



## Emotion regulation difficulties and social control correlates of smoking among pregnant women trying to quit



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### HIGHLIGHTS

- Cessation correlates are examined in low-income pregnant smokers trying to quit
- Emotion regulation difficulties predict greater smoking urges, withdrawal symptoms
- Negative social control predicts fewer smoking days, greater abstinence self-efficacy
- Positive social control buffered effects of negative affect smoking on dependence

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### ABSTRACT

Approximately 15% of US women currently smoke during pregnancy. An important step toward providing effective smoking cessation interventions during pregnancy is to identify individuals who are more likely to encounter difficulty quitting. Pregnant smokers frequently report smoking in response to intrapersonal factors (e.g., negative emotions), but successful cessation attempts can also be influenced by interpersonal factors (i.e., influence from close others). This study examined the association between emotion regulation difficulties, positive and negative social control (e.g., encouragement, criticism), and smoking cessation-related variables (i.e., smoking quantity, withdrawal symptoms) among pregnant smokers. Data were drawn from the pretreatment wave of a smoking cessation trial enrolling low-income pregnant women who self-reported smoking in response to negative affect ( $N = 73$ ). Greater emotion regulation difficulties were related to greater smoking urges ( $b = 0.295, p = .042$ ) and withdrawal symptoms ( $b = 0.085, p = .003$ ). Additionally, more negative social control from close others was related to fewer smoking days ( $b = -0.614, p = .042$ ) and higher smoking abstinence self-efficacy ( $b = 0.017, p = .002$ ). More positive social control from close others interacted with negative affect smoking ( $b = -0.052, p = .043$ ); the association between negative affect smoking and nicotine dependence ( $b = 0.812, p < .001$ ) only occurred at low levels of positive social control. Findings suggest that emotion regulation difficulties may contribute to smoking during pregnancy by exacerbating women's negative experiences related to smoking cessation attempts. Negative social control was related to lower smoking frequency and greater confidence in quitting smoking, suggesting that it may assist pregnant smokers' cessation efforts. Positive social control buffered women from the effects of negative affect smoking on nicotine dependence.

*Trial registration:* [ClinicalTrials.gov, NCT01163864](https://clinicaltrials.gov/ct2/show/study/NCT01163864)

### 1. Introduction

Smoking during pregnancy is associated with a host of prenatal

health problems for women (e.g., miscarriage, placenta previa, preeclampsia) (Cnattingius, 2004; Hand, Ellis, Carr, Abatemarco, & Ledgerwood, 2017), and is a leading cause of poor perinatal outcomes

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for infants (e.g., low birth weight, neurological problems, behavioral problems, SIDS) (Beijers, Burger, Verbeek, Bockting, & Ormel, 2014; Cnattingius, 2004; Goodwin, Cheslack-Postava, Nelson, et al., 2017; Hammoud et al., 2005; Micalizzi & Knopik, 2017; Riaz, Lewis, Coleman, et al., 2016; Tong, England, Rockhill, & D'Angelo, 2017). Despite these well-known negative consequences, approximately 15% of women in the US currently use tobacco during pregnancy (Beijers et al., 2014; Hand et al., 2017; SAMHSA, 2014). In particular, women with less than a high school diploma are sixteen times more likely to smoke during pregnancy, and those who live below the poverty line are three times more likely to smoke during pregnancy (Kurti, Redner, Lopez, et al., 2017). Although rates of smoking during pregnancy have significantly declined since the 1980s (Riaz et al., 2016), there has been little decrease during the past decade (Goodwin et al., 2017). Therefore, there is a critical need to identify variables that promote or impede successful smoking cessation among pregnant women.

One such variable, negative affect,<sup>2</sup> has been identified as a key factor influencing smoking among women, and escape and avoidance of negative affect is theorized as a primary motive for smoking (Bradizza, Stasiewicz, Zhuo, et al., 2017; Brandon, 1994) and other substance use disorders (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004; Stasiewicz, Bradizza, & Slosman, 2018; Stasiewicz & Maisto, 1993). In explaining the relationship between negative affect and smoking, there has been increasing interest in conceptualizing cigarette smoking as an emotion regulation strategy and in examining alternative emotion regulation strategies for targeting smoking-related problems (Fucito, Juliano, & Toll, 2010; Szasz, Szentagotai, & Hofmann, 2012). The construct of emotion regulation generally refers to the cognitive and behavioral strategies that people use to keep emotions within tolerable levels. Thompson defines emotion regulation as the “extrinsic or intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions especially their intensive and temporal features, to accomplish one's goals” (pp. 27–28) (Thompson, 1994). Similarly, *emotion regulation difficulties* refer to the self-report of problems with appropriately or effectively regulating emotional responses (Gratz & Roemer, 2004).

Theories of emotion regulation identify both intrapersonal (e.g., cognitive reappraisal, expressive suppression) and interpersonal (e.g., social support, negative social control) emotion regulation strategies (Campos, Walle, Dahl, & Main, 2011; Gross, 1998; Hofmann, 2014; Rimé, 2009). The preponderance of emotion regulation research emphasizes intrapersonal processes with many fewer investigations of interpersonal emotion regulation processes (Zaki & Williams, 2013). However, recent research on affective processes has seen a shift from a solely intrapersonal perspective to a greater focus on interpersonal or social processes (Niven, Totterdell, & Holman, 2009). Below we discuss the role of both intrapersonal and interpersonal risk factors for smoking during pregnancy.

### 1.1. Intrapersonal factors related to smoking

There are a number of known intrapersonal risk factors for continued smoking during pregnancy including mental health conditions (e.g., depression, anxiety, externalizing problems) (Eiden, Leonard, Colder, et al., 2011; Miguez, Pereira, & Figueiredo, 2017; Smedberg, Lupattelli, Mardby, Overland, & Nordeng, 2015), personality variables

<sup>2</sup> Gross uses the term *affect* as a higher order category for positive and negative internal states, including specific emotions (e.g. anger, sadness), emotion episodes (e.g., disagreement with a friend), and moods (e.g. euphoria, depression) (Gross, 1998). As a member of the affect family, *emotions* (a) unfold over a relatively short period of time, (b) have a shorter duration (versus moods), and (c) give rise to behavioral response tendencies (e.g. shouting during a disagreement). Though affect and emotion have distinct meanings, these terms have often been used interchangeably in the literature. In this paper, for consistency we have opted most often to use the broader term *affect*.

(e.g., low agreeableness, low conscientiousness) (Maxson, Edwards, Ingram, & Miranda, 2012), and perceived stress (Maxson et al., 2012; Powers, McDermott, Dloxton, & Chojena, 2013). Studies indicate that the relationship between affective (e.g. negative emotions, craving) and smoking-related variables appears to be particularly strong for women. In laboratory studies, women experience greater craving (Perkins, Karelitz, Giedgowd, & Conklin, 2013; Saladin et al., 2012) and demonstrate greater tobacco and nicotine intake (Perkins, Giedgowd, Karelitz, Conklin, & Lerman, 2012; Weinberger & McKee, 2011) than men in response to both in vivo smoking cues and negative affect or stress inductions. In addition, women report greater relief from negative affect following smoking as compared to men (Eissenberg, Adams, Riggins, & Likness, 1999; Xu, Azizian, Monterosso, et al., 2008). Among pregnant smokers, emotions such as hostility and anger have been associated with persistent smoking during pregnancy, over and above depression and stress (Eiden et al., 2011). In a recent study examining predictors of abstinence following a smoking cessation intervention, only dependence levels predicted successful abstinence in pregnant smokers, whereas cognitive-motivational variables such as smoking-cessation self-efficacy did not (Emery, Sutton, & Naughton, 2017). Thus, given (a) the significance of negative emotion in theories of addiction (Baker et al., 2004; Stasiewicz & Maisto, 1993), (b) the stable associations between negative affect and nicotine dependence, withdrawal, and smoking lapses, particularly among women (Eissenberg et al., 1999; Perkins et al., 2012; Perkins et al., 2013; Rogers, Bakhshaie, Viana, et al., 2017; Saladin et al., 2012; Weinberger & McKee, 2011; Xu et al., 2008), and (c) the strong associations between negative affect and nicotine use among pregnant women (Howard et al., 2013), it is important to examine intrapersonal factors such as emotion regulation difficulties among pregnant smokers attempting to quit (Emery et al., 2017).

