4 years of marriage. *Psychology of Addictive Behaviors*, *22*, 25–35. doi:10.1037/0893-164x.22.1.25

Lewis, M. A., McBride, C. M., Pollak, K. I., Puleo, E., Butterfield, R. M., & Emmons, K. M. (2006). Understanding health behavior change among couples: An interdependence and communal coping approach. *Social Science & Medicine*, *62*, 1369–1380. doi:10.1016/j.socscimed.2005.08.006

McBride, C. M., Curry, S. J., Grothaus, L. C., Nelson, J. C., Lando, H., & Pirie, P. L. (1998). Partner smoking status and pregnant smoker's perceptions of support for and likelihood of smoking cessation. *Health Psychology*, *17*, 63–69. doi:10.1037//0278-6133.17.1.63

Merline, A. C., Schulenberg, J. E., O'Malley, P. M., Bachman, J. G., & Johnston, L. D. (2008). Substance use in marital dyads: Premarital assortment and change over time. *Journal of Studies on Alcohol and Drugs*, *69*, 352–361. Retrieved from http://www.jsad.com/jsad/article/Substance_Use_in_Marital_Dyads_Premarital_Assortment_and_Change_Over_Time/2236.html

Mermelstein, R., Lichtenstein, E., & McIntyre, K. (1983). Partner support and relapse in smoking-cessation programs. *Journal of Consulting and Clinical Psychology*, *51*, 465–466. doi:10.1037/0022-006x.51.3.465

Meyler, D., Stimpson, J. P., & Peek, M. K. (2007). Health concordance within couples: A systematic review. *Social Science & Medicine*, *64*, 2297–2310. doi:10.1016/j.socscimed.2007.02.007

Mudar, P., Leonard, K. E., & Soltysinski, K. (2001). Discrepant substance use and marital functioning in newlywed couples. *Journal of Consulting and Clinical Psychology*, *69*, 130–134. doi:10.1037//0022-006x.69.1.130

Mullen, P. D., Richardson, M. A., Quinn, V. P., & Ershoff, D. H. (1997). Postpartum return to smoking: Who is at risk and when. *American Journal of Health Promotion*, *11*, 323–330. doi:10.4278/0890-1171-11.5.323

Pollak, K. I., Baucom, D. H., Peterson, B. L., Stanton, S., & McBride, C. A. (2006). Rated helpfulness and partner-reported smoking cessation support across the pregnancy-postpartum continuum. *Health Psychology*, *25*, 762–770. doi:10.1037/0278-6133.25.6.762

Pollak, K. I., & Mullen, P. D. (1997). 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. *Psychology of Addictive Behaviors*, *11*, 182–189. doi:10.1037//0893-164x.11.3.182

Price, R. A., & Vandenberg, S. G. (1980). Spouse similarity in American and Swedish couples. *Behavior Genetics*, *10*, 59–71. doi:10.1007/BF01067319

Rasbash, J., Browne, W. J., Healy, M., Cameron, B., & Charlton, C. (2011). *MLwiN: Version 2.24*. London: Centre for Multilevel Modeling, University of Bristol.

Schaefer, M. T., & Olson, D. H. (1981). Assessing intimacy: The PAIR Inventory. *Journal of Marital and Family Therapy*, *7*, 47–60. doi:10.1111/j.1752-0606.1981.tb01351.x

Severson, H. H., Andrews, J. A., Lichtenstein, E., Wall, M., & Zoref, L. (1995). Predictors of smoking during and after pregnancy: A survey of mothers of newborns. *Preventive Medicine*, *24*, 23–28. doi:10.1006/pmed.1995.1004

Shiffman, S., & Waters, A. J. (2004). Negative affect and smoking lapses: A prospective analysis. *Journal of Consulting and Clinical Psychology*, *72*, 192–201. doi:10.1037/0022-006x.72.2.192

Snijders, T. A. B., & Bosker, R. J. (1999). *Multilevel analysis: An introduction to basic and advanced multilevel modeling*. London: Sage.

Stroebe, W., & Stroebe, M. (1996). The social psychology of social support. In A. Kruglanski & E. T. Higgins (Eds.), *Social psychology: Handbook of basic principles* (pp. 597–621). New York: Guilford Press.

Sutton, G. C. (1980). Assortative marriage for smoking habits. *Annals of Human Biology*, *7*, 449–456. doi:10.1080/03014468000004561

Väänänen, A., Kouvonen, A., Kivimäki, M., Pentti, J., & Vahtera, J. (2008). Social support, network heterogeneity, and smoking behavior in women: The 10-town study. *American Journal of Health Promotion*, *22*, 246–255. doi:10.4278/0701094r1.1

Wagner, J., Burg, M., & Sirois, B. (2004). Social support and the transtheoretical model: Relationship of social support to smoking cessation stage, decisional balance, process use, and temptation. *Addictive Behaviors*, *29*, 1039–1043. doi:10.1016/j.addbeh.2004.02.058

Wethington, E., & Kessler, R. C. (1986). Perceived support, received support, and adjustment to stressful life events. *Journal of Health and Social Behavior*, *27*, 78–89. doi:10.2307/2136504