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HHS Public Access

Author manuscript

Subst Use Misuse. Author manuscript; available in PMC 2021 March 10.

Published in final edited form as:

Subst Use Misuse. 2020 ; 55(7): 1113–1121. doi:10.1080/10826084.2020.1729198.

The great disrupter: Relationship of alexithymia to emotion regulation processes and smoking among pregnant women

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Abstract

Background—Many women continue to smoke during pregnancy, despite known risks, often in response to negative affect. Recent scholarship has begun to examine factors that decrease the success of behavioral treatments for smoking cessation in pregnancy, which are the preferred interventions. Alexithymia is one factor that may interfere with smoking cessation interventions. Alexithymia restricts access to emotional information and increases propensity toward maladaptive behaviors, including smoking. However, mechanisms underlying such effects are largely unknown.

Objectives—Using data from a longitudinal treatment study, the present research examined difficulties with emotion regulation as a potential mechanism linking alexithymia and smoking. Pregnant smokers (n=73; mean age = 24.78; SD = 4.50) completed measures related to alexithymia, smoking, emotion regulation, depression, anxiety, and anger at baseline and then again following eight sessions of Cognitive-Behavioral Smoking Cessation Treatment.

Results—Nearly 40% of the sample met the criteria for alexithymia. The alexithymia group reported higher depression, anxiety, and anger. They also reported more difficulties with emotion regulation. In a path analysis, baseline alexithymia had a significant positive indirect effect on number of cigarettes smoked at the end of treatment through difficulties with emotion regulation.

Conclusions/Importance—Similar to other studies, alexithymia limits the understanding of emotional information necessary for selection and implementation of adaptive coping responses. Our results extend the literature by suggesting that smoking may be an attempt to manage undifferentiated and unpleasant sensations created by alexithymia.

Keywords

Pregnant women; smoking; alexithymia; emotion regulation

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Introduction

Smoking during pregnancy is associated with negative physical consequences for both mother and baby (Banderali et al., 2015; Cnattingius, 2004). Smoking during pregnancy remains highest among minority status and socioeconomically disadvantaged women (Graham, Hawkins, & Law, 2010; Griffiths, Brown, Fulton, Tombor, & Naughton, 2016; Moore, Blatt, Aimin, Van Hook, & DeFranco, 2016; Riaz, Lewis, Naughton, & Ussher, 2018), despite significant declines in rates of smoking during pregnancy for women with greater education and higher incomes (Li et al., 2018). Consequently, smoking during pregnancy remains an urgent public health priority. Smoking cessation benefits both mother and baby. The benefits of cessation for infants include higher birth weight, better infant health outcomes, and prevention of cognitive delays that affect language development and behavior problems (Cnattingius, 2004; Godleski, Shisler, Eiden, & Huestis, 2018; Hernández-Martínez et al., 2017). For mothers, cessation may result in fewer complications during pregnancy and shorter labor (Britton, James, Collier, Sprague, & Brinthaupt, 2013). Most smokers seeking to quit are likely to benefit most from a combination of behavioral counseling and nicotine replacement therapies (NRT) or smoking cessation medications (e.g., varenicline or bupropion; Ussher et al., 2012). However, regarding smoking cessation in pregnancy, there is no consensus on the use of NRT and many women report reluctance to use NRT or are noncompliant with medication (Bittoun & Femia, 2010; Coleman, Chamberlain, Cooper, & Leonardi-Bee, 2011). Consequently, behavioral interventions remain the most accepted smoking cessation strategy for pregnant smokers.

Behavioral interventions have shown promise for smoking cessation in pregnancy (Bradizza et al., 2017; Lee et al., 2015; Su & Buttenheim, 2014). Unfortunately, they are not equally effective across all socioeconomic groups (Schneider, Huy, Schütz, & Diehl, 2010). Women with higher incomes are most likely to quit successfully during pregnancy (Dias-Damé & Cesar, 2015), while lower income women are more likely to continue to smoke (Yukiko, Kunihiko, & Setsuko, 2015). To address these disparities, recent attention has focused on identifying factors that facilitate or inhibit cessation success (Brooks et al., 2018; Mantzari, Vogt, & Marteau, 2012).

