Published in final edited form as:

J Subst Abuse Treat. 2020 February ; 109: 1–7. doi:10.1016/j.jsat.2019.10.006.

Effects of Smoking Cessation Treatment Attendance on Abstinence: The Moderating Role of Psychologically Based Behavioral Health Conditions

Lorra Garey^a, Andrew H. Rogers^a, Kara Manning^a, Tanya Smit^a, Jaye L. Derrick^a, Andres G. Viana^a, Norman B. Schmidt^b, Michael J. Zvolensky^{a,c,d}

^aDepartment of Psychology, University of Houston, Houston, TX

^bDepartment of Psychology, Florida State University, Tallahassee, FL

^cDepartment of Behavioral Science, The University of Texas MD Anderson Cancer Center, Houston, TX

^dHEALTH Institute, University of Houston, Houston, TX

Abstract

Available smoking cessation treatments have shown only modest quit success. Presence of a psychologically based behavioral health condition (PBHC), such as depression, anxiety, or addiction, can impact smoking cessation treatment engagement and quit success; however, the differential effect of treatment engagement on smoking cessation outcomes across smokers with and without a PBHC is unknown. The current study examined the moderating effect presence (versus absence) of a PBHC on the relation between treatment attendance and early smoking abstinence following a 4-session smoking cessation treatment. Participants included 529 (45.9% male; $M_{age} = 38.23$ years, $SD = 13.56$; 75.4% White) smokers enrolled in a large randomized controlled trial evaluating the efficacy of a transdiagnostic smoking cessation treatment. A repeated-measures latent class analysis (RMLCA) was conducted to examine treatment attendance. The effects of treatment attendance, PBHC (present/absent), and their interaction were modeled on biochemically-verified point prevalence abstinence using a latent growth curve from 1-week to 1-month post-quit. The RMLCA provided evidence for three classes: Drop-outs ($n = 197$), Titrators ($n = 89$), and Completers ($n = 243$). A significant interaction emerged such that Completers without a PBHC were significantly more likely to be abstinent relative to Completers with a PBHC ($b = 2.69$, $SE = .67$, $p < .001$) and Titrators without a PBHC ($b = 3.36$, $SE = .80$, $p < .001$). These results provide novel data that implicate the clinical importance of treatment attendance and PBHC status on smoking abstinence.

*Corresponding author: Michael J. Zvolensky, Ph.D., Dept of Psychology, 3695 Cullen Blvd., Room 126, University of Houston, Houston, TX, 77204, (713) 743-8056, mjzvolen@central.uh.edu.

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Declaration of interest statement: none.

Keywords

Cigarettes; Smoking Abstinence; Mental Health; Attendance; Treatment dose

1. Introduction

Cigarette smoking is the leading preventable cause of death and disability globally (World Health Organization, 2008) and contributes to over 480,000 premature deaths annually in the United States (US) (US Department of Health and Human Services, 2014). The majority of smokers (68%) in the US report a desire to quit (Babb, 2017) and most (55.4%) of the 38 million Americans who smoke make a serious quit attempt each year (Babb, 2017; Jamal et al., 2018). However, less than 5% of cessation attempters remain abstinent for 6 or more months (Hughes, Keely, & Naud, 2004). Effective treatment options exist to assist smokers with quitting (Roberts, Kerr, & Smith, 2013; Stead, Koilpillai, Fanshawe, & Lancaster, 2016; Wu, Wilson, Dimoulas, & Mills, 2006). These treatments vary considerably in terms of their time intensity, components (e.g., behavioral, medication, combination), and accessibility (Fiore et al., 2008; Stead et al., 2016). Variation in these factors contributes, in part, to the large range in smoking cessation treatment completion (23% to 89.2%; Belita & Sidani, 2015).

