SRNT

OXFORD

Brief report

Psychological Functioning in Patients With Chronic Obstructive Pulmonary Disease: A Preliminary Study of Relations With Smoking Status and Disease Impact

Amanda R. Mathew PhD¹, Susan E. Yount PhD², Ravi Kalhan MD, MS³, Brian Hitsman PhD⁴

¹Department of Preventive Medicine, ²Department of Medical Social Sciences, ³Department of Preventive Medicine, Division of Pulmonary and Critical Care Medicine, ⁴Department of Preventive Medicine, Northwestern University Feinberg School of Medicine, Chicago, IL

Corresponding Author: Amanda R. Mathew, PhD, Department of Preventive Medicine, Northwestern University Feinberg School of Medicine, 680 N Lake Shore Drive, Suite 1400, Chicago, IL 60611, USA. Telephone: 312-503-1343; E-mail: Amanda.mathew@northwestern.edu

Abstract

Introduction: Chronic obstructive pulmonary disease (COPD) is a tobacco-related disease associated with several comorbid conditions, including elevated rates of depression and anxiety. Psychological factors that commonly underlie nicotine dependence, depression, and anxiety may represent novel treatment targets, but have not yet been examined among patients with COPD. We assessed three psychological factors—anxiety sensitivity (AS; fear of anxiety-related sensations), distress intolerance (DI; inability to withstand distressing states), and anhedonia (Anh; diminished sense of pleasure or interest)—in relation to smoking status, COPD symptom impact, and negative response to COPD symptoms.

Methods: We conducted a single-session laboratory assessment with 37 patients with COPD (17 current daily smokers and 20 former smokers). All participants completed self-report measures of psychological factors, COPD symptom impact, response to COPD symptoms, and anxiety and depression symptoms.

Results: Current versus former smokers with COPD reported higher levels of AS, DI, and Anh. In univariate regression models, AS, DI, and Anh were each associated with greater COPD symptom impact and breathlessness catastrophizing. Only AS remained a significant predictor of COPD symptom impact and breathlessness catastrophizing after adjusting for general depression and anxiety symptoms.

Conclusions: Our preliminary study is the first to assess AS, DI, and Anh among patients with COPD. These psychological factors were elevated among current smokers and associated with more negative disease impact, suggesting their potential utility as treatment targets within this clinical population.

Implications: While elevated rates of anxiety and depression among patients with COPD have been well characterized, few studies have specifically addressed the causal, modifiable psychological factors that may underlie these disorders. Our preliminary findings demonstrate associations of three psychological factors—AS, DI, and Anh—with smoking status, COPD symptom impact, and negative reaction to symptoms. Cognitive-behavioral interventions targeted to these psychological factors may improve smoking cessation outcomes and disease adjustment among patients with COPD.

Introduction

Chronic obstructive pulmonary disease (COPD) is the third leading cause of death in the United States, responsible for 135 000 deaths each year.¹ Despite the fact that quitting smoking is the most effective and cost-effective therapy for COPD,² 47% of individuals with COPD are current smokers.³ Recent research has focused on the development of targeted interventions to foster smoking cessation among patients with COPD,⁴ but these interventions have demonstrated only modest success with long-term abstinence.⁵

Patients with COPD commonly have cooccurring conditions—high nicotine dependence, depression, and anxiety—that are associated with both smoking maintenance⁶ and lower disease functioning.⁷ Characterizing the shared psychological mechanisms that underlie these cooccurring conditions may shed light on key risk factors that can be assessed in the course of clinical care for COPD and modified by targeted intervention. A recent review highlighted three candidate psychological factors⁸: *anxiety sensitivity* (AS; fear of anxiety-related sensations), *distress intolerance* (DI; inability to withstand distressing states), and *anhedonia* (Anh; diminished sense of pleasure or interest). In the general population, these factors increase risk of clinical depression and anxiety, and are also associated with nicotine dependence and difficulty quitting smoking.⁸ Targeted cognitive-behavioral treatment strategies have been shown to effectively reduce each psychological factor^{9–11} and improve smoking cessation rates.^{12–14}

A growing body of research literature has implicated psychological factors in negative adjustment and smoking maintenance among those with COPD and other chronic airway diseases. In patients with COPD, AS is correlated with panic-spectrum psychopathology (ie, panic attacks and panic disorder),¹⁵ agoraphobic avoidance,¹⁶ and lower self-efficacy.¹⁷ Similarly, with regard to asthma, AS is associated with greater anxiety and asthma symptoms,¹⁸ and current smoking status.¹⁹ Among smokers with asthma, AS is also linked with greater nicotine dependence motives²⁰ and barriers to cessation.²¹ However, despite potential clinical utility, we are not aware of any assessment of AS and other psychological risk factors in relation to smoking status and disease functioning in patients with COPD.