Alexithymia is one such factor that may interfere with the success of behavioral interventions for smoking cessation. Alexithymia is a disruption in the emotion regulation process (Lyvers, Brown, & Thorberg, 2018) and is distinguished by deficits in identifying and describing emotions, deficits in social attachment, and a limited fantasy life (Sifneos, 1973). Smokers score higher on measures of alexithymia than do non-smokers (Carton, Bayard, Jouanne, & Lagrue, 2008). Alexithymia is associated with adverse life events (Oyefeso, Brown, Chiang, & Clancy, 2008), and negatively related to socioeconomic status (Peters & Lumley, 2007). Notably, adverse life events and low socioeconomic status are commonly associated with smoking in pregnancy and pose a barrier to successful quit attempts (Moore, et al., 2016; Griffiths et al., 2016). Alexithymia may undermine behavioral interventions for smoking cessation, which target the relations between affective states and smoking (e.g., Bradizza et al., 2017; Ussher et al., 2012). Therefore, a better understanding of the role that alexithymia plays in disrupting adaptive emotion regulation processes may

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help researchers and clinicians adapt existing behavioral therapies for smoking cessation to improve cessation outcomes for pregnant women.

No known studies have examined the impact of alexithymia on smoking in pregnancy and only a few studies have examined the relationship between affect and smoking longitudinally. Thus, the purpose of the current study was to: (1) assess potential differences in emotion regulation processes between pregnant smokers with and without alexithymia and (2) utilize longitudinal data to determine the indirect effect of alexithymia on end-of-treatment smoking behavior via difficulties with emotion regulation.

Methods

Data for analyses were drawn from the baseline and post-treatment assessments of a behavioral clinical trial for pregnant women (n=73) who were identified as negative affect smokers at screening (see measures section) and expressed an interest in quitting smoking (see Bradizza et al., 2017 for more details). The University at Buffalo Institutional Review Board approved study procedures and materials.

Procedure

Study participants were recruited from a publicly-funded prenatal clinic in Buffalo, New York, USA. Participants were randomly assigned to receive standard smoking cessation treatment combined with either (a) an emotion regulation intervention (ERT) or (b) a health and lifestyle (HLS) intervention. All participants received eight individually-administered, hour-long sessions. The smoking cessation component of the intervention comprised 20 minutes of each session and the ERT or HLS intervention comprised the remaining 40 minutes of each session. Conditions were designed to be equivalent with respect to time, intensity, and client expectation of positive smoking outcomes (Bradizza et al., 2017). Consequently, participants from both conditions were combined to form a single group in the current analyses. There were no baseline differences between ERT and HLS conditions on mean alexithymia scores (47.43 [sd=10.99] and 45.35 [sd=13.05], respectively).

The smoking cessation treatment was adapted from *The Tobacco Dependence Handbook: Guide to Best Practices* (Abrams et al., 2003). The topics covered in each session were: (1) Reasons for Quitting, Smoking Triggers, Preparation for Session 2 Quit Day; (2) Benefits of Quitting Smoking, Urge Management, Quit Day Experiences; (3) Coping Strategies for Avoiding Smoking, Coping with Slips; (4) Identifying High-risk Situations; (5) Obtaining Social Support for Quitting; (6) Managing High Risk Situations; (7) Thoughts that Lead to Smoking, Managing High-risk Situations; and (8) Smoke-free Action Plan or Tips for Future Progress Towards Cessation Goal.

The topics covered in the ERT (Bradizza et al., 2017) condition were: (1) Program Rationale, Introduction to Emotions, and Emotions and Smoking; (2) Dedicated Mindfulness Practice and Mindfulness in Daily Activities; (3) Preparing for Guided Imagery/Exposure to Negative Affect Smoking Situations, Mindfulness; (4) Emotions and Urges, Physiologically Focused Guided Imagery/Exposure to Negative Affect Smoking Situations; (5–7) Mindfulness Review, Guided Imagery/Exposure to Negative Affect

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Smoking Situations; and (8) Review of Progress. Participants were also asked to complete daily homework, consisting of daily tracking of smoking, worksheets that reviewed session content, and 10 minutes of mindful breathing.

The topics covered in the HLS intervention (see Bradizza et al., 2017) were: (1) Benefits of a Healthy Lifestyle; (2) Personal Values and Priorities; (3–4) Nutrition; (5) Avoiding Carbon Monoxide Poisoning; (6) Reducing HIV Risk; (7) Balancing Life Roles; and (8) Review of Health and Lifestyle Changes. Homework in this condition involved daily tracking of smoking. monitoring changes in diet and exercise, and worksheets that reviewed the session content. Homework in this condition was designed to be equivalent in time and effort to homework in the ERT condition.