Treatment dose, conceptualized via treatment attendance, has traditionally been operationalized as a dichotomy to distinguish those who attended an a priori defined number of treatment sessions from those who did not (Matthews et al., 2013), or to capture behavior (present/absent) at a particular time-point (Snow, Connett, Sharma, & Murray, 2007). Emerging work, however, suggests that there may be a more nuanced patterning to smoking cessation treatment attendance that is not captured by these traditional modeling efforts (Jacquart et al., 2017). Specifically, Jacquart and colleagues examined data from 136 adult daily sedentary smoker with elevated anxiety sensitivity (AS) who participated in a large trial evaluating the efficacy of exercise as an adjunct to standard smoking cessation treatment relative to standard smoking cessation treatment coupled with wellness education (see Smits et al., 2016). Participants received treatment for 15 weeks, which consisted of cognitive behavioral therapy for smoking cessation and either (a) exercise on a treadmill with a rationale for vigorous-intensity aerobic exercise to aid with smoking cessation or (b) wellness education sessions focused on living a healthy lifestyle. Treatment consisted of a pre-quit (sessions 1–5) and post-quit (session 7–15) period. Markedly different patterns of treatment attendance were observed and supported three unique groups: Completers, Titrators, and Droppers. A differential dose-response pattern across treatment groups emerged such that greater session attendance (e.g., Completers) was related to an increased likelihood of smoking cessation for those in the standard treatment condition; no dose-response pattern was observed within the exercise adjunct condition. According to dose-response models of substance use (DiClemente & Scott, 1997), attending a greater number of treatment sessions should be related to better outcomes. Within the smoking literature, however, support for the dose-response model (i.e., more sessions results in better outcomes) has been inconsistent across studies (Lancaster & Stead, 2017). By extension, modest, albeit limited, evidence supports an association between adherence to nicotine replacement

therapies and smoking cessation (Raupach, Brown, Herbec, Brose, & West, 2014). As indicated by Jacquart et al., 2017, treatment-specific factors (i.e., treatment content) contribute to observed differences in treatment attendance and adherence. Individual difference factors (Hays, Leischow, Lawrence, & Lee, 2010; Raupach et al., 2014) also likely play a role in the relation between smoking cessation treatment attendance/adherence and cessation outcomes. To date, however, work has focused on treatment-specific considerations in attendance-cessation outcomes models and neglected to investigate individual differences.

One individual difference factor that may be relevant to understanding the dose-response model of smoking cessation is psychologically based behavioral health conditions (PBHC). PBHC, including depression, anxiety, and addiction, are remarkably common in the general population (American Psychiatric Association, 2013), commonly co-occur with one another (Lai et al., 2015; Stice, Presnell, & Bearman, 2001), and markedly comorbid with smoking (Lasser et al., 2000; Anzengruber et al., 2006). Individuals with a PBHC are more likely to smoke than individuals without a condition (Gfroerer et al., 2013; Lipari, Van Horn, & Administration, 2017). Further, smokers with a PBHC are at greater risk for smoking-related health problems (Centers for Disease Control and Prevention, 2013; Druss, Zhao, Von Esenwein, Morrato, & Marcus, 2011; Gfroerer et al., 2013) and are less likely to quit compared to smokers in the general population (Gfroerer et al., 2013). Despite robust evidence for differential patterns of tobacco use and quit behavior among those with a PBHC compared to the general population (Ziedonis et al., 2008), no scientific data has examined how the presence of a PBHC may uniquely impact the relation between smoking cessation treatment attendance and outcomes. Such work would have strong implications for treatment development and implementation by providing insight into a potentially deviant dose-response pattern that may contribute to tobacco-related health disparities among smokers who struggle with a PBHC.

Theoretically, presence of a PBHC, whether depression, anxiety, or addiction, may moderate the effect of smoking cessation treatment attendance on outcomes, such that those without a condition who receive the same dose (i.e., attend a comparable number of treatment sessions) are more likely to be abstinent at follow-up relative to those with a PBHC. The conceptual basis for this model may stem from environmental and (poor) emotion regulation factors. For example, individuals with a PBHC compared to those without are more likely to be exposed to chronic stress (e.g., stressful living conditions, economic strain; (Center for Behavioral Health Statistics and Quality, 2017). They are also more likely to have difficulty accessing adaptive coping skills to manage chronic stressors, and as a possible consequence, experience greater challenges regulating their emotion (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Gross & Jazaieri, 2014; Sheppes, Suri, & Gross, 2015). Consequently, at similar treatment doses, smokers with a PBHC compared to those without may not be as responsive to smoking cessation treatment due to exposure to greater chronic stress and more taxed emotion regulation systems. However, no tests of a psychological health model for smoking cessation attendance have been conducted. Given the high rate of co-occurrence across PBHCs and the lack of research for how this psychological construct relates to smoking cessation attendance, taking a global perspective to test the moderating role of PBHC on the smoking cessation attendance-smoking cessation relation would critically

advance current understandings of how smoking-related disparities are developed and are maintained within individuals with and without a PBHC.