In the current preliminary study of current and former smokers with COPD, we examined relations between three psychological factors—AS, DI, and Anh—and current smoking status, symptom impact, and response to COPD symptoms. The goal of our study was to generate hypotheses for future research on candidate treatment targets among smokers with COPD.

Methods

Design

We recruited a convenience sample of 37 patients with COPD from a pulmonary clinic in an academic medical center. Recruitment was stratified by smoking status to ensure that study participants were balanced across current smoker and former smoker groups. Participants provided informed consent and completed a single-session assessment at the research center. All procedures were approved by the institutional review board.

Participants

Eligible participants were females and males up to 85 years of age with a current diagnosis of COPD, as confirmed by electronic medical record. Current smokers were those who reported any level

of daily cigarette smoking over the past month (ie, ≥ 1 cigarette[s]/day, ≥ 25 days/month). Former smokers reported smoking at least 100 cigarettes in their lifetime, but smoking abstinence for at least 12 months.

Measures

Smoking Status

Participants reported their smoking status, which was confirmed through assessment of expired carbon monoxide. For current smokers, we assessed nicotine dependence with the brief Wisconsin Inventory for Smoking Dependence Motives (WISDM)²² and motivation to quit in the next month with a modified Readiness Ladder from 0 to 10, with higher scores indicating greater intent to quit in the next month.²³

Psychological Factors

AS was assessed using the Anxiety Sensitivity Index-3 (ASI-3),²⁴ an 18-item measure of tendency to be fearful of body sensations. The ASI-3 is composed of one higher-order AS factor and three specific lower-order factors of physical, cognitive, and social concerns.²⁴ DI was assessed with the Distress Intolerance Index (DII),²⁵ a 10-item measure of perceived tolerance of negative physical or emotional states. As the DII is a composite measure of the strongest items from the Frustration Discomfort Scale,²⁶ Distress Tolerance Scale,²⁷ and ASI,²⁴ we ran analyses with and without shared ASI-3 items to account for overlap. Anh was assessed using the Snaith–Hamilton Pleasure Scale (SHAPS),²⁸ a 14-item measure of a sense of pleasure or enjoyment from various activities.

Depression and Anxiety Symptoms

Depressive symptoms were assessed using the Patient Reported Outcomes Measurement Information System (PROMIS) eight-item depression short form, which measures self-reported negative mood over the past 7 days.^{29,30} Anxiety symptoms were assessed using the PROMIS eight-item anxiety short form, which measures self-reported fear, anxious misery, hyperarousal, and somatic symptoms related to arousal over the past 7 days.^{29,30}

COPD-Related Factors

COPD symptom impact was assessed with the COPD Assessment Test (CAT),³¹ an eight-item questionnaire measuring the global impact of dyspnea (eg, sputum, chest tightness, cough, and dyspnea) on health status. Response to COPD symptoms was assessed using the Breathlessness Catastrophizing Scale (BCS),¹⁷ a 13-item measure of thoughts and feelings in response to the symptom of shortness of breath.

Analytic Strategy

Data were summarized using graphical methods (eg, histograms) and descriptive statistics (eg, means and standard deviation for continuous and ordinal variables, and count and frequency for categorical variables). We next examined intercorrelations between continuous study variables using Pearson's r and tested differences between current versus former smokers using t tests for continuous variables and Pearson's χ^2 tests for categorical variables. Lastly, we ran a series of linear regression models to examine each psychological factor (AS, DI, and Anh) as a predictor of COPD symptom impact and negative response to symptoms. The models were run before and after covarying for depression and anxiety symptoms. Regression results are reported as standardized beta ($\hat{\beta}$)-weights.

Results

Descriptive Data and Intercorrelations Between Study Variables

As shown in Table 1, participants were older adults (66.7 ± 6.9 years; 18 men, 19 women) with moderate symptoms of COPD (CAT score 16.7 ± 7.0).