### 1.2. Interpersonal factors related to smoking

Interpersonal factors can also play an important role in motivating smoking behavior and in successful cessation (Butler, Hollenstein, Shoham, & Rohrbaugh, 2014; Robles, Slatcher, Trombello, & McGinn, 2014; Stadler, Snyder, Horn, Shrout, & Bolger, 2012). For example, a close other is often among the first to perceive and attempt to influence an individual's negative health-related behavior; this process of trying to influence health-related behavior of another person is referred to as *social control* (Lewis & Rook, 1999; Umberson, 1987). In general, social control tactics can be categorized into positive (e.g., encouragement, persuasion, positive reinforcement) and negative (e.g., disapproval, pressuring, and criticism) behaviors (Lewis & Butterfield, 2005). For example, partners, relatives, or close friends may try to influence a pregnant woman's smoking behavior by encouraging her to quit smoking (positive social control) or by criticizing her for putting the health of the fetus at risk (negative social control).

Multiple models of social control (e.g., dual-effects model, domain specific model, mediational model, contextual model) have been proposed to explain the relations between providers' social control behavior and the recipient's health-related behavior (Craddock, vanDellen, Novak, & Ranby, 2015; Okun, Huff, August, & Rook, 2007). A common theme across models is the idea that social control attempts may elicit both positive and negative emotional (e.g., positive affect, negative affect) and behavioral responses (e.g., change behavior in desired direction, ignore attempts/change behavior in opposite direction) on the part of the recipient. A growing body of research has found support for these models across a wide range of health behaviors (Okun et al., 2007). Importantly, there is a degree of overlap between social control and interpersonal emotion regulation. Interpersonal emotion regulation involves the role of interpersonal interactions (i.e., social control) on the modulation of emotional experiences. This includes sharing an emotional state with others (Rimé, 2009), attenuating negative affect while others are present (Coan, 2011), and attempting to change other's

emotions (Niven et al., 2009). A recent meta-analysis found positive social control to be more strongly associated with positive health behavior change ( $d = 0.31$ ,  $SE = 0.02$ ; i.e., reducing negative health behaviors or increasing positive health behaviors) than negative social control ( $d = -0.08$ ,  $SE = 0.03$ ) (Craddock et al., 2015). Indeed, empirical support for the relationship between negative social control and health behavior change has been mixed (Craddock et al., 2015; Lewis & Butterfield, 2007; Lewis & Rook, 1999), possibly due to associations between negative social control and both positive and negative emotional responses in recipients (Tucker, Orlando, Elliott, & Klein, 2006a).

With respect to smoking, given the strong societal norms that surround the protection of fetal well-being, and increasingly punitive approaches toward women who use tobacco and other substances during pregnancy (Armstrong, 2005), pregnant women may be increasingly likely to become targets of social control efforts from close others regarding their smoking. At present, little is known regarding the effectiveness of close others' positive and negative social control behavior directed at pregnant women's smoking. A greater understanding of social control related to pregnant smokers' cessation efforts can help to inform interventions for this vulnerable population, who often experience great difficulty quitting (Beijers et al., 2014; SAMHSA, 2014).

### 1.3. Present study

The present study aims to advance the literature on smoking cessation during pregnancy by examining intrapersonal (i.e., emotion regulation difficulties) and interpersonal factors (i.e., positive and negative social control from partners, parents, or friends) that may hinder or promote smoking cessation during this critical period. Given the higher rates of smoking among pregnant women of lower socioeconomic status (SES) and the call for more research on this vulnerable population (Mullen, 2004), the present study recruited primarily low SES pregnant smokers. Additionally, much of the literature on social control has exclusively focused on the influence of spouses/partners; however, other social network members (e.g., parents, friends) also exert significant influence on health behavior (Lewis & Rook, 1999; Tucker, Elliott, & Klein, 2006b; Tucker, Klein, & Elliott, 2004). It is important to expand the field of possible close others who may try to influence pregnant women's smoking, particularly among low SES populations, given the significantly higher rates of single-parent families primarily headed by mothers (Entmacher, Robbins, Vogtman, & Frohlich, 2013; Olson & Banyard, 1993). An exclusive focus on spouses/partners in this population is likely to miss a great deal of the social control these women experience. Therefore, the present research examines the extent to which important intrapersonal and interpersonal factors are associated with smoking cessation-related variables (i.e., smoking quantity, frequency, dependence, urges, withdrawal, abstinence self-efficacy) among low-income pregnant women trying to quit.

## 2. Method

### 2.1. Participants and procedure

Data for this study were drawn from the pretreatment wave of a smoking cessation treatment development study for pregnant women (Bradizza et al., 2017). Participants were recruited from a publicly-funded women's prenatal health care center and screened on 7 inclusion criteria: (1) age 18 years or older, (2) singleton pregnancies, (3) smoked an average of at least 1 cigarette per day over the prior week (Karatay, Kublay, & Emiroglu, 2010; Oncken, Dornelas, Greene, et al., 2008), (4) < 24 weeks gestation, (5) met criteria for negative affect smoking (using the BSCQ-A, NA; see below), (6) able to provide a collateral contact (person familiar with their smoking), and (7) consumed  $\leq 0.50$  oz of ethanol per day (1 drink) and had no incidence of binge drinking during the pregnancy ( $\geq 4$  drinks per occasion). Exclusion

**Table 1**  
Demographic characteristics of treatment-seeking pregnant smokers ( $N = 73$ ).

Variable	% (N) or M (SD)
Age (years)	24.8 (4.5)
Race/ethnicity	
Hispanic	15.1% (11)
African American	43.8% (32)
White	30.1% (22)
Native American	5.5% (4)
Other	5.5% (4)
Education (years)	11.9 (1.9)
Total income last year	
less than \$10,000	68.5% (50)
\$10,000 - \$20,000	20.5% (15)
\$20,000 or more	11.0% (8)
Employment status	
Not employed, not looking for work/disability	16.4% (12)
Not employed, looking for work	46.6% (34)
Employed, part-time	24.7% (18)
Employed, full-time/student	12.3% (9)
Marital status	
Single, never married	49.3% (36)
Divorced/separated	8.2% (6)
In a relationship, not living together	12.3% (9)
Married/co-habiting	30.1% (22)
Gestational age at pretreatment (weeks)	15.3 (5.1)

criteria included: (1) no telephone, (2) acute psychosis or severe cognitive impairment, (3) any diagnosed drug use disorder other than marijuana, and (4) lack of English fluency. Further information regarding the parent study is published elsewhere (Bradizza et al., 2017).

Of the 102 women who were eligible and agreed to participate at screening, 78 completed the pretreatment assessment. Five of these women were no longer pregnant at the pretreatment assessment. The remaining 73 participants were included in the present analyses. Demographic characteristics of the sample are presented in Table 1. On average, participants were young, ethnically-diverse, low-income women with less than a high school education who were early in their second trimester of pregnancy. The majority of the sample was single or divorced/separated.

### 2.2. Measures

#### 2.2.1. Brief smoking consequences questionnaire-adult (BSCQ-A)

Participants were screened for eligibility using the negative affect reduction scale (NA) of the BSCQ-A (Rash & Copeland, 2008). The NA subscale consists of 4 items assessing the degree to which an individual expects to reduce their negative affect by smoking cigarettes. Example items include: "Smoking calms me down when I feel nervous" and "When I'm feeling irritable, a smoke will help me relax." Items are rated on a 10-point scale ranging from 0 (*very unlikely*) to 9 (*very likely*), and scores were averaged across items. This measure has demonstrated good internal consistency in prior research ( $\alpha = 0.79$ ) (Rash & Copeland, 2008) and in the present sample ( $\alpha = 0.92$ ). Based on prior work (Copeland, Brandon, & Quinn, 1995), a score of 5.6 or higher was used as an indicator of negative affect smoking for study eligibility.