The current study examined the interactive effect of smoking cessation treatment attendance patterns and PBHC on smoking abstinence during early abstinence (i.e., 1-week post-quit to 1-month post-quit). Early abstinence was examined to provide a more thorough understanding of the impact of treatment attendance on the early stage of quitting. This approach is consistent with a phase-based process model of quitting, which purports phase-specific challenges that can interfere with smoking abstinence at different stages (early vs late) of abstinence and warrant specialized intervention (Baker et al., 2010). Identifying potential for specialized treatment matched to stages of quitting requires independent examination of the quit process within different phases of abstinence; thus, the current study sought to add to the growing literature on the early phase of quitting. We hypothesized a significant interaction between smoking cessation treatment attendance patterns and PBHC on early abstinence.

2. Materials and Methods

2.1. Participants

Participants included 529 treatment seeking adult daily smokers (45.9% male; $M_{age} = 38.23$ years, $SD = 13.56$) enrolled in a large randomized controlled trial evaluating the efficacy of a four-session integrated transdiagnostic smoking cessation treatment relative to a control (see Zvolensky et al., 2018). Eligibility criteria for the trial included: (1) older than 18 years of age; (2) being a daily smoker for at least 1 year; (3) currently smoking a minimum of 8 cigarettes per day; and (4) motivation to quit smoking (e.g., reported at least a 5 on a 10-point scale). Exclusion criteria included: (1) current use of pharmacotherapy for smoking cessation (except the nicotine patch, which was provided by the study); (2) limited mental competency and inability to provide informed, voluntary, written consent; (3) psychotic disorder, uncontrolled bipolar disorder, serious suicidal intent that warranted hospitalization or immediate treatment; and (4) planning to relocate within the next 6 months.

Most participants identified as White (75.4%), with 9.5% as Black, 3.4% as Hispanic, 0.9% as Asian, and 1.7% as “other;” 9.1% did not report their race. Participants smoked an average of 16.56 ($SD = 9.55$) cigarettes per day and reported moderate levels of nicotine dependence (Fagerström Test for Cigarette Dependence: $M = 5.16$, $SD = 2.27$). On average, participants reported starting to smoke at age 14.84 ($SD = 3.52$) years, reported becoming a regular daily smoker at age 17.42 ($SD = 3.79$), and reported 19.66 ($SD = 13.44$) years of being a daily smoker. Additionally, 43.5% of participants met criteria for at least one Axis I psychological disorder, as assessed by the Structured Clinical Interview for *DSM-IV*-Non-Patient Version (SCID; (First et al., 1995; Spitzer, Williams, Gibbon, & First, 1990). See Table 1 for prevalence rates across specific psychological disorders.

2.2. Measures

Demographics.—Demographic information collected included sex, age, and race. Items from this measure were used to describe the sample.

Structured Clinical Interview for DSM-IV-Non-Patient Version (SCID-N/P).—The SCID-N/P (First et al., 1995; Spitzer et al., 1990) is a clinician-administered measure designed to assess prevalence/incidence of current (past month) psychiatric diagnoses. Trained staff administered the interviews; doctoral-level psychologists supervised the interviewers. Approximately 12.5% of the audio-recorded interviews were checked for accuracy; no cases of diagnostic coding disagreement were noted. Consistent with taking a holistic approach to understand the role of PBHC (defined in the present study as current mood, anxiety, substance use, or eating disorder) in the hypothesized relations, psychiatric diagnoses were dummy coded to create a dichotomized PBHC item (0 = absent; 1 = present). Within the current sample, no eligible participant met diagnostic criteria for an Axis I disorder other than the defined PBHC (see Table 1); therefore, those who were coded ‘0’ represent eligible participants without any mental health diagnosis or PBHC.

Fagerström Test for Cigarette Dependence (FTCD).—The FTCD is a 6-item scale that assesses gradations in cigarette dependence (Fagerström, 2012; Heatherton, Kozlowski, Frecker, & Fagerström, 1991). Scores range from 0–10, with higher scores reflecting higher levels of physiological dependence on cigarettes. In the current study, the FTCD total score was used to characterize cigarette dependence across the sample and included as a covariate.