Current versus former smokers were younger and reported greater levels of each psychological factor (AS, DI, and Anh) as well as greater anxiety symptoms and COPD symptom impact. Former smokers had quit smoking for at least 1 year, with the majority reporting smoking abstinence for 5 years or more ($M = 15.3 \pm 13.8$ years, median = 10.0 years). Among current smokers, participants reported smoking just over half a pack per day ($M = 10.9 \pm 5.6$ cigarettes/day) and 47.1% smoked their first cigarette within 30 minutes of waking.

Correlations were first examined between depression and anxiety symptoms, COPD symptom impact, and response to COPD symptoms. COPD symptom impact was positively associated with symptoms of depression ($r = .56, p < .001$) and anxiety ($r = .66, p < .001$). Similarly, negative response to COPD symptoms was also associated with greater symptoms of depression ($r = .66, p < .001$) and anxiety

($r = .75, p < .001$). COPD symptom impact was positively correlated with negative response to COPD symptoms ($r = .73, p < .001$).

With regard to our main predictors, AS was positively correlated with DI after removing shared items ($r = .50, p = .002$). Anh was marginally related to DI ($r = .28, p = .09$), but unrelated to AS ($r = .23, p = .17$). Consistent with past research, AS and DI were positively associated with symptoms of depression and anxiety (r 's $.59-.71$; all p 's $< .05$). Anh was positively associated with anxiety symptoms ($r = .41, p = .01$) and marginally associated with depression symptoms ($r = .30, p = .07$).

Associations Between Psychological Factors, Smoking Status, and COPD-Related Factors

Current versus former smokers reported higher levels of AS (21.4 vs. 9.9; $p = .01$), DI (17.5 vs. 11.5; $p = .03$), and Anh (22.1 vs. 18.2; $p = .02$). Among current smokers, only AS was positively associated with nicotine dependence ($r = .60, p = .01$).

In the univariate regression models, AS ($\beta = .65, p < .001$) and DI ($\beta = .54, p = .001$) were each associated with greater COPD symptom impact (Figure 1). Anh was associated with COPD symptom impact at a trend level ($\beta = .31, p = .06$). Each factor was also associated with

Table 1. Sample Characteristics: Overall and by Smoking Status

Demographic variables	M (SD) or N (%)		
	Former smokers (<i>n</i> =20)	Current smokers (<i>n</i> =17)	Overall (<i>N</i> =37)
Age*	68.95 (7.11)	64.12 (5.79)	66.73 (6.90)
Sex			
Female	11 (55.0%)	8 (47.1%)	19 (51.4%)
Male	9 (45.0%)	9 (52.9%)	18 (48.6%)
Race/ethnicity			
Non-Hispanic white	14 (70.0%)	8 (47.1%)	22 (59.5%)
African American/Black	5 (25.0%)	7 (41.2%)	12 (32.4%)
Hispanic or other	1 (5.0%)	2 (11.8%)	3 (8.1%)
Smoking-related			
Expired CO value*	1.38 (1.87)	17.06 (10.74)	10.76 (8.58)
Next-month intent to quit ^a	—	7.09 (3.61)	—

Questionnaire measures	Internal consistency ^b	Possible range	Observed range	M (SD)		
				Former smokers	Current smokers	Overall
Psychological factors						
ASI-3*	0.93	0–64	0–48	9.90 (8.30)	21.41 (14.80)	15.19 (12.94)
DII*	0.86	0–40	0–34	11.45 (6.77)	17.47 (8.86)	14.22 (8.27)
SHAPS*	0.88	14–56	14–29	18.15 (4.53)	22.06 (5.19)	19.95 (5.17)
Depression and anxiety symptoms						
PROMIS-Anxiety*	0.95	37.1–83.1	37.1–69.4	49.12 (8.50)	55.21 (9.73)	51.92 (9.47)
PROMIS-Depression	0.94	38.2–81.3	38.2–70.5	47.92 (8.05)	52.15 (8.46)	49.86 (8.40)
COPD- and smoking-related						
CAT*	0.81	0–40	3–32	14.15 (6.84)	19.71 (6.05)	16.70 (6.99)
BCS	0.96	0–52	0–43	13.00 (10.97)	20.35 (12.82)	16.38 (12.26)
WISDM ^a	0.96	11–77	16.7–64.1	—	39.78 (14.22)	—