Measures

Demographic variables collected at baseline included age, education, marital status, employment status, income, and receipt of public assistance. Smoking variables collected included age first started smoking, average number of cigarettes per day, and number of prior quit attempts.

Fagerstrom Test of Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991) is a six-item scale assessing quantity of cigarette consumption, compulsion to smoke, and dependence. Summing responses yields an ordinal measure of nicotine dependence: very low (0–2), low (3–4), medium (5), high (6–7), or very high (8–10). Cronbach's α for the FTND in the present study was .58. Though low, it is common for this widely-used measure and may reflect a forced-choice answer format (Fillo, Alfano, Paulus, et al., 2016; Korte, Capron, Zvolensky, & Schmidt, 2013). Despite the low alpha, the FTND is commonly used in smoking cessation studies and, given its relationship to biological indicators of smoking (Heatherton et al., 1991), is regarded as an indicator of nicotine dependence.

Brief Smoking Consequences Questionnaire-Adult (BSCQ-A; Rash & Copeland, 2008) is a 25-item scale assessing adult smoking expectancies. Although the scale contains 10 subscales, only the 3-item negative affect reduction subscale was used to identify negative affect smokers during screening. Consistent with previous research (Copeland, Brandon, & Quinn, 1995), those who scored 5.60 or higher on the subscale were considered negative affect smokers. Negative affect reduction refers to the belief that smoking helps manage negative affect (Brandon & Baker, 1991). Cronbach's α for the negative affect subscale was .90.

Toronto Alexithymia Scale (TAS-20; Bagby, Parker, & Taylor, 1994) is a 20-item scale that measures alexithymia. Items are rated on a scale from 1 (strongly disagree) to 5 (strongly agree) and summed to form a total score. Scores of 61 or greater indicate alexithymia, 51 to 60 indicate possible alexithymia, and 50 or lower indicate absence of alexithymia (Bagby, Parker, & Taylor, 1994). The TAS-20 total score has been shown to be a reliable and valid measure of alexithymia (Bagby, Parker, & Taylor, 1994). Cronbach's α for all items in the scale was .72.

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Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) is a 10-item measure that contains two subscales: (1) Suppression (α=.73; four items) is the extent to which emotional responses are actively inhibited and is considered to be a maladaptive emotion regulation strategy, and (2) Reappraisal (α=.77; six items) is the extent to which situations are recast to change their emotional impact and is considered to be an adaptive emotion regulation strategy that has been associated with better emotional functioning (Aldao, 2012). Items are rated on a scale from 1 (strongly disagree) to 5 (strongly agree). For both subscales, higher scores indicate greater use of the particular emotion regulation strategy.

Difficulties with Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) is a 36-item measure (α=.86) assessing six domains of emotion regulation difficulties: (1) Nonacceptance of emotional responses (α=.87; six items) is the tendency to experience negative secondary emotions as a result of primary negative emotions, (2) Difficulties with goal-directed behavior (α=.80; five items) refers to struggling with staying focused and accomplishing tasks when experiencing negative emotions, (3) Difficulty controlling impulses (α=.86; six items) is the tendency to remain in control when experiencing negative emotions, (4) Awareness of emotional responses (α=.73; six items) is a tendency to avoid acknowledging and attending to emotions, (5) Strategies to control emotions (α=.88; eight items) is the belief that one has little control over negative emotions, and (6) Clarity of emotional responses (α=.71; five items) is the extent to which individuals struggle to discern emotions they are experiencing. Items are rated on a scale from 1 (almost never) to 5 (almost always). Higher subscale scores or total score indicate greater difficulty with emotion regulation.

Depression, a form of negative affect, was assessed with the 21-item **Beck Depression Inventory-II** (BDI-II; α=.85; Beck, Steer, & Brown, 1996). Individual items are summed and higher scores indicate more severe symptoms. The BDI-II is considered a reliable and valid measure of depression (Subica et al., 2014).

Anxiety, a second form of negative affect, was assessed with the 21-item item **Beck Anxiety Inventory** (BAI; α=.92; Beck et al., 1988). Individual items are summed and higher scores indicate more severe levels of anxiety. The BAI is considered a reliable and valid measure of anxiety (Beck et al., 1988).

