

The role of posttraumatic growth and timing of quitting smoking as moderators of the relationship between stigma and psychological distress among lung cancer survivors who are former smokers

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Abstract

Objective: Patients diagnosed with lung cancer report high levels of stigma and psychological distress. This study examined posttraumatic growth among lung cancer survivors as a potential buffer against this relationship between stigma and psychological distress and examined how these relationships differed by the timing of quitting smoking (pre versus post-diagnosis).

Methods: Stages IA and IB non-small-cell lung cancer survivors ($N = 141$) who were former smokers, 1–6 years post-treatment, and had no evidence of disease completed standardized questionnaires assessing stigma, posttraumatic growth, timing of quitting smoking history, and psychological distress.

Results: Hierarchical linear regression and simple slope analyses indicated that among those who quit smoking prior to diagnosis (pre-diagnosis quitters), stigma had a positive association with psychological distress at high levels of posttraumatic growth ($p = 0.003$) and had a positive (but non-significant) association with psychological distress among those with low levels of posttraumatic growth ($p = 0.167$). Among those who quit smoking after diagnosis (post-diagnosis quitters), stigma had a positive association with psychological distress among those with low levels of posttraumatic growth ($p = 0.004$) but had no relationship among those with high levels of posttraumatic growth ($p = 0.880$).

Conclusions: Findings indicate that posttraumatic growth buffers against the negative effects of stigma on psychological distress but only among post-diagnosis quitters. Future interventions could focus on fostering posttraumatic growth as a way to decrease the negative effects of stigma.

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Background

Stigma occurs when individuals or society label a person as tainted or view them less favorably than others [1]. Health-related stigma is a specific type of stigma in which a person perceives and/or internalizes an experience of exclusion, rejection, blame, or devaluation directly linked to the belief that their behavior has caused their current health condition [2]. Health-related stigma has been shown to be associated with a variety of negative psychosocial and medical outcomes including depression, limited social support, and decreased treatment adherence [3,4].

Because of its association with smoking, lung cancer represents a disease in which many patients (both smokers and non-smokers) experience stigma [5–7]. Whereas stigma represents the labeling or treatment (by society or an individual) of a person as less favorable or tainted (enacted stigma) [1], most research in lung cancer stigma has focused on perceived (felt) and internalized (self) stigma [2,8–12]. Although a connection between smoking and lung cancer is well-founded (over 80% of diagnoses for lung cancer

occur in current or former smokers [13]), the unintended consequences of lung cancer stigma are deleterious. Because smoking is often considered a ‘choice’, lung cancer patients with a smoking history are often seen as responsible, and sometimes deserving, of this deadly cancer [14]. Lung cancer patients report experiencing stigma from family, friends, and doctors (perceived or felt stigma) [8] as well as internalized (self) stigma [9]. Moreover, stigma often continues several years after patients quit smoking [8].

Empirical research on lung cancer stigma is limited [15] but has shown that it can negatively impact a variety of patient outcomes. For instance, stigma among lung cancer patients has been shown to be associated with a variety of adverse psychosocial outcomes [2,8,10–12,15–18], including greater rates of depression [2,18] and decreased quality of life [2]. Lung cancer stigma predicts depressive symptomatology even after controlling for relevant demographic, clinical, and psychosocial variables [18].

Little research has examined potential factors that buffer or provide some protections against the negative effects of stigma on psychosocial outcomes. Discovering

a potential buffer against the negative effects of lung cancer stigma could guide the development of psychosocial support interventions to promote lung cancer patients' psychological adjustment. One potential buffer to the relationship between lung cancer stigma and psychological distress may be posttraumatic growth [19], a type of psychosocial adaptation or coping mechanism that sometimes occurs among individuals dealing with life-threatening diseases (such as cancer) in which they focus on positive self-appraisals and experience positive growth or benefit finding due to their illness, [19–23]. This positive growth can be emotional and/or behavioral (e.g., greater acceptance and health behavior change) and often promotes better psychological adjustment and reduced distress. For instance, one study of head and neck cancer and lung cancer patients [24] found that posttraumatic growth reduced the negative effects of stigma on psychological well-being. However, this study did not consider smoking status and quitting history (pre versus post-diagnosis quitting) of the patient as a possible source of influence.