#### 2.2.2. Difficulties with emotion regulation scale (DERS)

Emotion regulation difficulties were assessed using the DERS, a 36-item multidimensional scale in which items are rated on a 5-point scale ranging from 1 (*almost never*) to 5 (*almost always*) (Gratz & Roemer, 2004). Example items include: "I have difficulty making sense out of my feelings" and "When I'm upset, I believe there is nothing I can do to make myself feel better." Scores were summed across all items to create an overall indicator of emotion regulation difficulties (range: 36–180). Total scores 80 or below are considered normal (Bradizza et al., 2018). This measure has demonstrated good internal consistency in prior research ( $\alpha = 0.93$ ) (Gratz & Roemer, 2004) and in the present sample

( $\alpha = 0.93$ ).

2.2.3. Partner interaction questionnaire (PIQ)

The frequency of close others' engagement in positive and negative social control behaviors related to participants' smoking and cessation efforts was assessed using the PIQ (Cohen & Lichtenstein, 1990). This measure is composed of 10 negative and 10 positive reactions rated on a 5-point scale ranging from 0 (almost never) to 4 (very often). Example items include, "congratulate you for your decision to quit smoking" (positive) and "comment that smoking is a dirty habit" (negative). This scale was originally developed to measure romantic partners' behavior, but can also be used to measure social control from other individuals. If participants were married or had a romantic partner, they were asked to answer the questions with respect to that person's behavior. If they did not have a romantic partner, they were asked to answer the questions about the behavior of a person – friend or relative – who would follow their progress in quitting most closely. Scores were summed across items within each subscale (range: 0–40). This measure has demonstrated good internal consistency in prior research ( $\alpha_{\text{positive}} = 0.89$ ,  $\alpha_{\text{negative}} = 0.85$ ) (Cohen & Lichtenstein, 1990) and in the present sample ( $\alpha_{\text{positive}} = 0.92$ ,  $\alpha_{\text{negative}} = 0.89$ ).

2.2.4. Smoking and cessation variables

Analyses examined 6 smoking- and cessation-related variables: smoking quantity, smoking frequency, nicotine dependence, smoking urges, withdrawal symptoms, and abstinence self-efficacy. Cigarette use over the prior 6 months was assessed by self-report at pretreatment using the Timeline Follow-Back, which has been shown to be a valid measure of smoking behavior; it corresponds highly with daily reports of smoking over the same time period (Brown et al., 1998). Smoking quantity was defined as the mean number of cigarettes per day (CPD) during the 6 months prior to the pretreatment assessment. Smoking frequency was defined as the number of smoking days over the 6 months (180 days) prior to the pretreatment assessment. Nicotine dependence was assessed using 6-item, self-report Fagerstrom Test Nicotine Dependence (FTND) (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991). Items assess various indicators of physical addiction to nicotine, such as time before first cigarette after waking, total number of cigarettes per day, and smoking even when ill. Total scores range from 0 to 10, and higher scores indicate greater nicotine dependence. Prior research has found the FTND to have adequate internal consistency ( $\alpha = 0.61$ ) and positive associations with biological smoking indicators (Heatherton et al., 1991). Internal consistency for FTND total scores was low in the current sample ( $\alpha = 0.59$ ), but similar to prior research (Fillo, Alfano, Paulus, et al., 2016; Korte, Capron, Zvolensky, & Schmidt, 2013). Smoking urges were assessed using the 10-item Questionnaire of Smoking Urges-Brief (QSU-B) (Cox, Tiffany, & Christen, 2001). Example items include: "I have an urge for a cigarette" and "I would do almost anything for a cigarette now." Each item is rated on a 100-point scale ranging from 1 (strongly disagree) to 100 (strongly agree), and scores were averaged across items. This measure has demonstrated good internal consistency in prior research ( $\alpha_s = 0.78$ –0.97) (Cox et al., 2001; Toll, Katulak, & McKee, 2006) and in the present sample ( $\alpha = 0.90$ ). Tobacco withdrawal symptoms experienced over the prior 24 h were assessed using the 8-item Minnesota Nicotine Withdrawal Scale (MNWS) (Hughes & Hatsukami, 1986). Example symptoms include: "difficulty concentrating," irritability, frustration, or anger," and "insomnia or sleep problems." Items are rated on a 4-point scale ranging from 0 (none) to 4 (severe), and scores were summed across items to create a total score (range: 0–32). The MNWS has demonstrated good reliability ( $\alpha_s = 0.77$ –0.84) and validity in prior research (Toll, O'Malley, McKee, Salovey, & Krishnan-Sarin, 2007), as well as in the present sample ( $\alpha = 0.80$ ). Participants' confidence that they could not smoke cigarettes in a variety of situations was assessed using the 20-item Smoking Self-Efficacy Scale (Velicer, Diclemente, Rossi, & Prochaska, 1990). Example situations include: "with my spouse or close friend who is smoking" and "when things are not going the way I want and I am frustrated." Items are rated on a 5-point scale ranging from 1 (not at all confident) to 5 (extremely confident), and scores were averaged across items (Scharfe & Eldredge, 2001). This measure has demonstrated good internal consistency in prior research ( $\alpha_s = 0.92$ –0.95) (Velicer et al., 1990) and in the present sample ( $\alpha = 0.90$ ).

2.3. Data analytic plan

Analyses were conducted using SPSS Statistics 24 (IBM Corporation, 2016). Separate ordinary least squares regression analyses examined the association between emotion regulation difficulties, positive or negative social control, and the 6 smoking-related outcome variables. Because negative affect smoking was an eligibility criterion for the parent study, all models controlled for the effects of negative affect smoking, as well as interactions between negative affect smoking and the focal predictor in each model (i.e., emotion regulation difficulties, negative social control, or positive social control). All predictors and covariates were grand mean centered. Prior to conducting focal analyses, we examined whether there were differences in the amount of social control, negative or positive, received from romantic partners compared to others (e.g., parents, friends). There were no significant differences; therefore, the source of the social control was not included as a covariate in the models.

3. Results

3.1. Preliminary analyses

Descriptive statistics and correlations among focal study variables are presented in Table 2. On average, over the 6 months (180 days) prior to the pretreatment assessment, participants smoked an average of 12.3 cigarettes per day ( $SD = 8.0$ ) almost every day ( $M = 172.6$  days,

Table 2  
Descriptive statistics and correlations among focal study variables (N = 73).

Variable	1	2	3	4	5	6	7	8	9	M (SD)
1. Negative Affect Smoking	–									7.9 (1.1)
2. Emotion Regulation Difficulties	0.312*	–								81.5 (22.6)
3. Negative Social Control	0.006	–0.106	–							20.9 (11.4)
4. Positive Social Control	0.149	–0.176	0.423***	–						29.8 (9.4)
5. Smoking Quantity	0.108	0.072	–0.021	0.068	–					12.3 (8.0)
6. Smoking Frequency	0.244	0.171	–0.231*	–0.109	0.244*	–				172.6 (30.2)
7. Nicotine Dependence	0.391**	0.147	0.035	0.071	0.507***	0.298*	–			3.4 (2.4)
8. Smoking Urges	0.356**	0.325**	0.088	0.135	0.192	0.197	0.406***	–		36.0 (28.2)
9. Withdrawal Symptoms	0.427**	0.472**	0.073	0.092	0.288*	0.186	0.301*	0.520***	–	13.6 (5.4)
10. Abstinence Self-Efficacy	–0.640***	–0.321**	0.269*	–0.048	–0.176	–0.208†	–0.417***	–0.417***	–0.357***	2.1 (0.7)

Note: † $p < .10$ . \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

$SD = 30.2$ ) and had low nicotine dependence ( $M = 3.4$ ,  $SD = 2.4$ ). Approximately half of participants responded to the PIQ regarding influence from a spouse or partner (57.5%), with the other half responding about a friend or family member (42.5%).<sup>3</sup>

### 3.2. Focal analyses

#### 3.2.1. Emotion regulation difficulties

Analyses examined the relation between emotion regulation difficulties and each of the 6 focal outcomes, controlling for negative affect smoking (see Table 3). None of the interactions between emotion regulation difficulties and negative affect smoking were significant, so these interaction terms were dropped from the models and are not presented. Results revealed significant main effects of emotion regulation difficulties in predicting smoking urges and withdrawal symptoms, above and beyond the effects of negative affect smoking. Greater emotion regulation difficulties were associated with greater smoking urges ( $b = 0.295$ ,  $p = .042$ ) and withdrawal symptoms ( $b = 0.085$ ,  $p = .003$ ) at pretreatment. There were no significant main effects of emotion regulation difficulties in the models predicting smoking quantity, smoking frequency, nicotine dependence, or abstinence self-efficacy at pretreatment.