Multidimensional Anger Inventory (MAI; Siegel, 1986) consists of 38-items in which participants rate agreement with a series of statements on a scale from 1 (undescriptive of me) to 5 (completely descriptive of me). MAI consists of four subscales: (1) Anger eliciting situations (α=.71; nine items) refers to common experiences that elicit anger (for example, “I get angry when someone lets me down”), (2) Hostile outlook (α=.61; six items) is the tendency for anger to emerge as the first emotional response, (3) Anger out (α=.70; five items) is the tendency to express anger outwardly, and (4) Anger in (α=.73; six items) is the tendency to deal with anger internally. Items are rated on a scale from 1 (completely undescriptive of me) to 5 (completely descriptive of me). The MAI has been determined to be a reliable and valid measure of anger (Siegel, 1986).

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Timeline Follow Back (Sobell & Sobell, 1995) was used to assess the mean number of cigarettes smoked in the previous seven days at baseline. TLFB uses anchor points and events of personal interest to assist participants in recalling the number of cigarettes smoked on each day. It has been shown to be a reliable measure of cigarettes smoked when administered by trained interviewers (Brown et al., 1998).

Analysis

The first aim of the present research was to assess potential differences in emotion regulation processes and affect based on baseline alexithymia status. Accordingly, independent samples t-tests were conducted using SPSS version 25 (IBM Corp., 2017) to compare group scores on the ERQ, DERS, BDI, BAI, and MAI. We used a Holm-Bonferroni correction (Holm, 1979) to control for multiple comparisons. Holm's correction rank orders the comparisons from most to least significant and estimates the Bonferroni corrected p-value based on the location of the comparison in the rank order. Comparisons stop once the null hypothesis fails to be rejected (Holm, 1979) and all further comparisons are deemed non-significant. Hedges' g (Hedges, 1981) was used to estimate effect size, as it is more conservative than Cohen's d (Ferguson, 2009).

For the second aim, we conducted a path analysis using Mplus version 8 (Muthén & Muthén, 1998–2017) to test the indirect effect of baseline alexithymia on end-of-treatment smoking via difficulties with emotion regulation (DERS total score) measured at baseline and end-of-treatment (see Figure 1). This analysis also controlled for effect of nicotine dependence (FTND score). A bootstrap with 5000 iterations was used to obtain 95% confidence intervals for the indirect effect (Hayes, 2013).

Results

Similar to prior studies examining alexithymia, we combined the possible alexithymia and alexithymia groups (Gilanifar & Delavar, 2016; Parruti et al., 2013). Thus, of the total sample ($N = 73$), 17 (23.3%) participants with TAS scores greater than 61 indicating alexithymia were combined with 12 (16.5%) participants with TAS scores between 52 and 61 indicating possible alexithymia for a total of 29 (39.8%) participants in the alexithymia group. Additionally, 44 (60.2%) participants with TAS scores less than 51 formed the no alexithymia group. Comparisons were conducted between the alexithymia group (n = 29) and no alexithymia (n = 44) groups. Table 1 contains demographic and smoking information for the full sample and by alexithymia status. There were no significant differences between groups on age, age began smoking, FTND score, and mean number of cigarettes smoked per day in the previous seven days. However, the alexithymia group had significantly more years of education as compared with the no alexithymia group [t(71)=2.91, p=.005]. Alexithymia did not change significantly from baseline to end of treatment for the entire sample (46.50 [sd=11.83] and 44.65 [13.88], respectively) or for either the ERT (47.43 [sd=10.99] and 45.29 [sd=13.80], respectively) or HLS control (45.35 [sd=13.05] and 43.88 [sd=14.36], respectively) conditions.

Table 2 reports group comparisons tested in the first aim of the study. This includes means, standard deviations, and the results of comparisons of the emotion and emotion regulation

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variables from the DERS, MAI, ERQ, BAI, and BDI by alexithymia status. Following application of the Holm-Bonferroni correction, the alexithymia group reported significantly higher scores on the DERS total score and also on the Goal, Strategies, Awareness, and Clarity subscales of the DERS. The alexithymia group reported higher Suppression subscale scores of the ERQ. On MAI, the alexithymia group reported significantly higher Anger-arousal, Anger-in and Anger-out subscale and total scores. Lastly, the alexithymia group reported higher scores on the BDI-II.

Results of the path analysis

Figure 1 depicts the path model tested in the second aim of this study. The path model had adequate fit to the data (CFI = 1.00; TLI = 1.01; χ^2 = n.s; Geiser 2013), but two paths were not significant: end of treatment nicotine dependence to end of treatment smoking, and end of treatment difficulties with emotion regulation to end of treatment smoking. End of treatment nicotine dependence did not have a significant effect on any variables.