Because posttraumatic growth requires positive change or growth, it may only reduce the effects of stigma on psychological distress among lung cancer survivors with a history of smoking (more than 100 cigarettes in their entire life). In other words, posttraumatic growth may only buffer against stigma's negative effects among those who have 'room for growth' or 'change' to make by quitting smoking. The present study tested the hypothesis that posttraumatic growth would buffer against the negative effect of lung cancer stigma on psychological distress and examined how this effect differed according to timing of quitting history (pre versus post-diagnosis quitting).

Methods

Participants and procedures

Study patients were identified through queries of institutional and clinical research databases at Memorial Sloan Kettering Cancer Center. Previous papers examining dyspnea [25], fatigue [26], quality of life [27], symptom burden [28], and health behaviors [29] have been published from this dataset of early stage, lung cancer survivors. Eligibility criteria included the following: diagnosis of primary stage IA or IB non-small-cell lung cancer, surgical resection with curative intent, being between 1–6 years post-surgical treatment, and no evidence of disease at the time of recruitment. Additional criteria were as follows: no severe psychiatric or cognitive impairment that would be likely to interfere with study participation (as defined by less than four errors on the Brief Six-Item Screener [30]), the ability to give informed consent, and reachable by telephone.

All potentially eligible participants ($n=503$) were identified and mailed a consent form and letter inviting them to

participate in a study of lung cancer survivors. Two weeks later, all individuals received a telephone call to confirm eligibility and assess study interest. All interested participants provided verbal informed consent via telephone. After providing consent, the participants were able to choose between completing the 45 to 60-min survey via telephone or mail. All potential participants were offered print materials summarizing the availability of psychosocial and rehabilitation services for cancer survivors at Memorial Sloan Kettering Cancer Center (i.e., the Post-treatment Resource Program) as well as informational materials on survivorship (i.e., the National Cancer Institute brochure entitled, 'Facing Forward: Life after Cancer Treatment').

Measures

Demographics

Participants reported age, sex, race/ethnicity, marital/partnership status, education, employment status, and income.

Medical characteristics

The thoracic surgical database was used to identify pathological disease stage and time since surgical resection.

Psychological distress

Psychological distress was measured by the 14-item Hospital Anxiety and Depression Scale (HADS) [31], a self-report measure of distressed mood designed for use in medical populations.¹ Each item on this scale is rated on a four-point scale (0 to 3), and all items (anxiety and depressive symptoms) are summed to create a HADS total score ($\alpha=0.85$ in the present study).

Stigma

Lung cancer stigma was measured with an adapted version of the Shame and Stigma Scale in head and neck cancer [32].² The adapted scale retained the prior stigma and regret subscales (with some minor modification of items) but did not include the shame with appearance or the social/speech concerns subscales, which are specific to the concerns of patients diagnosed with head and neck cancers. In place of these two subscales, items assessing feelings of guilt and regret (internalized stigma) for smoking behavior were added. Thus, the adapted Shame and Stigma Scale contained two subscales: (a) perceived stigma (10 items; e.g., 'I feel others consider me responsible for my cancer'; $\alpha=0.79$) and (b) internalized stigma (11 items; 'If I had a second chance, I would do many things differently'; $\alpha=0.77$). The total scale consisted of 21 items, each rated on a four-point scale (0=strongly disagree to 3=strongly agree). All items are summed to create a total Shame and Stigma score ($\alpha=0.81$ in the present study).

Posttraumatic growth

Posttraumatic growth was measured with the widely used Posttraumatic Growth Inventory (PTGI) [19], which measures the degree to which patients have experienced positive outcomes due to their cancer.³ This scale consists of 21 items, each rated on a six-point scale (0=I did not experience this change to 5=I experienced this change to a very great degree). All items are summed to create a total PTGI score ($\alpha=0.96$ in the present study).