#### 3.2.2. Negative social control

Analyses examined the relation between close others' negative social control regarding participants' smoking and cessation efforts and each of the 6 focal outcomes, controlling for negative affect smoking (see Table 3). None of the interactions between negative social control and negative affect smoking were significant, so these interaction terms were dropped from the models and are not presented. Results revealed significant main effects of negative social control in predicting smoking frequency and abstinence self-efficacy, above and beyond the effects of negative affect smoking. Greater negative social control from close others was associated with fewer smoking days over the past 6 months ( $b = -0.614$ ,  $p = .042$ ) and greater abstinence self-efficacy at pretreatment ( $b = 0.017$ ,  $p = .002$ ). There were no significant main effects of negative social control in the models predicting smoking quantity, nicotine dependence, smoking urges, or withdrawal symptoms.

#### 3.2.3. Positive social control

Analyses examined the relation between close others' positive social control regarding participants' smoking and cessation efforts and each of the 6 focal outcomes, controlling for negative affect smoking (see Table 3). Results revealed a significant interaction between negative affect smoking and positive social control ( $b = -0.052$ ,  $p = .043$ ; see Fig. 1) in predicting nicotine dependence. Follow-up analyses revealed that when positive social control was low, higher negative affect smoking was associated with greater nicotine dependence ( $b = 1.305$ ,  $p < .001$ ). In contrast, when positive social control was high, negative affect smoking and nicotine dependence were not significantly associated ( $b = 0.319$ ,  $p = .977$ ). The interaction between negative affect smoking and positive social control was not significant in any of the other models, so it was dropped from all other models and is not presented. There were no significant main effects of positive social control in any of the models.

<sup>3</sup> Whereas slightly less than half of the sample reported being married/cohabiting (30.1%) or in a non-cohabiting romantic relationships (12.3%), approximately half of the sample (57.5%) responded to the PIQ about a spouse or romantic partner. Therefore, some single/divorced participants still reported on social control received from a spouse/partner. However, from the data collected, we are not able to determine the nature of these relationships, or why they chose to report on a spouse/partner over another individual (e.g., family member, friend).

## 4. Discussion

The present research sought to advance the literature on smoking cessation during pregnancy by investigating intrapersonal and interpersonal factors which may hinder or promote smoking cessation during this critical period. Specifically, this study examined the extent to which emotion regulation difficulties and positive and negative social control efforts by close others were associated with 6 smoking cessation-related variables: smoking quantity, smoking frequency, nicotine dependence, smoking urges, withdrawal symptoms, and abstinence self-efficacy. These relations were examined within a sample of primarily low-income pregnant smokers seeking smoking cessation treatment. Results revealed that emotion regulation difficulties were associated with more negative cessation-related outcomes, whereas both positive and negative social control by close others were associated with more positive cessation-related outcomes.

Consistent with prior research demonstrating a link between intrapersonal emotion regulation difficulties and unsuccessful smoking cessation efforts (Eiden et al., 2011; Miguez et al., 2017; Niven et al., 2009; Zaki & Williams, 2013) our findings showed that greater emotion regulation difficulties were associated with greater urges to smoke and greater withdrawal symptoms, both of which are known to undermine smoking cessation efforts (Allen, Bade, Hatsukami, & Center, 2008; Wray, Gass, & Tiffany, 2013). It may be that emotion regulation difficulties inhibit an individual's ability to engage in goal-directed behavior, such as smoking cessation, thus leading to greater quit difficulties. Overall, these findings are in line with prior research indicating that emotion regulation difficulties are implicated in a number of addictive behaviors, including smoking (Berking et al., 2011; Bradizza et al., 2017; Bradizza et al., 2018; Carmody, 1992; Fox, Hong, & Sinha, 2008; Stasiewicz et al., 2018).

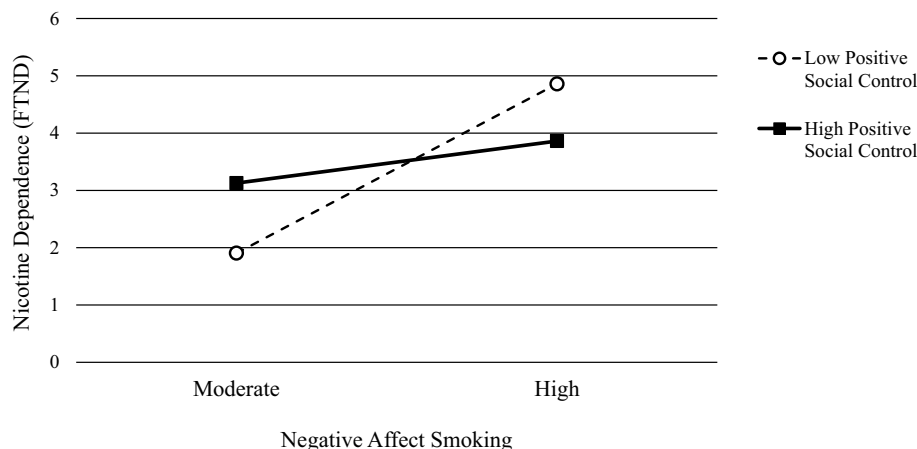
With regard to interpersonal factors, both positive and negative social control from close others were associated with more beneficial outcomes with respect to smoking-related variables. Results revealed a significant interaction between positive social control and negative affect smoking in relation to nicotine dependence. Specifically, at lower levels of positive social control, negative affect smoking was associated with greater nicotine dependence; however, at higher levels of positive social control, women were buffered from the positive association between negative affect smoking and nicotine dependence. This finding is important given the role of nicotine dependence in abstinence success among pregnant smokers found in prior research (Emery et al., 2017). It is possible that positive social control behaviors may help reduce negative affect and/or provide increased interpersonal emotion regulation of negative affect for pregnant smokers (Zaki & Williams, 2013), thus decreasing a path to nicotine dependence. This finding suggests that positive interactions with close others may be protective from negative health outcomes via bolstering regulatory capacities. However, positive social control was not associated with any of the other smoking-cessation-related variables. Negative social control was associated with lower smoking frequency, but not lower smoking quantity. Negative social control may be effective in helping women smoke on fewer days, but women may then smoke a higher quantity of cigarettes in each instance, resulting the same average quantity of cigarettes smoked over time. This suggests that negative social control may lead women to conceal, but not reduce their smoking, which is consistent with prior research on social control of smoking and other health behaviors (Okun et al., 2007; Scholz et al., 2013; Tucker & Anders, 2001). Additionally, negative social control was associated with higher smoking abstinence self-efficacy. It is possible that negative social control from close others is signaling to women that others are invested in their quitting and will be there to help them, though not necessarily through the most positive means.

The present research found that social control from close others, both negative and positive, was associated with smoking and cessation-related variables. Although speculative, these associations suggest they

**Table 3**  
Smoking and cessation variables as a function of negative affect smoking and emotion regulation difficulties, negative social control, or positive social control.