The model was re-tested after trimming these non-significant pathways. Model fit remained in excess of established norms (CFI = 1.00; TLI = 1.07; χ^2 = *n.s*; Gesier, 2013). All paths in the model were significant. Figure 2 depicts the final path model and displays standardized beta weights, standard errors, and significance tests for each pathway.

A bootstrap with 5000 iterations was run on the final model presented in Figure 2. Baseline alexithymia had a significant indirect effect on end of treatment smoking through baseline difficulties with emotion regulation and end of treatment difficulties with emotion regulation (β = .12; 95% CI [.01, 24]).

The full path model accounted for 34% ($p < .000$) of the variance in smoking at baseline and 38% ($p < .000$) of the variance in smoking at end of treatment. Baseline nicotine dependence alone accounted for 28% of the variance in baseline smoking. Adding baseline alexithymia and difficulties in emotion regulation accounted for an additional 7% of the variance and represented a statistically significant increase ($p = .01$) over variance in baseline smoking accounted for by baseline nicotine dependence alone.

Discussion

Understanding the effects of alexithymia on emotion regulation may assist researchers and clinicians in adapting and refining behavioral interventions that could ultimately lead to improved smoking cessation outcomes for women attempting to quit smoking during pregnancy. To that end, the present research sought to: (1) assess potential differences in emotion regulation processes between pregnant smokers with and without alexithymia and (2) determine the indirect effect of alexithymia on smoking behavior via difficulties with emotion regulation. After a Holm-Bonferroni correction, results indicate that pregnant smokers with alexithymia score higher than those without alexithymia on measures of difficulties with emotion regulation and negative affect. Additionally, this study is the first known study to empirically and longitudinally examine the impact of alexithymia on smoking outcomes among pregnant smokers and found that emotion regulation difficulties mediated the relationship of alexithymia and smoking. The results of this analysis clarify the

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relationship between alexithymia and maladaptive coping strategies and illuminate clinical intervention targets.

Alexithymia may make quitting smoking especially difficult given that it restricts access to emotional information necessary for selection and implementation of adaptive emotion regulation (Taylor, 2018). Pregnant smokers report significant negative affect including depression, relationship problems, stressors and uncertainties associated with low socioeconomic status (Moore et al., 2016; Riaz, Lewis, Naughton, & Ussher, 2018; Smedberg, Lupattelli, Mårdby, Øverland, & Nordeng, 2015; Yukiko, Kunihiko, & Setsuko, 2015). Pregnancy is also a significant stressor for smokers (Schneider, Huy, Schütz, & Diehl, 2010). Among pregnant women, particularly those with low incomes, smoking may provide a brief respite during times of stress. However, given that access to emotional information is restricted for individuals with alexithymia, negative affect is experienced as an unpleasant bodily sensation rather than as an emotion (Betka et al., 2018; Mueller & Alpers, 2006). Smoking may be an attempt to manage this undifferentiated aversive bodily sensation. For an alexithymic individual, these undifferentiated, aversive bodily sensations are experienced whenever negative affect is encountered (Pollatos & Herbert, 2018; Porcelli & Taylor, 2018). Thus, long-term reliance on smoking as a preferred method for managing these aversive bodily sensations may make smoking cessation particularly difficult.

Previous research has shown that alexithymia results in increased use of unhealthy coping behaviors, including smoking (Carton, Bayard, Jouanne, & Lagrue, 2008; Peters & Lumley, 2007), though this relationship is poorly understood. The current results extend this literature by illuminating a possible pathway by which alexithymia motivates continued smoking. In our study, baseline alexithymia had a significant and positive indirect effect on end of treatment smoking through baseline and end-of-treatment difficulties with emotion regulation. The indirect effect of alexithymia is positive, indicating that alexithymia is associated with greater emotion regulation difficulties, which are in turn, associated with greater smoking. These findings are consistent with other studies of substance use disorders and alexithymia (Morie & Ridout, 2018). This model of alexithymia is consistent with the prevailing view that it impairs the regulation of emotions, which in turn motivates smoking behavior (Bonnet, Bréjard, & Pedinielli, 2013; Lyvers, Brown, & Thorberg, 2018; Zdankiewicz-Ścigała & Ścigała, 2018).