Smoking History Questionnaire (SHQ).—The SHQ was used to assess smoking rate, years of daily smoking, and other characteristics (Richard A. Brown, Lejuez, Kahler, & Strong, 2002). Smoking rate was obtained from the question, “Since you started regular daily smoking, what is the average number of cigarettes you smoked per day?” Years as a daily smoker was assessed by the question, “For how many years, altogether, have you been a regular daily smoker?”.

Point Prevalence Abstinence (PPA).—Self-reported smoking status was assessed in-person at follow-ups. The present study utilized data collected at 1-week post-quit, 2-weeks post-quit, and 1-month post-quit. The Timeline Follow-Back (Brown et al., 1998; Sobell & Sobell, 1992) procedure was used at all assessments to assess cigarette consumption at each day since the previous assessment. The assessment has demonstrated good reliability and validity with biochemical indices of smoking (Sobell & Sobell, 1996). Self-reported abstinence was verified by expired carbon monoxide (CO) using a CMD/CO Series Carbon Monoxide Monitor (Model 3110; Spirometrics, Inc., Auburn, ME). Self-reported abstinence was overridden by a positive expired CO reading (> 8ppm; SRNT Subcommittee on Biochemical Verification, 2002). Missing self-reported abstinence or biochemical verification of smoking status was marked as “smoked.” PPA was defined as self-reported “no smoking, not even a puff,” in the 7 days prior to any assessment. Self-reported abstinence was biochemically verified.

Treatment Attendance.—Participants were coded as either present or absent for each of the 4 weeks of treatment. Participants who attended the scheduled treatment session were coded as present (1) and those who did not were coded as absent (0).

2.3. Procedure

Data for the present study were collected during a multi-site randomized controlled clinical trial examining the efficacy of two smoking cessation interventions described in detail elsewhere (Schmidt, Raines, Allan, & Zvolensky, 2016; Zvolensky et al., 2018). The current study is a secondary analysis of the main study to address the interactive effect of smoking cessation treatment attendance patterns and PBHC on smoking abstinence during early abstinence. Community member interested in the current study contacted the research team. Interested people were provided with a detailed description of the study via phone and screened for initial eligibility. Callers eligible at the phone screener were then scheduled for an initial baseline appointment. Participants provided written informed consent, were interviewed using the SCID-I/NP, and completed a computerized self-report assessment battery, as well as biochemical verification of smoking status to evaluate eligibility criteria at baseline. The methodology of the present research design is described in detail elsewhere (Schmidt et al., 2016; Zvolensky et al., 2018). The central focus of the current study does not overlap with previously reported findings from this dataset. The Institutional Review Boards at the University of Vermont and Florida State University approved the study protocol (clinicaltrials.gov #).

2.4. Data Analytic Plan

First, treatment and follow-up attrition was examined. Analyses were conducted to examine differences in treatment (defined as not attending a single treatment session [session 1–4] versus attending at least one; Schmidt et al., 2016). Second, a repeated-measures latent class analysis (RMLCA; McCarthy, Ebssa, Witkiewitz, & Shiffman, 2015) was conducted to evaluate patterns of treatment attendance. Attendance at treatment sessions 1–4 (0 = absent; 1 = present) served as class indicators. We estimated 1 to 4 classes; the optimal number of classes was determined by multiple indices of model fit and classification precision, including the Akaike Information Criterion (AIC; Akaike, 1974), Bayesian Information Criterion (BIC; Schwarz, 1978), the sample-size adjusted BIC (aBIC; Sclove, 1987), the Lo-Mendell-Rubin likelihood ratio test (LMR-LRT; Lo, Mendell, & Rubin, 2001), the bootstrap likelihood ratio test (BLRT; McCutcheon, 1987; McLachlan & Peel, 2000), and interpretability of latent classes.