	Outcome Variable											
	Smoking Quantity (cigarettes per day)		Smoking Frequency (days in past 6 months)		Nicotine Dependence (FTND)		Smoking Urges (QSU-B)		Withdrawal Symptoms (MWS)		Smoking Abstinence Self-Efficacy	
	b	SE	b	SE	b	SE	b	SE	b	SE	b	SE
Intercept	12.258***	0.940	172.644***	3.453	3.356***	0.257	36.018***	3.041	13.493***	0.585	2.104***	0.063
Negative affect smoking	0.664	0.878	5.595†	3.223	0.792**	0.240	7.022*	2.839	1.403*	0.552	-0.369***	0.059
Emotion regulation difficulties	0.015	0.044	0.140	0.162	0.003	0.012	0.295*	0.142	0.085**	0.027	-0.004	0.003
Intercept	12.258***	0.941	172.644***	3.370	3.356***	0.257	36.018***	3.120	13.728***	0.625	2.104***	0.060
Negative affect smoking	0.757	0.834	6.507*	2.988	0.810**	0.228	8.845**	2.767	2.023**	0.555	-0.395***	0.053
Negative Social Control	-0.015	0.083	-0.614*	0.297	0.007	0.023	0.213	0.275	0.036	0.057	0.017**	0.005
Intercept	12.258***	0.940	172.644***	3.431	3.438***	0.254	36.018***	3.121	13.720***	0.627	2.104***	0.064
Negative affect smoking	0.700	0.843	7.056*	3.077	0.812**	0.225	8.550**	2.799	2.003**	0.564	-0.399***	0.057
Positive Social Control	0.045	0.102	-0.477	0.372	0.006	0.027	0.251	0.338	0.015	0.068	0.004	0.007
Negative affect smoking x Positive Social Control	-	-	-	-	-0.052*	0.025	-	-	-	-	-	-

Note: †p < .10. \*p < .05. \*\*p < .01. \*\*\*p < .001.



**Fig. 1.** Interaction between negative affect smoking and positive social control predicting nicotine dependence at pretreatment.

Note. FTND = Fagerstrom Test for Nicotine Dependence. Predicted values were calculated at +/− 1 standard deviation from the sample mean on negative affect smoking and positive social control. Because having negative affect smoking scores above 5.6 (mean established in prior research) was an eligibility criterion for the parent study, predicted values estimated at 1 standard deviation below the mean for negative affect smoking in the present sample are more appropriately characterized as “moderate” negative affect smoking.

may ultimately be beneficial for supporting smoking cessation in this population. This finding is somewhat unexpected given there is robust evidence in the literature for the efficacy of positive social control in improving health behavior, and evidence suggesting null, mixed, or even harmful effects of negative social control (Craddock et al., 2015). Given the positive associations between smoking/nicotine dependence during pregnancy and mental health conditions such as depression and anxiety (Cook et al., 2010; Goodwin, Keyes, & Simuro, 2007), it is possible that cognitive biases associated with depression and anxiety (Beck, Rush, Shaw, & Emery, 1979; Mathews & MacLeod, 2005; Swann, Wenzlaff, & Tafarodi, 1992) shape women's perceptions of social control from close others, promoting their effectiveness. For example, negative tactics such as highlighting potential harms of smoking on the fetus may be more congruent with these women's negative self-schemas. Additionally, depression and anxiety might contribute to women discounting positive social control or other positive statements (Beck et al., 1979). Moreover, low SES is associated with high levels of stress, with these individuals facing both more frequent and severe stressors in their day-to-day lives (Baum, Garafalo, & Yali, 1999; Crittenden, Manfredi, Cho, & Dolecek, 2007). Thus, it may be that for this population, negative social control from others is perceived as a stressor that can be alleviated more readily (i.e., by reducing the number of smoking days) as compared with other more chronic stressors in these individuals' lives. It is possible that positive social control tactics could be effective in aiding smoking cessation in a population that is less stressed or experiencing fewer emotion regulation

difficulties.

Additionally, the present research contributes to the literature on the effects of social control by examining a broader range of close relationships (e.g., parents, friends) that may influence health behavior, in addition to romantic partners. To date, the social control literature has largely focused on social control from romantic partners, which are an important and commonly-cited source of social control by recipients. However, low SES pregnant women are more often single parents (Entmacher et al., 2013; Olson & Banyard, 1993). Indeed, the majority of the women in our sample did not have a current romantic partner but were just as likely to report receiving social control from close others (e.g., family, friends). It is important for future research examining social control in low SES populations, and other populations with higher proportions of single individuals (e.g., young adults), not to restrict their examination to romantic partners but take a broader view of the social control these individuals may be experiencing. Future research with larger samples would enable the examination of potential differences between the social control received from these different sources, as well as any differences in their relations to smoking and cessation variables.

4.1. Clinical implications

Given these findings, there is a need for intervention efforts that target both intrapersonal and interpersonal factors relevant to pregnant women's smoking. To date, a number of interventions have been

developed to address smoking cessation among pregnant smokers and have demonstrated some efficacy (Bradizza et al., 2017; Heil, Higgins, Bernstein, et al., 2008; Higgins, Washio, Heil, et al., 2012). However, pregnant women may benefit from broader intervention efforts in which close others are involved in the process. For example, Behavioral Couples Therapy (BCT) (Powers, Vedel, & Emmelkamp, 2008) is an approach to improve the relationship functioning of romantic partners that has also demonstrated effectiveness in treating various substance use problems in one or both romantic partners (Schumm & O'Farrell, 2013). This approach has been found to be more effective than traditional individual-based treatments for alcohol and other drugs (e.g., cognitive behavioral therapy) (Powers et al., 2008). Conjoint therapeutic approaches, like BCT, have been successful in reducing smoking in those who are not pregnant (Palmer, Baucom, & McBride, 2000; Rohrbaugh, Shoham, Skoyen, Jensen, & Mehl, 2012), but results have been mixed among pregnant smokers and their partners (Duckworth & Chertok, 2012). Given the higher rates of smoking among low SES pregnant women, as well as the higher rates of single parenthood in these populations, such approaches may benefit from adaptations to incorporate family members or close others in addition to or instead of romantic partners. For example, Multidimensional Family Therapy (Liddle, 2013), based on Bronfenbrenner's ecological model, has primarily been used with adolescents, with the goal of incorporating families into the treatment of adolescent delinquent behavior, and has been shown to be effective (Austin, Macgowan, & Wagner, 2016). This framework acknowledges that the ways in which families function has a profound impact on behavior and as such, involvement of close others is crucial to promoting positive functioning in these relationships. This focus on close others provides a foundation of support for the focal individual to encourage engagement in more positive behaviors and thus may be a useful framework for addressing smoking cessation efforts in pregnant women.

Additionally, our findings suggest that interventions aimed at smoking cessation may benefit from encouraging specific social control tactics among close others in order to more effectively leverage them as part of the intervention. Smokers, particularly women (Eissenberg et al., 1999; Xu et al., 2008), use tobacco to reduce internal negative stimuli (i.e., negative affect, withdrawal symptoms); however, once pregnant, they may find themselves the recipients of considerable external negative stimuli (i.e., negative social control). At this point, they may be highly motivated to *avoid* smoking in order to remove the aversive stimuli of negative social control (i.e., negative reinforcement for non-smoking). Increasing emotion regulation skills (e.g. urge surfing, acceptance of negative affect) (Bradizza et al., 2017; Marlatt, 1985; Stasiewicz et al., 2018) may serve to decrease reliance on social control by close others among pregnant smokers struggling to quit smoking.