For continuous variables, *M*(*SD*) values are provided and *p* values for current versus former smoker comparisons were determined by *t*-tests. For categorical variables, *N*(%) values are provided and *p* values were determined by Pearson's χ^2 tests. ASI-3 = Anxiety Sensitivity Index-3; DII = Distress Intolerance Index; SHAPS = Snaith–Hamilton Pleasure Scale; PROMIS = Patient-Reported Outcomes Measurement Information System; CAT = COPD Assessment Test; BCS = Breathlessness Catastrophizing Scale; WISDM = Wisconsin Inventory for Smoking Dependence Motives.

^aVariables assessed among current smokers only.

^bInternal consistency determined by Cronbach's alpha.

* $p < .05$.

Figure 1. Relations between psychological factors and (a) smoking status, (b) COPD symptom impact, and (c) negative response to symptoms. Standardized (Z-score) values are reported. AS = anxiety sensitivity; DI = distress intolerance; Anh = anhedonia.

a more negative response to symptoms (β 's .35–.70; all p 's < .05). For the Distress Intolerance Index, models were run before and after removing shared items with the ASI-3, and the same pattern of associations was observed. After adjusting for depression and anxiety symptoms, only AS remained significantly associated with both COPD symptom impact (β = .37, p = .04) and negative response to symptoms (β = .31, p = .03). We subsequently examined the three lower-order AS factors as simultaneous predictors; only the AS-Physical Concern factor was significantly associated with COPD symptom impact (β = .61, p = .02) and negative response to symptoms (β = .62, p = .02).

Discussion

In summary, these preliminary findings show higher levels of three psychological risk factors—AS, DI, and Anh—among current versus former smokers with COPD. Our study is the first to demonstrate that these psychological factors were also associated with greater symptom impact and negative response to symptoms among patients with COPD. AS—particularly the dimension of physical concerns—showed unique associations with COPD-related outcomes, even after adjusting for depression and anxiety symptoms. Because AS indexes risk for negative reactions to bodily sensations such as shortness of breath, it may be a particularly sensitive indicator of psychological vulnerability among patients with COPD, and maintain smoking for negative reinforcement motives.

While elevated rates of anxiety and depression among patients with COPD have been well characterized, few studies have specifically addressed the causal, modifiable psychological factors that underlie these disorders. Previous investigations among those with chronic airway diseases have identified AS as a robust predictor of both symptoms of psychological disorders^{15,16} and smoking-related characteristics.^{19–21} Our study extends these findings by examining theory-based psychological factors in relation to both symptom adjustment and smoking status among patients with COPD. Findings show that mean AS scores among current smokers with COPD exceeded published norms in a nonclinical sample (M = 12.8 $\pm$ 10.6), but do not reach levels endorsed by patients with clinical anxiety disorders (M = 26.3–32.6).³² Mean DI scores among current smokers with COPD are similarly greater than those reported in a nonclinical sample (M = 10.1 $\pm$ 7.0),³³ but less than those of individuals with psychiatric disorders (M = 22.5 $\pm$ 10.0).¹¹ Mean Anh scores were relatively low, with only three participants endorsing Anh at or above the suggested clinical cutoff score.²⁸ Given the functional limitations associated with COPD, a measure of Anh that indexes actual versus anticipated pleasure in response to events (eg, Environmental Reward Observation Scale [EROS]³⁴) may be a more meaningful index of the construct in this population.

Cognitive-behavioral interventions targeted to these psychological factors may improve smoking cessation outcomes and disease adjustment among patients with COPD. Intervention strategies such as mindfulness training, behavioral activation, and interoceptive exposure are promising in reducing psychological risk factors^{9–11} and fostering successful smoking cessation.^{12–14} Treatment targets could be further extended among patients with COPD to address other aspects of behavioral health such as exercise tolerance, treatment engagement, and physical activity, with potential to significantly improve disease functioning and quality of life.