Third, a linear latent growth curve model (LGCM) analysis was used to evaluate PPA trajectory across 1-week, 2-week, and 1-month post-quit (i.e., after treatment session 4/quit day), with the intercept centered at 1-month post-quit. PPA was treated as a categorical variable (coded 0 = abstinent, 1 = smoking). Model fit information is not provided in nonlinear models as means, variances, and covariances are not sufficient statistics for χ^2 estimation (Edwards, Wirth, Houts, & Xi, 2012). Sex, age, treatment condition, cigarette dependence (FTCD), attendance pattern, presence of PBHC, and interaction between attendance pattern and presence of PBHC were included as predictors of the intercept in the conditional model. Analyses were conducted in Mplus version 8 (Muthén & Muthén, 2012) using robust maximum likelihood with the Yuan-Bentler (Y-B) scaled χ^2 index to correct for data nonnormality.

3. Results

Of the 529 participants eligible for the trial, 67.1% attended treatment session 1, 58.2% attended session 2, 52.9% attended session 3 and 50.1% attended session 4; 40.3% attended all sessions. Retention rates were 47.4% at the 1-week follow-up, 42.9% at the 2-week follow-up, and 39.5% at the 1-month follow-up (see CONSORT diagram previously published in Schmidt et al., 2016). Biochemically verified PPA was 20.8% at the 1-week follow-up, 21.0% at the 2-week follow-up, and 16.3% at the 1-month follow-up. Participants who attended at least one treatment session did not differ from participants who did not attend any treatment sessions in terms of age ($t = -1.34$, $p = 0.18$), gender ($\chi^2[1] = 0.45$, $p = 0.50$), race ($\chi^2[5] = 1.98$, $p = 0.85$); groups differed on FTCD score ($t = -2.17$, $p = 0.04$).

3.1. Treatment Attendance Patterns

Fit indices for 1-through 4-class solutions are provided in Table 2. Evaluation of fit indices and interpretability supported a 3-class solution. Attendance patterns identified included: Completers ($n = 243$; 45.9%), Titrators ($n = 89$; 16.8%) and Drop-outs ($n = 197$; 37.2%). Completers were characterized by a maintained high probability of treatment attendance; Titrators demonstrated an initial high probability of treatment attendance that decreased over the course of treatment; and Drop-outs evinced a consistently low probability of treatment attendance. Figure 1 presents the corresponding class plot. The distribution of participants following each attendance pattern did not significantly differ between treatments ($\chi^2(2) = 1.27$, $p = .53$), sex ($\chi^2(2) = 2.55$, $p = .28$) or PBHC status ($\chi^2(2) = 1.34$, $p = .51$).

3.2. LGCM

The LGCM was restricted to Completers and Titrators given that Drop-outs withdrew prior to quit-week. Table 3 contains parameter estimates for the conditional model (ie, models with predictors). Results yielded a significant attendance pattern by PBHC status interaction such that Completers without a PBHC were significantly more likely to be abstinent (24.9%) relative to Completers with a PBHC (14.4%; $b = 2.69$, $SE = .67$, $p < .001$) and Titrators without a PBHC (5.2%; $b = 3.36$, $SE = .80$, $p < .001$); abstinence did not differ across Titrators with and without a PBHC (5.1% vs 5.2%, respectively; $b = -0.83$, $SE = .89$, $p > .05$) nor did abstinence differ between Completers and Titrators with a PBHC ($b = -.17$, $SE = .76$, $p > .05$).¹ See Figure 2.

4. Discussion

The current study examined the moderating effect of PBHC on the relation between treatment attendance pattern and smoking cessation. Consistent with prediction, data supported three unique attendance patterns: Drop-outs, Titrators, and Completers. Growth models constrained to Titrators and Completers revealed a significant interactive effect of attendance pattern and PBHC on abstinence at 1-month post-quit follow-up, such that Completers with a PBHC were significantly less likely to be abstinent at follow-up relative

¹The overall pattern of findings did not change when controlling for nicotine replacement use at 1-month post-quit.

to those without a PBHC as well as Titrators without a PBHC. Effects were observed after controlling for the influence of sex, age, treatment condition, and cigarette dependence.