Smoking status and quitting history

Patients reported current smoking status, including whether they had smoked at least 100 cigarettes in their life (never or ever smoker), whether they had quit smoking before diagnosis, when they stopped smoking (if no longer a smoker), and if they were a current smoker. Four discrete smoking status categories were created from these variables: *never smokers*, *pre-diagnosis quitters* (smokers who quit before their diagnosis), *post-diagnosis quitters* (smokers who quit after their diagnosis), and *current smokers*.

Analytic plan

Descriptive statistics were calculated for demographic and medical variables, HADS, stigma, and PTGI. *T*-tests were utilized to examine differences in the levels of HADS, stigma, and PTGI according to the timing of quitting smoking. Bivariate correlations were calculated to examine the degree of association between HADS, stigma, and PTGI. Finally, hierarchical linear regression was used to examine PTGI and timing of quitting as potential moderators of the relationship between stigma and HADS. To rule out potential confounding variables, patient (i.e., age, sex, marital/partnership status, education, employment status, and income) and medical variables (i.e., disease stage and time since surgical resection) were examined as predictors of HADS. Race and ethnicity were not included as control variables because this was a predominately (95.0%) White, non-Hispanic sample. All significant demographic and medical predictors of HADS were included in the final model. Measures of stigma and PTGI were centered to create interaction terms. The centered variables were utilized in the final hierarchical linear regression model. Simple slopes analyses were calculated to interpret any significant two-way or three-way interactions in the hierarchical linear regression.

Results

Participants

Of the non-small-cell lung cancer patients identified in the database ($n=503$), 222 were screened out because of not meeting the eligibility criteria. The most common reasons for exclusion included the following: current malignancy ($n=71$), more than 6 years post-surgical

resection ($n=46$), deceased ($n=26$), diagnosis of stages II–IV disease ($n=25$), or non-English speaking ($n=17$). Of those who were eligible, 19 patients could not be reached via telephone and 78 declined to participate. The main reasons for refusal to participate included the following: lack of interest in the study ($n=23$), wishing to avoid discussing cancer ($n=20$), and feeling too ill to participate ($n=10$). A final total of 183 lung cancer survivors (65% of eligible patients) provided informed consent and participated in the study from September 2005 to July 2007. There were no significant differences on major demographic or medical characteristics (age, sex, time since surgical resection, or pathological disease stage) between participating and non-participating patients ($p > 0.05$).

In the present study, one patient had missing data on smoking status and was excluded. Never smokers ($n=30$) were excluded from analyses because five items on the Shame and Stigma Scale specifically assess guilt related to smoking. Thus, these items are non-applicable to never smokers and all never smokers had missing data on these items. Additionally, one participant from the original cohort ($n=183$) did not answer any of the study variable items (stigma, PTGI, and HADS) and was excluded as well. Of the remaining participants ($n=152$), there were too few current smokers ($n=10$) to adequately power analyses of current smokers compared with those who quit prior to or after diagnosis. Thus, current smokers were excluded from the analyses resulting in a final sample of lung cancer survivors who were former smokers who dif-

Table 1. Demographic and clinical characteristics of the sample ($N=141$)

Characteristic	Number	Percentage
Age (in years)	$M = 70.7$	$SD = 8.5$
Gender		
Female	87	61.7
Male	54	38.3
Relationship status		
Married/partnered	82	58.2
Race		
Non-Hispanic White	134	95.0
Non-Hispanic Black	5	3.5
Non-Hispanic other	2	1.4
Ethnicity		
Hispanic	5	3.5
Education		
Less than college degree	83	58.9
College degree or higher	58	41.1
Employment status		
Employed	32	22.7
Income		
>\$50,000	68	48.2
Missing (n)	25	17.7
Pathological disease stage		
Stage IA	95	67.4
Stage IB	45	31.9
Missing (n)	1	0.7
Time since surgical resection (years)	$M = 3.4$	$SD = 1.2$

ferred as to when they quit smoking (pre versus post-diagnosis quitting). A total of 141 lung cancer survivors were included in the present analyses. The final two categories of timing of quitting smoking included in the hierarchical linear regression model were as follows: *pre-diagnosis quitters* ($n=98$) and *post-diagnosis quitters* ($n=43$).