This study is limited by its small sample size and cross-sectional design. Findings are hypothesis generating and suggest several directions for future research. First, large-scale observational studies are needed to replicate and extend findings by examining prospective relations between psychological factors, smoking status, and other health behaviors (eg, treatment engagement and exercise tolerance) among patients with COPD. Second, future studies should assess cooccurring conditions such as psychiatric and substance use disorders and medical comorbidities (eg, cardiovascular disease and cancer) to characterize unique versus shared associations with psychological factors. Lastly, future work should examine psychological factors as prognostic indicators of long-term clinical outcomes (eg, smoking cessation and functional impairment) among patients with COPD. If the present findings are confirmed, targeting psychological factors would represent a potentially novel avenue to improve

smoking cessation outcomes, symptom burden, and quality of life among patients with COPD.

Funding

This work was supported by the National Institutes of Health (UL1TR001422, K23 HL138165 to AM) and the American Lung Association (SB-514748 to AM).

Declaration of Interests

None declared.

Acknowledgments

The authors wish to thank Nepheli Raptis, Avni Singh, Allison Rogowski, and Neil Shea for assisting with data collection.

References

1. Tilert T, Dillon C, Paulose-Ram R, Hnizdo E, Doney B. Estimating the U.S. prevalence of chronic obstructive pulmonary disease using pre- and post-bronchodilator spirometry: the National Health and Nutrition Examination Survey (NHANES) 2007–2010. *Respir Res.* 2013;14(1):103.
2. Godtfredsen NS, Lam TH, Hansel TT, et al. COPD-related morbidity and mortality after smoking cessation: status of the evidence. *Eur Respir J.* 2008;32(4):844–853.
3. Schauer GL, Wheaton AG, Malarcher AM, Croft JB. Smoking prevalence and cessation characteristics among U.S. adults with and without COPD: findings from the 2011 Behavioral Risk Factor Surveillance System. *COPD.* 2014;11(6):697–704.
4. van Eerd EA, van Rossem CR, Spigt MG, Wesseling G, van Schayck OC, Kotz D. Do we need tailored smoking cessation interventions for smokers with COPD? A comparative study of smokers with and without COPD regarding factors associated with tobacco smoking. *Respiration.* 2015;90(3):211–219.
5. Hoogendoorn M, Feenstra TL, Hoogenveen RT, Rutten-van Mölken MP. Long-term effectiveness and cost-effectiveness of smoking cessation interventions in patients with COPD. *Thorax.* 2010;65(8):711–718.
6. Jimenez-Ruiz CA, Guerrero AMC, Ulibarri MLM, Fernandez MIC, Gonzalez GL. Phenotypic features in COPD smokers attending a smoking cessation unit. *Eur Respir J.* 2011;38(suppl 55):1562.
7. Panagioti M, Scott C, Blakemore A, Coventry PA. Overview of the prevalence, impact, and management of depression and anxiety in chronic obstructive pulmonary disease. *Int J Chron Obstruct Pulmon Dis.* 2014;9(1):1289–1306.
8. Leventhal AM, Zvolensky MJ. Anxiety, depression, and cigarette smoking: a transdiagnostic vulnerability framework to understanding emotion-smoking comorbidity. *Psychol Bull.* 2015;141(1):176–212.
9. Feldner MT, Zvolensky MJ, Babson K, Leen-Feldner EW, Schmidt NB. An integrated approach to panic prevention targeting the empirically supported risk factors of smoking and anxiety sensitivity: theoretical basis and evidence from a pilot project evaluating feasibility and short-term efficacy. *J Anxiety Disord.* 2008;22(7):1227–1243.
10. Hopko DR, Armento ME, Robertson SM, et al. Brief behavioral activation and problem-solving therapy for depressed breast cancer patients: randomized trial. *J Consult Clin Psychol.* 2011;79(6):834–849.
11. McHugh RK, Kertz SJ, Weiss RB, Baskin-Sommers AR, Hearon BA, Björgvinsson T. Changes in distress intolerance and treatment outcome in a partial hospital setting. *Behav Ther.* 2014;45(2):232–240.