A model that incorporates emotion regulation as a mediator of the relationship between alexithymia and smoking also has valuable clinical utility. There is a substantial body of evidence indicating that emotion regulation is modifiable through clinical intervention (Fairholme, Boisseau, Ellard, Ehrenreich, & Barlow, 2010; Fehlinger, Stumpenhorst, Stenzel, & Rief, 2013; Stasiewicz et al., 2012). Thus, current findings highlight emotion regulation as a promising clinical target in a population that has demonstrated poor smoking cessation outcomes with a range of cognitive and behavioral smoking cessation interventions (Jones, Lewis, Parrott, Wormall, & Coleman, 2016; Ussher et al., 2012).

The identification of emotion regulation as a clinical target is particularly important given the ongoing controversy regarding whether or not alexithymia is modifiable through clinical intervention (de Haan, van der Palen, Wijdeveld, Buitelaar, & De Jong, 2014; Ogrodniczuk,

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Kealy, Hadjipavlou, & Cameron, 2018; Silva, Vasco, & Watson, 2017). In the absence of rigorous evidence indicating that alexithymia can be modified, targeting the specific domains of emotion regulation via existing therapeutic techniques may help increase quit rates for pregnant smokers (e.g., Bradizza et al., 2017). In the present study, alexithymia and diffculties with emotion regulation accounted for a significant portion of the variance over and above nicotine dependence. The unique variance accounted for by these variables suggests that interventions aimed at ameloriating emotion regulation difficulties could result in meaningful changes in rates of smoking cessation.

Alexithymia may also account for some of the challenges noted in engaging low socioeconomic status pregnant smokers in smoking cessation treatments (Giatras et al., 2017). The results of this study suggest that pregnant women with alexithymia may present with greater levels of anger and depression and thus may be more difficult for clinicians to engage in treatment (Probst et al., 2017; Quilty, Taylor, McBride, & Bagby, 2017). Therefore, additional efforts on the part of clinicians may be required to establish a strong therapeutic alliance. Given the prevalence of alexithymia among smokers (Carton et al., 2008), and among individuals who have experienced adversity (Oyefeso et al., 2008), screening for alexithymia among pregnant smokers, and among all smokers, may help to identify those in need of specialized clinical attention.

Despite a number of study strengths, including temporal precedence of variables in the path analysis and cotinine (a metabolite of nicotine) verification of smoking status at baseline and end of treatment, this study is not without limitations. Data were drawn from women in a single mid-sized northeastern U.S. city and may not generalize to all pregnant smokers. In addition, given the small sample size, findings may not generalize to all pregnant smokers. Additionally, data may contain self-report bias given that women recruited for this study led stressful lives and it was common for them to report feeling they needed to rush through research assessments, which is consistent with other reports of studies with this population (Giatras et al., 2017). To reduce self-report bias, this study used trained interviewers and participants were assured of confidentiality. Concerns regarding self-report may also be mitigated by a broad consensus that smoking can be reliably assessed via self-report (Blank et al., 2016; Kenkel, Lillard, & Mathios, 2003) when conducted in the context of a research study (Babor, Stephens, & Marlatt, 1987).

Conclusion

The results of this study suggest that pregnant smokers with alexithymia have greater difficulties with emotion regulation, and engage in more maladaptive emotion regulation strategies, relative to those without alexithymia. They also experience high levels of negative affect, making them more challenging to engage in treatment. Lastly, results suggest that difficulties with emotion regulation play a key role in the link between alexithymia and smoking. Taken together, these findings suggest that bolstering adaptive emotion regulation strategies would be a fruitful direction for future interventions. The opportunity to contribute to public health by assisting pregnant smokers with quitting is significant and requires immediate attention from scholars.

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Acknowledgements:

This research was supported in part y R01 DA 021802 from the National Institute on Drug Abuse and the Office of Research on Women's Health. Preparation of this manuscript was partially supported by T32 AA007583 and K01 AA027547 from the National Institute on Alcohol Abuse and Alcoholism.