Demographic and medical characteristics

All demographic and medical characteristics reported represent the entire sample included in the present study ($n=141$). The mean age of participants was 70.7 years ($SD=8.5$). Participants were primarily female (61.7%), White (95.0%), married/partnered (58.2%), and had less than a college degree (58.9%). Lung cancer survivors' mean time since resection was 3.4 years ($SD=1.2$). Detailed sample information on demographic and medical characteristics is presented in Table 1. Correlations between main study variables are presented in Table 2.

Table 2. Descriptive statics and inter-correlations of main study variables ($N=141$)

Variables	1	2	3	M	SD	Range	α
1. Stigma	—			21.56	7.55	3–39	0.81
2. PTGI	0.28**	—		47.42	27.44	0–103	0.96
3. HADS	0.27**	−0.02	—	7.79	5.70	0–30	0.85

PTGI, Posttraumatic Growth Inventory; HADS, Hospital Anxiety and Depression Scale.

* $p < 0.05$.

** $p < 0.01$.

T-tests were conducted to compare each of the major study variables between pre-diagnosis quitters and post-diagnosis quitters. Participants did not differ significantly by timing of quitting smoking on HADS ($t_{139}=0.16$, $p=0.88$; Cohen's $d=0.03$), stigma ($t_{139}=0.97$, $p=0.34$; Cohen's $d=0.18$), or PTGI ($t_{139}=0.15$, $p=0.88$; Cohen's $d=0.03$).

Moderators of the relationship between stigma and psychological distress

A hierarchical linear regression model was conducted to examine the effects of posttraumatic growth and timing of quitting smoking as moderators of the stigma-psychological distress relationship.⁴ Hierarchical linear regression results for the effects of stigma, posttraumatic growth, and timing of quitting smoking on psychological distress are shown in Table 3. The demographic control variables were included in the first step of the model. The main predictors (stigma and timing of quitting smoking) and all two-way interactions were included in the second step of the model. Finally, the three-way interaction was included in the final step of the model. The final model explained a large amount of variance (71%) in psychological distress (HADS). The three-way interaction between stigma, timing of quitting smoking, and posttraumatic growth explained a significant amount of additional variance in the overall model (R^2 change = 0.03, $p < 0.05$). Education ($p=0.001$) was significantly associated with psychological distress, such that higher levels of education were associated with lower levels

Table 3. Hierarchical linear regression predicting psychological distress (HADS) from education, employment, stigma, posttraumatic growth (PTGI), and timing of quitting ($N=141$)

Variable	Regression			Regression			Regression		
	coefficient (SE)	Beta ^a	t	coefficient (SE)	Beta ^a	t	coefficient (SE)	Beta ^a	t
	Step I			Step II			Step III		
Education ^b	−3.19 (0.94)	−0.28	−3.38*	−3.09 (0.95)	−0.27	−3.25*	−3.28 (0.94)	−0.28	−3.48*
Employed ^c	−1.93 (1.12)	−0.14	−1.74	−1.92 (1.10)	−0.14	−1.74	−2.09 (1.09)	−0.15	−1.91
Stigma	—			0.22 (0.07)	0.30	3.10*	0.22 (0.07)	0.30	3.14*
PTGI	—			−0.04 (0.02)	−0.17	−1.61	−0.02 (0.02)	−0.12	−1.11
Timing of quitting ^d	—			0.26 (0.99)	0.02	0.26	0.97 (1.04)	0.08	0.93
Stigma × PTGI	—			0.00 (0.00)	0.00	0.03	0.00 (0.00)	0.14	1.32
PTGI × timing of quitting	—			0.02 (0.04)	0.06	0.59	0.02 (0.04)	0.05	0.43
Stigma × timing of quitting	—			−0.09 (0.14)	−0.06	−0.61	−0.08 (0.14)	−0.06	−0.59
Stigma × PTGI × timing of quitting	—			—			−0.01 (0.01)	−0.22	−2.10*
Model statistics	$F(2, 138) = 8.76, p < 0.001$			$F(8, 132) = 3.85, p < 0.001$			$F(9, 131) = 3.99, p < 0.001$		
Adj. R^2	0.10			0.14			0.16		
R^2 change	0.11**			0.08			0.03*		

Stigma and PTGI in this model both represent centered variables. There is a drop in degrees of freedom across the various models due to a minor loss in number of participants due to missing data on the added covariates.