#### 4.2. Limitations and future directions

This study has some limitations that warrant discussion. First, social control was only measured from the perspective of the target – pregnant women trying to quit. However, there is emerging evidence that social control which exists outside the target's awareness may be more effective at changing behavior (Lüscher, Stadler, Ochsner, et al., 2015; Stephens, Rook, Franks, Khan, & Iida, 2010). Future research examining the perspectives of both the provider and recipient of social control efforts may be important to developing a more complete understanding of the effects of social control on smoking cessation. Internal consistency for the FTND measure was low in the present research; however, this is common for this measure in the literature (e.g., Fillo et al., 2016; Korte et al., 2013), and may be due to the use of forced choice responses for certain items (Korte et al., 2013). Additionally, data for the present research were drawn from a smoking cessation treatment development study for pregnant smokers, a particularly difficult population to recruit and retain. Thus, the sample size was relatively

small, which limited the complexity of the analyses that could be conducted. Given this, and the exploratory nature of the analyses on this understudied population, the findings were not corrected for multiple comparisons. Additional research with a larger sample is needed to replicate these findings, as well as evaluate the generalizability of these findings beyond low-income pregnant women high in negative affect smoking. Finally, given the cross-sectional nature of the data, we cannot infer causal relationships. Prospective studies examining the impact of social control efforts by others on pregnant women's subsequent smoking cessation success are needed.

#### 5. Conclusion

The present research examines an important public health topic, smoking during pregnancy, among a particularly at-risk population of low-income women. The results show a relationship between deficits in emotion regulation and smoking urges and withdrawal, suggesting that poor emotion regulation may increase the risk for relapse. Findings suggest that positive social control may buffer pregnant women from the deleterious effects of negative affect smoking on nicotine dependence. Further, negative social control was found to be associated with lower smoking frequency and greater abstinence self-efficacy among low-income pregnant women trying to quit. Intervention efforts targeting both intrapersonal factors, such as emotion regulation (Bradizza et al., 2017; Stasiewicz et al., 2018), and interpersonal factors, such as helping close others influence pregnant women in appropriate and effective ways, may show promise in reducing smoking during pregnancy.

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#### References

- Allen, S. S., Bade, T., Hatsukami, D., & Center, B. (2008). Craving, withdrawal, and smoking urges on days immediately prior to smoking relapse. *Nicotine & Tobacco Research, 10*(1), 35–45.
- Armstrong, E. M. (2005). Drug and alcohol use during pregnancy: We need to protect, not punish, women. *Women's Health Issues, 15*(2), 45–47.
- Austin, A. M., Macgowan, M. J., & Wagner, E. F. (2016). Effective family-based interventions for adolescents with substance use problems: A systematic review. *Research on Social Work Practice, 15*(2), 67–83.
- Baker, T. B., Piper, M. E., McCarthy, D. E., Majeskie, M. R., & Fiore, M. C. (2004). Addiction motivation reformulated: An affective processing model of negative reinforcement. *Psychological Review, 111*(1), 33–51.
- Baum, A., Garafalo, J. P., & Yali, A. M. (1999). Socioeconomic stress and chronic stress: Does stress account for SES effects on health? *Annals of the New York Academy of Sciences, 896*, 131–144.
- Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). *Cognitive Therapy of Depression*. New York, NY: Guilford Press.
- Beijers, C., Burger, H., Verbeek, T., Bockting, C. L., & Ormel, J. (2014). Continued smoking and continued alcohol consumption during early pregnancy distinctively associated with personality. *Addictive Behaviors, 39*(5), 980–986.
- Berking, M., Margraf, M., Ebert, D., Wupperman, P., Hofmann, S. G., & Junghans, K. (2011). Deficits in emotion-regulation skills predict alcohol use during and after cognitive-behavioral therapy for alcohol dependence. *Journal of Consulting and Clinical Psychology, 79*(3), 307–318.
- Bradizza, C. M., Brown, W. C., Ruszczyk, M. U., Dermen, K. H., Lucke, J. F., & Stasiewicz, P. R. (2018). Difficulties in emotion regulation in treatment-seeking alcoholics with and without co-occurring mood and anxiety disorders. *Addictive Behaviors, 80*, 6–13.
- Bradizza, C. M., Stasiewicz, P. R., Zhuo, Y., Ruszczyk, M., Maisto, S. A., Lucke, J. F., ... Giarratano, P. (2017). Smoking cessation for pregnant smokers: Development and pilot test of an emotion regulation treatment supplement to standard smoking cessation for negative affect smokers. *Nicotine & Tobacco Research, 19*(5), 578–584.
- Brandon, T. H. (1994). Negative affect as motivation to smoke. *Current Directions in*