Extant work has highlighted the influence of individual difference factors, including sex and cigarette dependence, in smoking cessation success (Caponnetto & Polosa, 2008), but this is the first study to examine PBHC as an individual difference factor in the relation between smoking cessation treatment attendance and outcomes. Based on the present findings, it seems that PBHC is centrally relevant to smoking abstinence among participants who complete treatment. Specifically, smokers who completed treatment were more likely to be abstinent at follow-up if they did not meet criteria for a PBHC. This finding further accentuates pathways that contribute to tobacco-related health disparities among smokers with mental illness (Williams, Steinberg, Griffiths, & Cooperman, 2013). It is important to note, however, that similar disparities in treatment response did not emerge when participants completed only a portion of the treatment session. Collectively, findings provide evidence that smokers who do not complete a full dose of treatment are equally likely to be abstinent at follow-up irrespective of their PBHC status, whereas among those who complete treatment, the likelihood of abstinence varies as a function of PBHC. Additional work should parse differential effects of internalizing vs externalizing disorders on the observed findings.

A treatment dose-smoking cessation response emerged for smokers without PBHC. Synthesized work broadly supports a dose-response for smoking cessation (Fiore et al., 2008), yet this effect differs across populations and treatments (Lancaster & Stead, 2017; Raupach et al., 2014). Based on current findings, presence of a PBHC may, in part, contribute to mixed findings for a dose-response effect following smoking cessation treatment. Smokers with a PBHC experience psychosocial stressors that may complicate their quit success (Leventhal et al., 2012). One avenue by which these factors may impede quit success may relate to concentration and encoding information (Toll, Sobell, Wagner, & Sobell, 2001). When smokers interested in quitting have to manage extreme life stressors while concurrently attempting to assuage withdrawal symptoms, as is often the case with smokers who experience mental illness (Williams & Ziedonis, 2004), their cognitive capacity to manage these two experiences may be depleted. Thus, distress and inability to effectively cope with emotional experiences, in turn, contribute to relapse ((Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005; Cosci, Pistelli, Lazzarini, & Carrozzi, 2011; Farris, Zvolensky, & Schmidt, 2016). Future work is needed to isolate nuanced dose-response patterns that may be unique to smokers with a mental illness. From a treatment development perspective, it may be useful to examine such relations within the context of a dismantling study to identify treatment elements that may influence patterns of attendance and cessation across those with and without mental illness.

Clinically, the present findings highlight the importance of PBHC in smoking cessation treatment. Indeed, these results align with and bolster the growing recognition that specialized treatment is needed to address the unique needs of smokers with mental illness (Banham & Gilbody, 2010; Gfroerer et al., 2013). Informed by present data, it may be advisable for clinicians to frequently assess engagement in treatment and integrate skills that may be applicable to smokers with mental illness across a range of life domains, such as

acceptance based training (Gifford et al., 2004). Moreover, given the success of motivational interviewing to strengthen treatment engagement (Heckman, Egleston, & Hofmann, 2010), clinicians may consider employing these tactics to assist with smoking cessation participation and abstinence adherence.

Several study limitations should be noted. First, the sample mainly consisted of White smokers. Future work would benefit from replication with a more racially/ethnically diverse sample of smokers to maximize the generalizability of these findings. Second, participants were treatment-seeking daily smokers with moderate levels of cigarette dependence. Sampling from a wider range of smoking populations (i.e., lighter and heavier smokers) may ensure the generalizability of the current findings to the general smoking population. Third, due to lack of outcome data, Drop-outs were excluded from abstinence analysis, which limits the scope of our ability to examine the relation between treatment attendance and outcome. Future work should aim to increase data collection after dropout to better understand the outcome after only brief treatment and the reasons for early treatment dropout. Fourth, the present study focused on early cessation (i.e., up to 1-month post-quit). Given initial support for the observed models, future work should expand this work to more distal outcomes. By extension, the observed cessation rates were slightly lower than those reported in pharmacological trials (see Fiore et al., 2008). Considering that the current study utilized a relatively mild pharmacological component that was offered on an optional basis, future work may test a more severe pharmacological cessation medication as an adjunct to the developed psychotherapy treatment. Finally, although the broad-based approach to mental health likely makes the current work applicable to a larger population, the current sample did not permit examining the potential influence of severe mental illness on the studied patterns. Considering extensive evidence has underscored the increased quit difficulty and smoking-related health disparities experienced by individuals with severe mental illness (Banham & Gilbody, 2010), additional research is needed to understand the role of severe mental illness in the treatment attendance-smoking cessation relation and how severe mental illness may differentially affect this relation relative to no mental illness and PBHCs. Similarly, the current study focused on clinically severe PBHCs. Yet, emerging data highlight the importance of subclinical affective disturbances and vulnerability in psychosocial treatment attendance and smoking cessation (Garey et al., 2019; Leventhal & Zvolensky, 2015; MacPherson, Stipelman, Duplinsky, Brown, & Lejuez, 2008). Future work may benefit from examining the impact of these affective vulnerabilities, including distress tolerance, emotion regulation or anxiety sensitivity, on the observed relations. A holistic statistical approach, such as structural equation modeling or latent profile analysis, would provide the greatest insights into the role of affective vulnerability on the treatment attendance-smoking cessation association.