HADS, Hospital Anxiety and Depression Scale; PTGI, Posttraumatic growth inventory; SE, Standard Error.

^aBeta = standardized regression coefficient.

^bEducation = dummy coded as 0 = less than college education, 1 = college degree or higher.

^cEmployed = dummy coded as 0 = retired or unemployed, 1 = employed.

^dTiming of quitting smoking = dummy coded as 0 = pre-diagnosis quitter, 1 = post-diagnosis quitter.

* $p < 0.05$.

** $p < 0.01$.

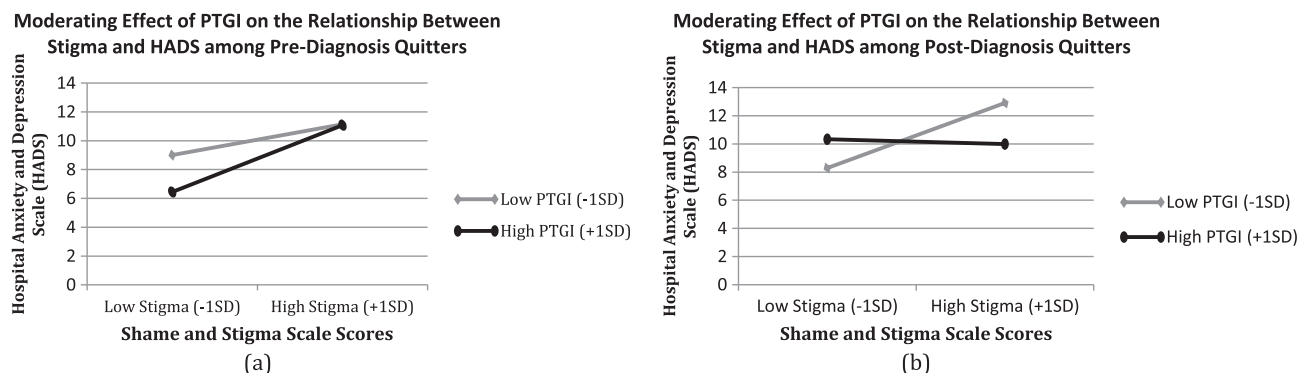


Figure 1. Results of the final step of hierarchical linear regression analysis among (a) patients who quit smoking prior to diagnosis ($n = 98$) and (b) patients who quit smoking after diagnosis ($n = 43$) regressing psychological distress (HADS) scores on self-reported stigma with posttraumatic growth (PTGI) as a moderator. Please note that all predicted values reported in these graphs are based on Step III of the hierarchical linear regression reported and thus are adjusted for covariates

of psychological distress. Lung cancer stigma was also significantly associated with psychological distress ($p = 0.002$), but this main effect was qualified by a significant three-way interaction ($p = .038$).

To test the simple slopes of this significant three-way interaction, procedures by Preacher, Curran, and Bauer [33] were used, which were developed specifically for multiple linear regression.⁵ To break apart the three-way interaction, the interactions between stigma and posttraumatic growth were examined among pre-diagnosis quitters versus post-diagnosis quitters. These findings are graphically depicted in Figure 1. As the figure shows, posttraumatic growth influenced the association between stigma and psychological distress differently for pre-diagnosis quitters (Figure 1(a)) compared with post-diagnosis quitters (Figure 1(b)). Among pre-diagnosis quitters, tests of the simple slopes showed that stigma had a positive but non-significant association with psychological distress at low levels of posttraumatic growth ($b = 0.14$, $t = 1.39$, $p = 0.167$). At high levels of posttraumatic growth, however, higher levels of stigma were associated with higher levels psychological distress ($b = 0.31$, $t = 3.01$, $p = 0.003$). Thus, simple slopes analyses indicate that the slopes for pre-diagnosis quitters are significantly different ($p = 0.003$) among those with low levels of posttraumatic growth (no effect of stigma on psychological distress) and those with high levels of posttraumatic growth (stigma is negatively associated with higher levels of psychological distress). Among post-diagnosis quitters, tests of the simple slopes showed that stigma was associated with higher levels of psychological distress at low levels of posttraumatic growth ($b = 0.31$, $t = 2.00$, $p = 0.004$). At high levels of posttraumatic growth, however, stigma had a non-significant association with psychological distress ($b = -0.02$, $t = -0.15$, $p = 0.880$).