- Psychological Science*, 3(2), 33–37.
- Brown, R. A., Burgess, E. S., Sales, S. D., Whiteley, J. A., Evans, D. M., & Miller, I. W. (1998). Reliability and validity of a smoking timeline follow-back interview. *Psychology of Addictive Behaviors*, 12(2), 101–112.
- Butler, E. A., Hollenstein, T., Shoham, V., & Rohrbough, M. J. (2014). A dynamic state-space analysis of interpersonal emotion regulation in couples who smoke. *Journal of Social and Personal Relationships*, 31(7), 907–927.
- Campos, J. J., Walle, E. A., Dahl, A., & Main, A. (2011). Reconceptualizing emotion regulation. *Emotion Review*, 3(1), 26–35.
- Carmody, T. P. (1992). Affect regulation, nicotine addiction, and smoking cessation. *Journal of Psychoactive Drugs*, 24(2), 111–122.
- Cnattingius, S. (2004). The epidemiology of smoking during pregnancy: Smoking prevalence, maternal characteristics, and pregnancy outcomes. *Nicotine & Tobacco Research*, 6, S125–S140 Supplement 2.
- Coan, J. A. (2011). The social regulation of emotion. In J. Decety, & J. T. Cacioppo (Eds.). *The Oxford Handbook of Social Neuroscience*. New York, NY: Oxford University Press.
- Cohen, S., & Lichtenstein, E. (1990). Partner behaviors that support quitting smoking. *Journal of Consulting and Clinical Psychology*, 58(3), 304–309.
- Cook, C. A. L., Flick, L. H., Homan, S. M., Campbell, C., McSweeney, M., & Gallagher, M. E. (2010). Psychiatric disorders and treatment in low-income pregnant women. *Journal of Women's Health*, 19(7), 1251–1262.
- Copeland, A. L., Brandon, T. H., & Quinn, E. P. (1995). The smoking Consequences Questionnaire-Adult: Measurement of smoking outcome expectancies of experienced smokers. *Psychological Assessment*, 7(4), 484–494.
- Cox, L. S., Tiffany, S. T., & Christen, A. G. (2001). Evaluation of the brief questionnaire of smoking urges (QSU-brief) in laboratory and clinical settings. *Nicotine & Tobacco Research*, 3(1), 7–16.
- Craddock, E., vanDellen, M. R., Novak, S. A., & Ranby, K. W. (2015). Influence in relationships: A meta-analysis on health-related social control. *Basic and Applied Social Psychology*, 37(2), 118–130.
- Crittenden, K. S., Manfredi, C., Cho, Y. I., & Dolecek, T. A. (2007). Smoking cessation processes in low-SES women: The impact of time-varying pregnancy status, health care messages, stress, and health concerns. *Addictive Behaviors*, 32(7), 1347–1366.
- Duckworth, A. L., & Chertok, I. R. A. (2012). Review of perinatal partner-focused smoking cessation interventions. *MCN: The American Journal of Maternal/Child Nursing*, 37(3), 174–181.
- Eiden, R. D., Leonard, K. E., Colder, C. R., Homish, G. G., Schuetz, P., Gray, T. R., ... Huestis, M. A. (2011). Anger, hostility, and aggression as predictors of persistent smoking during pregnancy. *Journal of Studies on Alcohol and Drugs*, 72(6), 926–932.
- Eissenberg, T., Adams, C., Riggins, E. C., & Likness, M. (1999). Smokers' sex and the effects of tobacco cigarettes: Subject-rated and physiological measures. *Nicotine & Tobacco Research*, 1(4), 317–324.
- Emery, J. L., Sutton, S., & Naughton, F. (2017). Cognitive and behavioral predictors of quit attempts and biochemically-validated abstinence during pregnancy. *Nicotine & Tobacco Research*, 19(5), 547–554.
- Entmacher, J., Robbins, K. G., Vogtman, J., & Frohlich, L. (2013). *Insecure and unequal: Poverty and income among women and families 2000–2012*. Washington, DC: National Women's Law Center.
- Fillo, J., Alfano, C. A., Paulus, D. J., Smits, J. A. J., Davis, M. L., Rosenfield, D., ... Zvolensky, M. J. (2016). Emotion dysregulation explains relations between sleep disturbance and smoking quit-related cognition and behavior. *Addictive Behaviors*, 57, 6–12.
- Fox, H. C., Hong, K. A., & Sinha, R. (2008). Difficulties in emotion regulation and impulse control in recently abstinent alcoholics compared with social drinkers. *Addictive Behaviors*, 33(2), 388–394.
- Fucito, L. M., Juliano, L. M., & Toll, B. A. (2010). Cognitive reappraisal and expressive suppression emotion regulation strategies in cigarette smokers. *Nicotine & Tobacco Research*, 12(11), 1156–1161.
- Goodwin, R. D., Cheslack-Postava, K., Nelson, D. B., Smith, P. H., Wall, M. M., Hasin, D. S., ... Galea, S. (2017). Smoking during pregnancy in the United States, 2005–2014: The role of depression. *Drug and Alcohol Dependence*, 179, 159–166.
- Goodwin, R. D., Keyes, K., & Simuro, N. (2007). Mental disorders and nicotine dependence among pregnant women in the United States. *Obstetrics and Gynecology*, 109(4), 875–883.
- Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment*, 26(1), 41–54.
- Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, 2(3), 271–299.
- Hammoud, A. O., Bujold, E., Sorokin, Y., Schild, C., Krapp, M., & Baumann, P. (2005). Smoking in pregnancy revisited: Findings from a large population-based study. *American Journal of Obstetrics and Gynecology*, 192(6), 1562–1856.
- Hand, D. J., Ellis, J. D., Carr, M. M., Abatemarco, D. J., & Ledgerwood, D. M. (2017). Contingency management interventions for tobacco and other substance use disorders in pregnancy. *Psychology of Addictive Behaviors*, 31(8), 907–921.
- Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerstrom, K.-O. (1991). The Fagerström Test for Nicotine Dependence: A revision of the Fagerstrom Tolerance Questionnaire. *Addiction*, 86(9), 1119–1127.
- Heil, S. H., Higgins, S. T., Bernstein, I. M., Solomon, L. J., Rogers, R. E., Thomas, C. S., ... Lynch, M. E. (2008). Effects of voucher-based incentives on abstinence from cigarette smoking and fetal growth among pregnant women. *Addiction*, 103(6), 1009–1018.
- Higgins, S. T., Washio, Y., Heil, S. H., Solomon, L. J., Gaalema, D. E., Higgins, T. M., ... Bernstein, I. M. (2012). Financial incentives for smoking cessation among pregnant and newly postpartum women. *Preventive Medicine*, 55, S33–S40 Supplement.
- Hofmann, S. G. (2014). Interpersonal emotion regulation model of mood and anxiety disorders. *Cognitive Therapy and Research*, 38(5), 483–492.
- Howard, L. M., Bekele, D., Rowe, M., Demilew, J., Bewley, S., & Marteau, T. M. (2013). Smoking cessation in pregnant women with mental disorders: A cohort and nested qualitative study. *BJOG: An International Journal of Obstetrics and Gynaecology*, 120(3), 362–370.
- Hughes, J. R., & Hatsukami, D. (1986). Signs and symptoms of tobacco withdrawal. *Archives of General Psychiatry*, 43(3), 289–294.
- Karatay, G., Kublay, G., & Emiroglu, O. N. (2010). Effect of motivational interviewing on smoking cessation in pregnant women. *Journal of Advanced Nursing*, 66(6), 1328–1337.
- Korte, K. J., Capron, D. W., Zvolensky, M., & Schmidt, N. B. (2013). The Fagerstrom Test for Nicotine Dependence: Do revisions in the item scoring enhance the psychometric properties? *Addictive Behaviors*, 38(3), 1757–1763.
- Kurti, A. N., Redner, R., Lopez, A. A., Keith, D. R., Villanti, A. C., Stanton, C. A., ... Higgins, S. T. (2017). Tobacco and nicotine delivery product use in a national sample of pregnant women. *Preventive Medicine*, 104, 50–56.
- Lewis, M. A., & Butterfield, R. M. (2005). Antecedents and reactions to health-related social control. *Personality and Social Psychology Bulletin*, 31(3), 416–427.
- Lewis, M. A., & Butterfield, R. M. (2007). Social control in marital relationships: Effect of one's partner on health behaviors. *Journal of Applied Social Psychology*, 37(2), 298–319.
- Lewis, M. A., & Rook, K. S. (1999). Social control in personal relationships: Impact on health behaviors and psychological distress. *Health Psychology*, 18(1), 63–71.
- Liddle, H. A. (2013). Multidimensional family therapy for adolescent substance abuse. In E. F. Wagner, & H. B. Waldron (Eds.). *Innovations in Adolescent Substance Abuse Interventions* (pp. 229–261). Kidlington, Oxford: Pergamon.
- Lüscher, J., Stadler, G., Ochsner, S., Rackow, P., Knoll, N., Hornung, R., ... Scholz, U. (2015). Daily negative affect and smoking after a self-set quit attempt: The role of dyadic invisible social support in a daily diary study. *British Journal of Health Psychology*, 20(4), 708–723.
- Marlatt, G. A. (1985). Relapse prevention: Theoretical rationale and overview of the model. In G. A. Marlatt, & J. R. Gordon (Eds.). *Relapse prevention: Maintenance strategies in the treatment of addictive behaviors* (pp. 3–70). New York, NY: The Guilford Press.
- Mathews, A., & MacLeod, C. (2005). Cognitive vulnerability to emotional disorders. *Annual Review of Clinical Psychology*, 1, 167–195.
- Maxson, P. J., Edwards, S. E., Ingram, A., & Miranda, M. L. (2012). Psychosocial differences between smokers and non-smokers during pregnancy. *Addictive Behaviors*, 37(2), 153–159.
- Micalizzi, L., & Knopik, V. S. (2017). Maternal smoking during pregnancy and offspring executive function: What do we know and what are the next steps? *Development and Psychopathology*, 1–22.
- Miguez, M. C., Pereira, B., & Figueiredo, B. (2017). Tobacco consumption and spontaneous quitting at the first trimester of pregnancy. *Addictive Behaviors*, 64, 111–117.
- Mullen, P. D. (2004). How can more smoking suspension during pregnancy become lifelong abstinence? Lessons learned about predictors, interventions, and gaps in our accumulated knowledge. *Nicotine & Tobacco Research*, 6(Suppl. 2), S217–S238.
- Niven, K., Totterdell, P., & Holman, D. (2009). A classification of controlled interpersonal affect regulation strategies. *Emotion*, 9(4), 498–509.
- Okun, M. A., Huff, B. P., August, K. J., & Rook, K. S. (2007). Testing hypotheses distilled from four models of the effects of health-related social control. *Basic and Applied Social Psychology*, 29(2), 185–193.
- Olson, S. L., & Banyard, V. (1993). Stop the world so I can get off for a while: Sources of daily stress in the lives low-income single mothers of young children. *Family Relations*, 42(1), 50–56.
- Oncken, C., Dornelas, E., Greene, J., Sankey, H., Glasmann, A., Feinn, R., ... Kranzler, H. R. (2008). Nicotine gum for pregnant smokers: A randomized controlled trial. *Obstetrics and Gynecology*, 112(4), 859–867.
- Palmer, C. A., Baucom, D. H., & McBride, C. M. (2000). Couple approaches to smoking cessation. In K. B. Schmaling, & T. G. Sher (Eds.). *The psychology of couples and illness: Theory, research, & practice* (pp. 311–336). Washington, DC: American Psychological Association.
- Perkins, K. A., Giedgowd, G. E., Karelitz, J. L., Conklin, C. A., & Lerman, C. (2012). Smoking in response to negative mood in men versus women as a function of distress tolerance. *Nicotine & Tobacco Research*, 14(12).
- Perkins, K. A., Karelitz, J. L., Giedgowd, G. E., & Conklin, C. A. (2013). Negative mood effects on craving to smoke in women versus men. *Addictive Behaviors*, 38(2), 1527–1531.
- Powers, J. R., McDermott, L. J., Dloxton, D. J., & Chojena, C. L. (2013). A prospective study of prevalence and predictors of concurrent alcohol and tobacco use during pregnancy. *Maternal and Child Health Journal*, 17(1), 76–84.
- Powers, M. B., Vedel, E., & Emmelkamp, P. M. (2008). Behavioral couples therapy (BCT) for alcohol and drug use disorders: A meta-analysis. *Clinical Psychology Review*, 28(6), 952–962.
- Rash, C. J., & Copeland, A. L. (2008). The brief smoking consequences questionnaire-adult (BSCQ-A): Development of a short form of the SCQ-A. *Nicotine & Tobacco Research*, 10(11), 1633–1643.
- Riaz, M., Lewis, S., Coleman, T., Aveyard, P., West, R., Naughton, F., ... Ussher, M. (2016). Which measures of cigarette dependence are predictors of smoking cessation during pregnancy? Analysis of data from a randomized controlled trial. *Addiction*, 111(9), 1656–1665.
- Rimé, B. (2009). Emotion elicits the social sharing of emotion: Theory and empirical review. *Emotion Review*, 1(1), 60–85.
- Robles, T. F., Slatcher, R. B., Trombello, J. M., & McGinn, M. M. (2014). Marital quality and health: A meta-analytic review. *Psychological Bulletin*, 140(1), 140–187.
- Rogers, A. H., Bakshshaie, J., Viana, A. G., Manning, K., Mayorga, N. A., Garey, L., ...