5. Conclusions

Overall, the current study identified psychologically based behavioral health conditions as important individual difference factors in determining smoking cessation success. Furthermore, these results suggest that mental illness may have a profound impact on treatment response for individuals attempting to quit. These results have the potential to

inform future smoking-based treatment interventions for individuals with and without mental illness.

Acknowledgments

Funding: This work was supported by the National Institute of Mental Health (grant number R01- MH076629); and the National Institute of Drug Abuse (grant number 1F31DA043390).

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Highlights

- Examined treatment attendance, psychopathology and their interaction on abstinence
- A significant interaction emerged between treatment attendance and psychopathology
- Completers without psychopathology were more likely to be abstinent
- Highlights the clinical importance of treatment attendance and psychopathology

Figure 1.
Treatment session attendance patterns.

Figure 2.
Abstinence across treatment attendance pattern by psychologically based behavioral health condition status.

Table 1.**Primary Psychiatric Diagnosis at Baseline**

Axis I Diagnosis	Percentage
<i>Any Axis I Diagnosis</i>	<i>43.5</i>
Major Depressive Disorder	4.7
Dysthymic Disorder	1.7
Bipolar I Disorder	0.2
Bipolar II Disorder	0.2
Seasonal Affective Disorder	0.2
Mood NOS	0.4
Alcohol Use Disorder	4.2
Substance Use Disorder	2.7
Social Anxiety Disorder	10.4
Specific Phobia	5.5
Obsessive-Compulsive Disorder	1.3
Posttraumatic Stress Disorder	3.0
Generalized Anxiety Disorder	6.2
Anxiety NOS	1.5
Eating Disorder	0.2
Other	1.1
<i>No Mental Health Diagnosis</i>	<i>56.3</i>

Note. *N* = 528, 1 participant was missing a diagnosis. NOS = Not otherwise specified.

Table 2.

Evaluative statistics for model selection.

Model (Class Selection)	AIC	BIC	aBIC	LMR-LRT	BLRT	Entropy
1 Class	2862.01	2879.09	2866.39	--	--	--
2 Class	1937.66	1976.10	1947.53	905.47 *	934.35 *	0.92
3 Class	1902.08	1961.87	1917.43	44.17 *	45.58 *	0.85
4 Class	1910.80	1991.95	1931.64	1.24	1.28	0.80

* Note. <.001; **Bold** indicates selected model. AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; LMR-LRT = Lo-Mendell-Rubin likelihood ratio test; BLRT = bootstrap likelihood ratio test.

Table 3.
Parameter estimates for conditional model predicting PPA among Completers and Titraters.

Parameter	Estimate	SE	p
Intercept	.00	.00	--
Intercept Variance	53.46	20.02	.008
Slope	1.01	.32	.001
Slope Variance	2.06	1.38	.14
I-S Covariance	10.49	5.41	.05
Sex	-.66	.46	.16
Age	-.03	.02	.11
Treatment Condition	-.27	.45	.56
Cigarette Dependence	.19	.11	.09
Attendance Pattern	3.36	.80	<.001
PBHC	2.69	.67	<.001
Attendance Pattern X PBHC	-3.52	1.12	.002

Note. $N = 311$. Sex coded as 0 = Male, 1 = Female. Treatment coded as 1 = Smoking Treatment and Anxiety Program, 2 = Standard Cessation Program; Attendance Pattern coded as 0 = Completers, 1 = Titraters; PBHC = Psychologically based behavioral health condition. PPA = Point-Prevalence Abstinence, coded as 0 = Abstinent, 1 = Smoked. *SE* = Standard error.