Conclusions

The present study examined posttraumatic growth as a potential moderator of the relationship between lung

cancer stigma and psychological distress and examined how these relationships varied according to when (pre versus post-diagnosis) patients quit smoking. Supporting our hypothesis, posttraumatic growth buffered (protected) against the negative relationship between stigma and psychological distress, but this effect only occurred among those who quit smoking following diagnosis (post-diagnosis quitters). For those who quit smoking before diagnosis (pre-diagnosis quitters), higher levels of stigma were associated with higher levels of psychological distress among individuals with high levels of posttraumatic growth. Interestingly, pre-diagnosis and post-diagnosis quitters did not differ significantly on levels of stigma or posttraumatic growth. Thus, the difference between these two groups lies in the way in which posttraumatic growth functions to either reduce or exacerbate the relationship between stigma and psychological distress.

One reason for the differences in these findings could be that the effect of stigma on psychological distress is stronger among pre-diagnosis quitters than post-diagnosis quitters. For instance, one study showed that among smokers, only 12.5% attributed their cancer diagnosis to smoking [34]. Most patients said they 'didn't know' or that it was due to toxins or air pollution. Even when directly asked if their smoking could have caused their cancer, most smokers surprisingly reported that smoking was not the cause of their cancer. Smokers with a light or occasional history of smoking, however, questioned whether their smoking could have contributed to their disease [34]. Similarly, it is possible that pre-diagnosis quitters internalize more guilt and regret surrounding their former smoking behavior and thus may not experience the protective effects of posttraumatic growth on behavior change. However, the present results seemingly indicate that this is not the case, as smokers who quit before diagnosis and after diagnosis did not differ significantly on levels of stigma.

Another reason, those who quit smoking prior to diagnosis may not experience the attenuated effects of stigma

on psychological distress (through posttraumatic growth), is that they may perceive less of an opportunity (or need) for behavioral change. Because internal and external causal attributions are significantly associated with perceived control [35], pre-diagnosis quitters may actually perceive having less control over their disease and thus may not experience the positive effects of healthy behavior change as a determinant of posttraumatic growth. In line with this, prior research has shown that acceptance predicts levels of posttraumatic growth [36]. Individuals who quit smoking prior to diagnosis may feel that regardless of their efforts to prevent lung cancer and other tobacco-related conditions, they still received a diagnosis of lung cancer. As such, acceptance of one's disease may be more difficult for these survivors. This, in turn, may influence the ability for positive change or growth from their diagnosis to modify their behaviors.

These findings confirm and extend previous research which demonstrates that stigma is associated with a variety of adverse psychosocial outcomes reported by patients with lung cancer [2,8,10–12,15–18]. The present findings expand on this prior research by demonstrating that benefit finding (i.e., posttraumatic growth) moderates the negative relationship between stigma and psychological distress among survivors who quit smoking following their lung cancer diagnosis.

Study strengths and limitations

This study had several strengths, including the utilization of validated measures of stigma, posttraumatic growth, and psychological distress; examination of time of quitting smoking; a good response rate (65%); and a lack of sample bias. Despite these strengths, this study was limited in scope. First, the study was cross-sectional, precluding analyses of the causal effect of posttraumatic growth on the stigma–distress relationship across time. Second, this study has limited generalizability given that the sample was predominately White, well-educated, and focused on patients with early stage disease. The lack of racial and educational diversity may have been partially because this sample consisted of survivors who were diagnosed with early stage disease. Minorities and those with lower levels of education are more typically diagnosed at later stages of disease [13]. Thus, these individuals are less likely to be present in a lung cancer survivorship sample. Future research should examine later stage patients to see how stigma affects psychological distress among those with more advanced disease and how posttraumatic growth may play a role in buffering these associations. Third, the Stigma Scale utilized was adapted from a scale originally intended for head and neck cancer patients. As such, two of the subscales had to be dropped. Although the present analyses indicate that this modified measure is internally consistent and reliable, the validity of this