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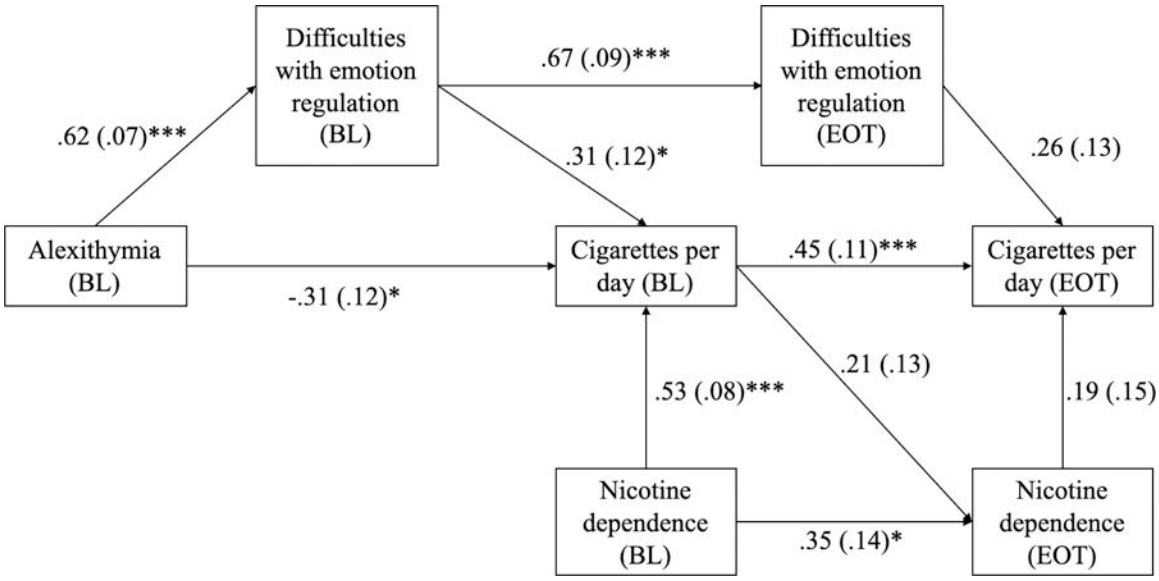

Figure 1.

Initial path model with standardized beta weights, standard errors, and significance values depicting relationship of alexithymia, emotion regulation difficulties, and smoking.

Note. BL stands for baseline measurement; EOT stands for end of treatment measurement.

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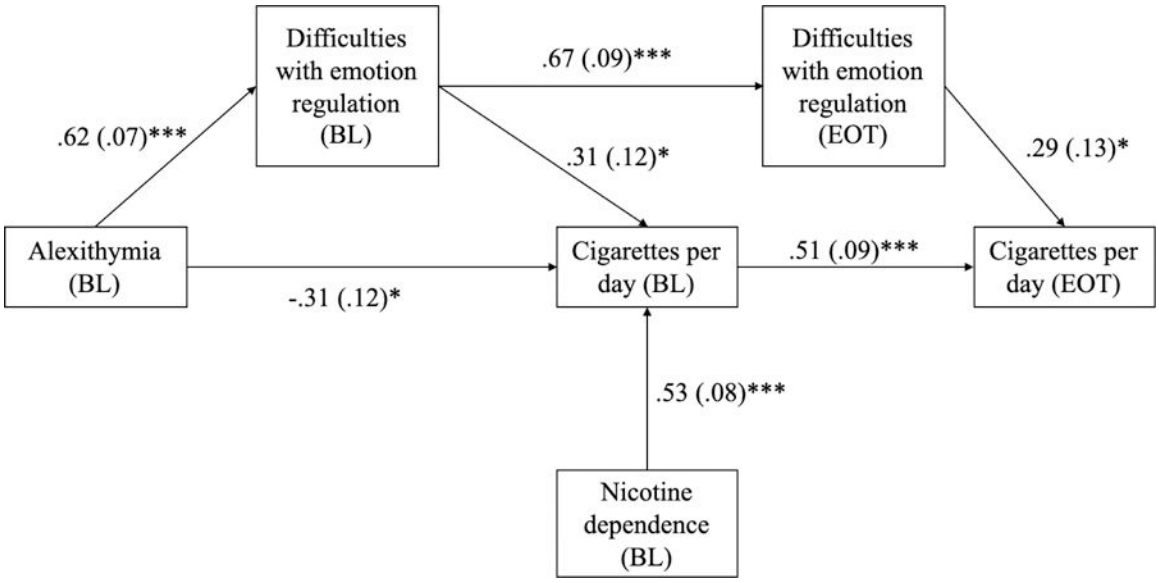

Figure 2.

Trimmed path model with standardized beta weights, standard errors, and significance values depicting relationship of alexithymia, emotion regulation difficulties, and smoking. Note. Indirect effect of alexithymia on mean cigarettes via baseline and end of treatment difficulties with emotion regulation was significant following a bootstrap with 5000 iterations (β = .12; 95% CI [.01–.24]). BL stands for baseline measurement; EOT stands for end of treatment measurement.

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Table 1.