12. MacPherson L, Tull MT, Matusiewicz AK, et al. Randomized controlled trial of behavioral activation smoking cessation treatment for smokers with elevated depressive symptoms. *J Consult Clin Psychol.* 2010;78(1):55–61.
13. Brown RA, Reed KM, Bloom EL, et al. Development and preliminary randomized controlled trial of a distress tolerance treatment for smokers with a history of early lapse. *Nicotine Tob Res.* 2013;15(12):2005–2015.
14. Zvolensky MJ, Borgiaian D, Salazar PL, Farris SG, Bakhshae J. Anxiety sensitivity reduction smoking-cessation program for Spanish-speaking smokers (Argentina). *Cogn Behav Pract.* 2014;21(3):350–363.
15. Livermore N, Sharpe L, McKenzie D. Catastrophic interpretations and anxiety sensitivity as predictors of panic-spectrum psychopathology in chronic obstructive pulmonary disease. *J Psychosom Res.* 2012;72(5):388–392.
16. Holas P, Michałowski J, Gawęda Ł, Domagała-Kulawik J. Agoraphobic avoidance predicts emotional distress and increased physical concerns in chronic obstructive pulmonary disease. *Respir Med.* 2017;128(7):7–12.
17. Solomon BK, Wilson KG, Henderson PR, Poulin PA, Kowal J, McKim DA. A Breathlessness Catastrophizing Scale for chronic obstructive pulmonary disease. *J Psychosom Res.* 2015;79(1):62–68.
18. McLeish AC, Luberto CM, O'Bryan EM. Anxiety sensitivity and reactivity to asthma-like sensations among young adults with asthma. *Behav Modif.* 2016;40(1–2):164–177.
19. Avallone KM, McLeish AC. Anxiety sensitivity as a mediator of the association between asthma and smoking. *J Asthma.* 2015;52(5):498–504.
20. McLeish AC, Farris SG, Johnson AL, Bernstein JA, Zvolensky MJ. An examination of the indirect effect of anxiety sensitivity in terms of asthma and smoking cessation processes. *Addict Behav.* 2015;50(11):188–191.
21. McLeish AC, Johnson AL, Avallone KM, Zvolensky MJ. Evaluating the role of anxiety sensitivity in barriers to cessation and reasons for quitting among smokers with asthma. *Psychol Health Med.* 2016;21(2):236–247.
22. Smith SS, Piper ME, Bolt DM, et al. Development of the brief Wisconsin Inventory of Smoking Dependence Motives. *Nicotine Tob Res.* 2010;12(5):489–499.
23. Biener L, Abrams DB. The Contemplation Ladder: validation of a measure of readiness to consider smoking cessation. *Health Psychol.* 1991;10(5):360–365.
24. Taylor S, Zvolensky MJ, Cox BJ, et al. Robust dimensions of anxiety sensitivity: development and initial validation of the Anxiety Sensitivity Index-3. *Psychol Assess.* 2007;19(2):176–188.
25. McHugh RK, Otto MW. Refining the measurement of distress intolerance. *Behav Ther.* 2012;43(3):641–651.
26. Harrington N. The frustration discomfort scale: development and psychometric properties. *Clin Psychol Psychother.* 2005;12(5):374–387.
27. Simons JS, Gaher RM. The distress tolerance scale: development and validation of a self-report measure. *Motiv Emot.* 2005;29(2):83–102.
28. Snaith RP, Hamilton M, Morley S, Humayan A, Hargreaves D, Trigwell P. A scale for the assessment of hedonic tone the Snaith–Hamilton Pleasure Scale. *Br J Psychiatry.* 1995;167(1):99–103.
29. Schalet BD, Pilkonis PA, Yu L, et al. Clinical validity of PROMIS Depression, Anxiety, and Anger across diverse clinical samples. *J Clin Epidemiol.* 2016;73(5):119–127.
30. Pilkonis PA, Choi SW, Reise SP, Stover AM, Riley WT, Cella D; PROMIS Cooperative Group. Item banks for measuring emotional distress from the Patient-Reported Outcomes Measurement Information System (PROMIS®): depression, anxiety, and anger. *Assessment.* 2011;18(3):263–283.
31. Jones PW, Harding G, Berry P, Wiklund I, Chen WH, Kline Leidy N. Development and first validation of the COPD Assessment Test. *Eur Respir J.* 2009;34(3):648–654.
32. Reiss S, Peterson R, Taylor S, Schmidt N, Weems C. Anxiety Sensitivity Index Consolidated User Manual: ASI, ASI-3, and CASI. Worthington, OH: IDS Publishing; 2008.
33. Szuhany KL, Otto MW. Contextual influences on distress intolerance: priming effects on behavioral persistence. *Cognit Ther Res.* 2015;39(4):499–507.
34. Armento ME, Hopko DR. The Environmental Reward Observation Scale (EROS): development, validity, and reliability. *Behav Ther.* 2007;38(2):107–119.