modified measure remains directly untested. Finally, the low number of current smokers in the present study did not allow for analyses to examine how stigma and posttraumatic growth might influence psychological distress among those who continued smoking following diagnosis. Future research should study this clinically important group of lung cancer patients as these patients are likely to suffer from high levels of stigma and may be at the highest risk for the negative effect of stigma on psychological distress.

Clinical implications and conclusions

The present study supports the importance of developing interventions that might reduce the negative effects of lung cancer stigma. Despite emerging research on the effects of lung cancer stigma on psychosocial outcomes [2,8–12,16–18], little empirical work has addressed interventions to reduce the deleterious effects of lung cancer stigma. Our findings suggest that lung cancer stigma could be reduced by targeting posttraumatic growth among lung cancer survivors who are post-diagnosis quitters. As such, future research should examine the effects of a posttraumatic growth intervention on reducing psychological distress among stigmatized lung cancer survivors. Achieving acceptance of prior smoking history and mitigating stigma through posttraumatic growth may be an important step in improving the psychosocial adaptation of lung cancer patients and survivors.

Therapeutic modalities focusing on cognitive behavioral strategies and self-forgiveness (e.g., acceptance and commitment therapy (ACT) and mindfulness-based cognitive behavioral therapy) may be particularly effective at reducing the association between stigma and psychological distress. For example, past research [37] indicates that ACT can significantly decrease cancer patients' levels of psychological distress and negative mood and increase quality of life and psychological flexibility (the ability to act on longer term values rather than short-term impulses, thoughts, and feelings). Relevant to the present population, ACT has also been shown to reduce internalized stigma among substance abusers [38]. As such, ACT might be an effective mode of psychotherapeutic intervention to utilize with lung cancer patients and survivors to increase posttraumatic growth and reduce the negative effects of stigma on psychological distress. Prior research [38] indicates that people experiencing internalized stigma (but not perceived stigma) benefit from utilizing ACT, suggesting that future interventions should focus on acceptance as a mode to reduce internalized stigma among individuals with lung cancer.

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Notes

1. This measure has been published and validated and shown to have good internal consistency ($\alpha=0.90$), test–retest reliability ($r=0.70$), convergent validity (correlated with Beck Depression Inventory; $r=0.71$). Validity and reliability measures are all based on the total, 14-item score.
2. This measure has been published and validated and shown to have good internal consistency ($\alpha=0.93$), convergent validity (correlated with Functional Assessment of Cancer Therapy-General (FACT-G) and Functional Assessment of Cancer Therapy-Head and Neck (FACT-H&N); $r=-0.61$ and -0.55 , respectively) and divergent validity (not significantly related to social desirability). Validity and reliability measures are all based on the total, 21-item score.
3. This measure has been published and validated and shown to have good internal consistency ($\alpha=0.90$), test–retest reliability ($r=0.70$), convergent validity (correlated with optimism) and divergent validity (not significantly related to social desirability). Validity and reliability measures are all based on the total, 21-item score.
4. To determine which covariates should be included in the final model, a multiple linear regression was conducted in order to examine which demographic and medical characteristics were significant predictors of psychological distress. All predictors significant at $p < 0.10$ level were included in the final model. Results indicated that only education (0=less than college, 1=college degree or higher) and employment (0=retired or unemployed, 1=employed) were significant predictors of psychological distress ($p=0.004$ and 0.074 , respectively). As such, these covariates were included in the final model.
5. Tests utilized with multiple linear regression were appropriate in this context because although a hierarchical linear model was utilized in the present analyses, the final step (Step III) of the model has the same regression coefficients, standard errors, and variance–covariance matrix as a multiple linear regression examining all predictors and interactions between variables as predictors of psychological distress.

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