Means and standard deviations of demographics and other variables in current study

	Full sample N=73	Alexithymia group n=29	No alexithymia group n=44
Age (y), M (SD)	24.78 (4.50)	24.59 (4.63)	24.91 (4.46)
Number of years of education (y), M (SD)	11.93 (1.90)	11.17 (1.67) **	12.43 (1.90) **
Race/ethnicity, n (%)			
African American	32 (43.84)	14 (48.28)	18 (40.91)
Caucasian	22 (30.14)	6 (20.69)	16 (36.36)
Native American	4 (5.48)	2 (6.90)	2 (4.55)
Other	4 (5.48)	0 (0.00)	4 (9.09)
Marital status, n (%)			
Single, never married	36 (49.3)	16 (55.2)	20 (45.5)
Divorced/separated	6 (8.2)	3 (10.3)	3 (6.8)
Married/Cohabitating	22 (30.1)	7 (24.1)	15 (34.1)
In a relationship, not living together	9 (12.3)	3 (10.3)	6 (13.6)
Employment status, n (%)			
Not employed, looking for work	34 (46.6)	16 (55.2)	18 (40.9)
Not employed, not looking for work/disability	12 (16.4)	7 (24.1)	5 (11.4)
Employed, part-time	18 (24.7)	5 (17.2)	13 (29.5)
Employed Full-time/Student	9 (12.3)	1 (3.4)	8 (18.2)
Total income last year, n (%)			
0 to less than $10,000	50 (68.5)	25 (86.2)	25 (56.8)
$10,000 to $20,000	15 (20.5)	1 (3.4)	14 (31.8)
$20,000 or more	8 (11.0)	3 (10.3)	5 (11.4)
Receives public assistance, n (%)	41 (56.2%)	21 (72.41)	20 (45.45)
Smoking history			
Age began smoking, M (SD)	14.85 (2.77)	15.03 (2.61)	14.73 (2.89)
Fagerstrom Test of Nicotine Dependence, M (SD)	2.15 (1.14)	3.28 (2.17)	3.41 (2.49)
Cigarettes per day, M (SD)	7.48 (9.41)	5.89 (5.18)	8.52 (11.32)
Ever tried to quit smoking, n (%)	63 (86.3)	25 (86.21)	38 (86.38)

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** Groups are significantly different at $p < .01$

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Table 2.

Results of Holm-corrected t-tests comparing emotion regulation processes by alexithymia status

Variable	Alexithymia M (sd)	No alexithymia M (sd)	t(71)	Holm corrected p-value	Hedges' g
Difficulties with Emotion Regulation Questionnaire					
Non-acceptance	14.82 (6.09)	11.86 (5.33)	−1.95	--	0.54
Goal	17.06 (4.78)	13.70 (4.35)	−2.73	.007**	0.76
Impulse	14.82 (5.09)	12.05 (5.24)	−1.92	--	0.53
Strategies	21.80 (7.57)	16.83 (5.25)	−2.531	.005**	0.85
Aware	17.41 (4.14)	13.35 (4.31)	−3.43	.003**	0.95
Clarity	13.06 (2.93)	9.66 (3.41)	−3.71	.003**	1.03
Total	99.53 (21.91)	75.98 (20.01)	−4.16	.03*	1.15
Emotion Regulation Questionnaire					
Reappraisal	27.65 (7.52)	29.57 (6.74)	1	--	0.28
Suppression	16.18 (5.07)	12.39 (5.82)	−2.42	.006**	0.67
Multidimensional Anger Inventory					
Anger-arousal	27.29 (5.25)	20.79 (7.53)	−3.32	.003**	0.92
Anger-eliciting	24.89 (5.28)	24.27 (6.19)	−0.19	--	0.05
Hostile Outlook	13.18 (3.47)	12.95 (4.16)	−0.21	--	0.06
Anger-in	17.12 (3.98)	13.34 (4.88)	−2.91	.004**	0.81
Anger-out	6.06 (1.82)	7.86 (2.01)	3.28	.004**	0.91
Total	131.06 (14.76)	115.34 (23.01)	−2.65	.006**	0.73
Beck Anxiety Inventory	22.65 (13.50)	17.84 (13.16)	−1.31	--	0.36
Beck Depression Inventory	26.12 (9.19)	19.88 (9.69)	−2.35	.007**	0.65

* $p < .05$

** $p < .01$

Note. Effect sizes for Hedge's *g* can be interpreted as .30 = small; .50 = medium; .80 = large.