- Zvolensky, M. J. (2017). Emotion dysregulation and smoking among treatment-seeking smokers. *Addictive Behaviors*, *79*, 124–130.
- Rohrbaugh, M. J., Shoham, V., Skoyen, J. A., Jensen, M., & Mehl, M. R. (2012). We-talk, communal coping, and cessation success in a couple-focused intervention for health-compromised smokers. *Family Process*, *51*(1), 107–121.
- Saladin, M. E., Gray, K. M., Carpenter, M. J., Larowe, S. D., Desantis, S. M., & Upadhyaya, H. P. (2012). Gender differences in craving and cue reactivity to smoking and negative affect/stress cues. *The American Journal on Addictions*, *21*(3), 210–220.
- SAMHSA (2014). *Results from the 2013 national survey on drug use and health: Summary of national findings*. Rockville, MD: Substance Abuse and Mental Health Services Administration.
- Scharfe, E., & Eldredge, D. (2001). Associations between attachment representations and health behaviors in late adolescence. *Journal of Health Psychology*, *6*(3), 295–307.
- Scholz, U., Berli, C., Goldammer, P., Luscher, J., Hornung, R., & Knoll, N. (2013). Social control and smoking: Examining the moderating effects of different dimensions of relationship quality. *Families, Systems & Health*, *31*(4), 354–365.
- Schumm, J. A., & O'Farrell, T. J. (2013). Behavioral couples therapy for alcoholism. In P. M. Miller (Vol. Ed.), *Interventions for Addiction. Vol. 3. Interventions for Addiction* (pp. 57–65). San Diego, CA: Academic Press.
- Smedberg, J., Lupattelli, A., Mardby, A. C., Overland, S., & Nordeng, H. (2015). The relationship between maternal depression and smoking cessation during pregnancy—a cross-sectional study of pregnant women from 15 European countries. *Archives of Women's Mental Health*, *18*(1), 73–84.
- Stadler, G., Snyder, K. A., Horn, A. B., Shrout, P. E., & Bolger, N. P. (2012). Close relationships and health in daily life: A review and empirical data on intimacy and somatic symptoms. *Psychosomatic Medicine*, *74*(4), 398–409.
- Stasiewicz, P. R., Bradizza, C. M., & Slosman, K. S. (2018). *Emotion regulation treatment of alcohol use disorders: Helping clients manage negative thoughts and feelings*. New York, NY: Routledge.
- Stasiewicz, P. R., & Maisto, S. A. (1993). Two-factor avoidance theory: The role of negative affect in the maintenance of substance use and substance use disorder. *Behavior Therapy*, *24*(3), 337–356.
- Stephens, M. A., Rook, K. S., Franks, M. M., Khan, C., & Iida, M. (2010). Spouses use of social control to improve diabetic patients' dietary adherence. *Families, Systems & Health*, *28*(3), 199–208.
- Swann, W. B., Wenzlaff, R. M., & Tafarodi, R. W. (1992). Depression and the search for negative evaluations: More evidence of the role of self-verification strivings. *Journal of Abnormal Psychology*, *101*(2), 314–317.
- Szasz, P. L., Szentagotai, A., & Hofmann, S. G. (2012). Effects of emotion regulation strategies on smoking craving, attentional bias, and task persistence. *Behaviour Research and Therapy*, *50*(5), 333–340.
- Thompson, R. A. (1994). Emotion regulation: A theme in search of definition. *Monographs of the Society for Research in Child Development*, *59*(2–3), 25–52.
- Toll, B. A., Katulak, N. A., & McKee, S. A. (2006). Investigating the factor structure of the questionnaire on smoking urges-brief (QSU-Brief). *Addictive Behaviors*, *31*(7), 1231–1239.
- Toll, B. A., O'Malley, S. S., McKee, S. A., Salovey, P., & Krishnan-Sarin, S. (2007). Confirmatory factor analysis of the Minnesota Nicotine Withdrawal Scale. *Psychology of Addictive Behaviors*, *21*(2), 216–225.
- Tong, V. T., England, L. J., Rockhill, K. M., & D'Angelo, D. V. (2017). Risks of Preterm delivery and small for Gestational Age infants: Effects of Nondaily and Low-Intensity Daily smoking during Pregnancy. *Paediatric and Perinatal Epidemiology*, *31*(2), 144–148.
- Tucker, J. S., & Anders, S. L. (2001). Social control of health behaviors in marriage. *Journal of Applied Social Psychology*, *31*(3), 467–485.
- Tucker, J. S., Elliott, M. N., & Klein, D. J. (2006b). Social control of health behavior: Associations with conscientiousness and neuroticism. *Personality and Social Psychology Bulletin*, *32*(9), 1143–1152.
- Tucker, J. S., Klein, D. J., & Elliott, M. N. (2004). Social control of health behaviors: A comparison of young, middle-aged, and older adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *59*(4), P147–P150.
- Tucker, J. S., Orlando, M., Elliott, M. N., & Klein, D. J. (2006a). Affective and behavioral responses to health-related social control. *Health Psychology*, *25*(6), 715.
- Umberson, D. (1987). Family status and health behaviors: Social control as a dimension of social integration. *Journal of Health and Social Behavior*, 306–319.
- Velicer, W. F., Diclemente, C. C., Rossi, J. S., & Prochaska, J. O. (1990). Relapse situations and self-efficacy: An integrative model. *Addictive Behaviors*, *15*(3), 271–283.
- Weinberger, A. H., & McKee, S. A. (2011). Gender differences in smoking following an implicit mood induction. *Nicotine & Tobacco Research*, *14*(5).
- Wray, J. M., Gass, J. C., & Tiffany, S. T. (2013). A systematic review of the relationships between craving and smoking cessation. *Nicotine & Tobacco Research*, *15*(7), 1167–1182.
- Xu, J., Azizian, A., Monterosso, J., Domier, C. P., Brody, A. L., London, E. D., ... Fong, T. W. (2008). Gender effects on mood and cigarette craving during early abstinence and resumption of smoking. *Nicotine & Tobacco Research*, *10*(11), 8.
- Zaki, J., & Williams, W. C. (2013). Interpersonal emotion regulation. *Emotion*, *13*(5), 803–810.